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# DISSERTATION

Titel der Dissertation

Nano is like...

The role of analogies in public engagement with  
nanotechnology in Austria

Verfasserin

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## A Kōan

Well, he said, I admit that justice bears a resemblance to holiness, for there is always some point of view in which everything is like every other thing; white is in a certain way like black, and hard is like soft, and the most extreme opposites have some qualities in common; even the parts of the face which, as we were saying before, are distinct and have different functions, are still in a certain point of view similar, and one of them is like another of them. And you may prove that they are like one another on the same principle that all things are like one another; and yet things which are like in some particular ought not to be called alike, nor things which are unlike in some particular, however slight, unlike. — *Plato, Protagoras*

All comparison delays, and that is why mediocrity likes it so much and, if possible, traps everyone in it by its despicable friendship among mediocrities. A person who blames others, that they have corrupted him, is talking nonsense and only informs against himself. — *Søren Kierkegaard, Either/Or*

What then is truth? A moveable host of metaphors, metonymies, and anthropomorphisms: in short, a sum of human relations which have been poetically and rhetorically intensified, transferred, and embellished, and which, after long usage, seem to people to be fixed, canonical, and binding. Truths are illusions which we have forgotten are illusions; they are metaphors that have become worn out and have been drained of sensuous force, coins which have lost their embossing and are now considered as metal and no longer as coins. — *Friedrich Nietzsche, On Truth and Lies in a Nonmoral Sense*

The way to solve the problem you see in life, is to live in a way that will make what is problematic disappear. The fact that life is problematic shows that the shape of your life does not fit into life's mold. So you must change the way you live and, once your life does fit into the mold, what is problematic will disappear. — *Ludwig Wittgenstein, Culture and Value*

At the beginning, the perception of oneness is not distinct—there is still the idea of “something confronting me!” With deepening practice this barrier gradually dissolves. (...) Let us take the body as a concrete example of the absolute equality of things. In the realization of the sameness aspect, of each object having equal value, your face and the soles of your feet are not different; one is not high and the other low. Similarly, a lawbreaker is not inherently evil, nor is a law-abiding person a pillar of virtue. (...) Having experienced the world of equality through kenshō, one sees differences in and through the aspect of sameness. — *Yasutani quoted in Philip Kapleau, The Three Pillars of Zen*

Why should black not be like white? Why should we give up comparing? How to experience difference in sameness? What is the truth and the most deeply-rooted illusion we cling to? What is the main problem in our lives and how to find a way of living that makes it disappear? One way of finding out: Let's apply actor-network theory to our minds—and then let's be pleasantly surprised of who really acts and asks these questions!



## Acknowledgements

The path that led to the completion of this dissertation has been shaped by many encounters during the five years of my PhD at the Department of Science and Technology Studies. Four of these years I spent working on two projects, for whose funding I am truly thankful because otherwise this dissertation would not have been written at all: the four-year “Making Futures Present” project funded by the Austrian Science Fund (FWF) and a shorter bmwf-funded Sparkling Science project. Although institutions provide the funding and material necessities to conduct research—thank you University of Vienna—, what matters most is the people who generously share their ideas with us. Here, first of all, I am indebted to my supervisor Professor Ulrike Felt. She enabled me to gain this invaluable project experience and always supported my PhD process with helpful comments and general understanding. As important were the many opportunities she facilitated to exchange ideas and get feedback from international scholars in countless summer schools and workshops (see below). Above all, her insatiable curiosity—to use the words of her mentor Helga Nowotny—has never ceased to amaze me since I first came to know her.

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in terms of team dynamics but also more fundamentally in that it made me reconsider my identity, as the individual formerly known as Claudia slowly merged with her into a “microscopic multiple” (Rieder 2013) dubbed Nini&Nano. What more can you wish for than having a colleague you can become one with: Nini&Nano never dies! Then, there is the rest of the so-called “Viennese STS circle” during my PhD days at the Department, among them Thomas Völker, Judith Igelsböck, Andrea Schikowitz, Michi Penkler, Kay Felder, Theresa Öhler, Christoph Musik, Ruth Müller, Max Fochler, Sarah Schönbauer, Stefanie Schürz and many more. You were there during the hard and the fun times—in fact, without you, there surely would not have been as many fun times, of this I’m certain! My thanks also go to all of you who commented on drafts of this dissertation at our PhD seminars and summer schools.

After leaving this active academic hub, the Institute for Advanced Studies on Science, Technology and Society in Graz became a great intermediate station filled with international scholars of different traits. Going there from time to time to escape my self-imposed isolation in the countryside in the final writing phase revived my motivation and helped me stay sane. My special thanks go to my officemates, Esther Ortega and Anna Schreuer. Back in Vienna, I came to value the luxurious surroundings of the Ludwig Wittgenstein reading room at Austrian National Library. It’s simply a fantastic place to concentrate, write and think in and for meeting and exchanging experiences with PhD comrades suffering from the same hardships and strains. Not to forget, walking by the portrait of Ludwig Wittgenstein several times a day reminded me that getting to the essence of phenomena and life is what should count the most—always.

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# 1 Introduction

## 1.1 Setting the scene: Encountering analogies at a podium discussion on nano

In February 2012, I happened to attend a podium discussion at a “Young researcher’s symposium” in Vienna, which marked the closing of a project that aimed to engage young people in reflecting on the risks and benefits of nanotechnology.<sup>1</sup> I was present at this event as a member of the large project team, but since I was not involved in the organization of the podium discussion, I was just sitting in the audience, not knowing what to expect when the podium discussion started. As it turned out, it was composed of a few students, who had participated in the project, and of several stakeholder representatives, among them a politician from the Austrian Ministry of Life, a spokesperson from a consumer protection organization and an industry representative from the Austrian Chamber of Commerce. What distinguished me from my fellow audience members was that I was the only one furiously taking notes when the podium discussion started. At that point in time I was knee-deep in my dissertation research—an academic undertaking driven by the interest to explore the role of analogies in public engagement settings on nano, and based on material generated in another four-year research project in which I collaborated.<sup>2</sup> This interest was sparked by a central aim from the larger project, namely to explore “the multiple ways actors construct their arguments or fuller narratives on these innovations, how they use past experiences, how they draw upon broader cultural analogies and metaphors as well as how they employ projections of potential futures in order to assess the present possibilities of choice” (from the project proposal, see also (Felt 2009)).

There I sat, hardly believing my luck, when the discussion took off with a debate about the adequacy of a specific analogy. Below is a representation of this debate, reconstructed from my detailed scribbling, because it captures perfectly what this dissertation is about: how people of different backgrounds make use of analogies when talking about nano to achieve specific effects in interaction. When reading the following conversation, please pay close attention to the ways in which analogies are constructed, accepted, or rejected; in

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<sup>1</sup> This was a bmwf (Austrian Ministry for Science and Research) funded Sparkling Science project, that ran from October 2010 until October 2012, under the title “Nanomaterials: Possibilities and Risks of a New Dimension”.

<sup>2</sup> The project was called “Making Futures Present: On the Co-Production of Nano and Society in the Austrian Context” (P20819), funded by the Austrian Science Fund (FWF), at the Department for Science and Technology Studies at the University of Vienna with Ulrike Felt as principal investigator.

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other words, how similarities are established and differences argued. Doing so will not only sharpen your analytical sensibility but also constitutes great preparation for the empirical part of this dissertation, where long stretches of talk will test your endurance.

- 1 Moderator: To what extent is the fascination with nano comparable to the fascination with radioactivity back in the day?
- 2 Politician: That's an interesting analogy because last year we had Marie Curie year. But you can't compare it with nano, because nano's portfolio is much larger and the societal assessment much better. Its applications are already quite concrete, so that we can grasp the fascination better.
- 3 Consumer representative: The comparison is not quite fitting. Radioactivity has a clear effect, nano has a lot of different effects, a much larger spectrum, which however is also the problem with nano. Another comparison would be with asbestos because the fibres are similar. It was already observed around 1900 that asbestos causes lung disease, but it was not banned by law until 1990. We need to do research on the negative effects of nano to guarantee its responsible introduction.
- 4 A female student: I agree with the consumer representative. Back then with radioactivity everything was new and what do they do now with nano? It's also a new technology that is not fully researched and we already use it! The comparison can be made. We have to be careful. I would be really careful.
- 5 Industry representative: This analogy is misleading. We are now much more advanced with risk anticipation. In the area of food, nano has been used since the 1960s. Nano is nothing new, we have been using it for long now. Of course you have to do risk assessment, but to just say that a product with nano is dangerous would be wrong.
- 6 A male student: You can compare it because the fascination is similar. Radioactivity was also en vogue back then. It's true, it has been used since the 19<sup>th</sup> century, but there's still work to do until you can say it's okay.
- 7 An older man from the audience: Just to put the record straight concerning radioactivity. Radioactivity affects humans if they aren't shielded, that's not the case with nano, it really depends on the application. It's like comparing apples and oranges if you compare these two.
- 8 Another male student: If you think about thalidomide or medication, and with nano the examination is still missing. We will hit on it 20 years later.
- 9 Industry representative: Yes and no. A lot of products pass through long processes, for instance medicine and cosmetics. There's precise risk assessment, it's not true that industry doesn't take responsibility.
- 10 Politician: Thalidomide is a great example because we really learned a lot since then. We've tried to improve the licensing systems and to handle our non-knowledge. Also with CFC we were so happy with its properties. All we can do is to make our systems better. We can't guarantee that something like thalidomide won't happen again.

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This is an extremely rich interchange in terms of analogical discourse. In the following I will provide a short analysis of some of its aspects, as a way to familiarize readers with my analytical approach. The discussion starts out with the moderator posing one out of 40 questions the students participating in the project came up with for the podium discussion. The question puts an analogy with radioactivity up for debate based on a suggested similarity of the societal “fascination” attending the introduction of both technologies. Without much of a prefix, the debate immediately takes off and different viewpoints are articulated around the analogy, leading also to the construction of alternative analogies as the legitimacy of the radioactivity analogy is challenged. The comments exhibit a range of argumentative strategies, employed either to embrace or to counter the analogy and the conclusions it is imagined to suggest. This shows that historical analogies invoking socio-culturally shared knowledge may prove fruitful starting points for stimulating debate about a new technology such as nanotechnology.

What is interesting to examine here is also who constructs which analogies to achieve what particular effect. Evidently, the radioactivity, asbestos, and thalidomide analogies all highlight the potential health threats nano could pose and are hence mobilized by the students and the consumer representative to demand better risk assessment of nano. These analogies are directed to the industry representative and politician present, because they react with defense strategies. For instance, in turn 5 the industry representative tries to appease concerns over nano’s riskiness by arguing that nano is not fundamentally new. The politician in turn 10, like the industry representative in turn 9, seeks to regain public trust when he highlights that state regulators have learned from past failures and do everything in their power to avoid similar events from reoccurring. Another interesting reaction to the radioactivity analogy can be found in turn 7, where an audience member has his say. Even without knowing the identity of the speaker, we are able to discern that he presents himself as someone who is entitled to dismiss the analogy, whereby he also devalues the students’ demand to exercise caution with nano.

Without going into more detail, this short analysis of the discussion already indicates that analogies bring with them specific frames, conclusions, and attribute responsibilities to certain actors, which makes them central and contested rhetorical elements in debates about nano. Investigating the role analogies play in public debates about new technologies may consequently prove a particularly rich research path to understand the public concerns that co-emerge around new technologies. While the above excerpt sets the scene thematically, the dissertation at hand does not analyze such multi-stakeholder debates but focuses on discussion group settings with citizens, where scientists and other stakeholders are not physically present. Such citizen-composed discussion groups have become

important means to implement the paradigm of public engagement that dominates current science and technology governance approaches in many Western nation states, at least on a discursive level. These settings can be considered as relatively new spaces where the public is invited to discuss and decide over technoscientific matters. This dissertation hence has grown out of and contributes to current political and academic debates about these new forms of citizen engagement. Additionally, it is also informed by and aims to provide insights to other research strands in science and technology studies (STS) such as recent work on the performative role of futures; discourse analysis, particularly discursive and rhetorical psychology; research about small group interaction and focus group research; as well as philosophy, primarily ethics. In the remaining parts of this introduction, I will introduce my specific take on analogies and elaborate on several academic discussions that form the background to this dissertation before I conclude with a more detailed specification of the research interest.

## **1.2 Is analogy like metaphor? A definitional attempt**

What is this thing I research and call analogies? The point of this section is to arrive at a brief working definition of analogies and to minimize the conceptual confusion that usually surrounds the notions analogy and metaphor right at the beginning. This is necessary because often the two terms are used interchangeably. Indeed, I also will engage in this equalization practice in the theoretical chapters of this dissertation, because most of the arguments made there equally apply to metaphors and analogies. In the empirical section, however, I will take the distinction between analogies and metaphors much more seriously.

In fact, analogy and metaphor are so closely related to each other that their frequent synonymic use in everyday speech or even their academic treatment appears less astounding. Take for instance this definition of analogies which may likewise apply to metaphors: “Two entities are analogous if the relevant aspects of one are related in such a way that they agree with or correspond to the way in which the relevant aspects of the other entity are related.” (Post and Leisey 1995, 46) Metaphors can incorporate such an analogical dimension, when the two entities they bring together are semantically distant (Holyoak 2005). In terms of nearness or distance of domains such metaphors represent “the form of similarity classification which involves the greatest distance between the conceptual objects involved, since it would be absurd or false to take the proposed conjunction literally” (Knorr-Cetina 1981, 51). Others claim that novel metaphors resemble analogies in the way they are interpreted, but that more common metaphors represent more general schemas (Gentner et al. 2001).

Having said that, let me stress that this dissertation is for the main part not about metaphors but about analogies, which is simply due to the abundance of analogies in the studied public engagement settings. While it is worthwhile to explore the metaphorical quality of any discourse, talk in public engagement settings simply does not tend to be exceptionally metaphorical. Discussion group settings do not generate much specific metaphorical language. Rather, and more frequently than in other kinds of discourse, one can find analogies and their counterpart, distinctions (Marková et al. 2007, 154). But since most metaphors are analogical, this focus on analogies, paradoxically, also broadens the scope of phenomena under investigation. This is why I prefer to speak of *analogizing* when referring more generally to comparative processes, which can be embodied in metaphors, analogies, disanalogies/distinctions, similes, idioms, or other comparative expressions. I will restrict my use of the term “analogy” in the empirical chapters to instances where analogical processes are not articulated in a word (a metaphor) but stretch over longer semantic entities and even beyond individual turns. More precisely, such analogies mostly occur in the shape of similes such as “X is similar to Y”, “X is like Y”, “X reminds me of”, “X is the same as Y”, or “X might be Y”, rather than in the typical metaphorical form of “X is Y”.

### **1.3 Nanotechnology between great expectations and risk management**

As this dissertation focuses on how participants in discussion groups talk about nanotechnology, a central question that might emerge is why nanotechnology has been chosen as the issue for discussion. To start with, nanotechnology is an interesting case to study because it has become a major research and development focus in many Western countries over the last decade, with many national and supranational funding initiatives allocating resources for research in this area. The Austrian Nano Initiative, which was launched in 2004, was one such initiative. Looking at a policy document from the Austrian Council for Research and Technology Development, written to gain funding for this initiative, we already encounter an analogy: there nano is described as a “promising future technology with an enormous application potential in many industrial sectors and areas of life [which] could have a similarly strong impact on our civilization as did information and communication technologies over the last decade” (Rat für Forschung und Technologieentwicklung (RFT) 2002). Here, an analogy between nanotechnology and information and communication technology is suggested presumably to generate excitement for nano and argue for its potential positive impacts on Western culture. The quote also illustrates that at the dawn of the 21st century nanotechnology is heralded as an essential “future technology” and a driving force for the “next industrial revolution”

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(National Science and Technology Council 2000) by scientists, industry representatives, and politicians. Particularly when it is imagined to converge with other fields such as biotechnology, information and cognitive technologies, nano is ascribed huge potential to deliver applications and products in a variety of fields, for instance in medicine, food production, new materials, ICTs or energy supply.

While nanotechnology is characterized by such great expectations, the definition of nanoscience and -technology<sup>3</sup> (henceforth also just “nano”) is still contested. In this dissertation, I follow a technical definition that conceives of nanoresearch as the study, manipulation, and construction of elements of 1 to 100 nanometers; a scale on which many materials change their properties. To be clear, nano does not refer to a single technology but to a variety of approaches converging at the nanoscale. Moreover, it has been argued that nanoscience is neither a new discipline nor a radical break from former ways of doing science, but rather a fusion of parts of disciplines such as physics, chemistry, material sciences and biology (Wood, Jones, and Geldart 2007). Following Wood et al., we may also distinguish between different views on nano: incremental nanotechnology that continues research from the last 50 years in the molecular and material sciences; evolutionary nanotechnology that scales down existing technologies to the nanoscale; and radical nanotechnology propagated by futurists like Eric Drexler, who imagine that nano may one day enable molecular manufacturing—the production of tiny self-reproducing machines.

Over 400 nano-enabled consumer products (e.g. sunscreens, cleaning agents, nano-coated surfaces) were estimated to have reached the Austrian market in 2009<sup>4</sup>, although mostly unnoticed due to missing regulations and labeling obligations. But as has become clear by now, advocates of nanotechnology predict more than just improvements of familiar products: they expect nanotechnology to bring about revolutionary changes in many areas of everyday life. The co-presences of existing applications and future rhetoric certainly makes it difficult to clearly distinguish between the applications already on the market, in the making, or merely existing in visionary discourse. Particularly media stories here play an important role in making the future look as if already present or “just around the corner” (Evans, Kotchetkova, and Langer 2009).

Nanotechnology hence represents a good contemporary example for a technology that creates an “economy of promises” (Felt 2007), in which many societal actors have stakes. Scholars specialized in the sociology of expectations—a growing area of research in STS—have highlighted the performative role of expectations and promises in research and

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<sup>3</sup> For clarity, nanotechnology is generally understood as the application of nanoscience for the production of marketable products (RS/RAE 2004).

<sup>4</sup> <http://epub.oeaw.ac.at/ita/nanotrust-dossiers/dossier009.pdf> (accessed 2 April 2014)



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development processes; that is, the effect of future-oriented rhetoric on the present, particularly when it comes to the allocation of funding (Brown, Rappert, and Webster 2000; Borup et al. 2006; Brown 2005; Brown and Michael 2003). In contrast to future studies or forecasting, this approach is not concerned with predicting the future ('looking into the future') but with investigating the strategic mobilization of the futures in the present ('looking at the future in-the-making'). In an era where the future is considered as open and to be shaped by human activities, such a perspective on 'present futures' becomes increasingly relevant (Adam and Groves 2007).

In this dissertation I propose to extend this view on future and foresight in the present by also taking into account how the past is conjured up to build specific futures and how hindsight is used to influence and justify present activities. This is where analogies come in. Again, in contrast to work in future studies, where forecasting by analogy is used to predict the future by referring to patterns of events from the past (Dortmans and Eiffe 2004), my approach departs from the assumption that analogies with past cases and experiences are invoked for a specific purpose in the present. Or put differently: constructions of the future are always entangled with constructions of the past and an orientation towards the present. Similarly, it has been argued that with nano both the future and past are mobilized to build an argument for the development of the technology (McGrail 2010). It is hence fundamental for social science 'looking at the future in-the-making' to not to lose sight of the past in the present.

In parallel to all the hopes and promises that accompany the emergence of nanotechnology, science fiction-like dystopian visions of self-replicating, destructive nanobots leading to a grey goo scenario<sup>5</sup> (Drexler 1987), likewise gave distinction to the debates about nanotechnology from the beginning. Notably, Michael Crichton's science fiction novel *Prey* (2002), in which a nano-enabled swarm of biological organisms gets out of control, has contributed to the publicity of such dystopian visions. While such science fiction stories were prominent in the 'early days' of the nano debate, the increasing development of applications and products already reaching the market has given rise to concerns about possible negative effects of nanoparticles on human health and the environment. It is in the context of debates about nano's potential health, safety and environmental risks that the asbestos-nano analogy emerged as a powerful but also contested resource (Kane and Hurt 2008; Von Schomberg 2010). By remembering a past case of a novel material where anticipatory risk assessment failed, the analogy cautions that

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<sup>5</sup> In such a scenario nanoassemblers are imagined to transform all organic material on earth into lifeless "grey goo" consisting only of nanomachines.

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research and regulation should address nano's potential toxicity (see turn 3 of the podium discussion at the beginning of this introduction).

In reaction, nanoscientists and industry representatives often tend to resort to rhetorical strategies that downplay nano's novelty and consequently its potential riskiness (see turn 5 of the podium discussion), while at the same time hailing nano as revolutionary to gain funding (Swierstra and Rip 2007). This already highlights a central view that is advocated in this dissertation, namely that we need to pay close attention to the different argumentative strategies or narratives that are mobilized to persuade specific audiences, and that tend to recur with many new technologies:

The technology is brand new (and will create a new society through genetic modification or offer nano-implants for human enhancement) when technological elites speak to investors, policy makers or patent offices, and to publics to be enrolled in the new venture. But the same technology is nothing unusual (we have been modifying genetic make-up of organisms all along, nanotechnology is just about making things smaller and faster) when actual or anticipated concerns have to be assuaged. (Felt and Wynne 2007, 26).

A discourse analytic perspective (see Chapter 3) allows us to see such seemingly contradictory arguments (Sparrow 2007) as arguments designed for specific audiences to achieve different effects.

The prominence of the asbestos analogy and these counter-arguments also elucidates that current policy debates about nano focus on risk issues rather than broader innovation governance (Felt and Wynne 2007). The asbestos analogy channels the debate in terms of the risks that can be examined by natural sciences, while moving broader questions about values, norms, and socio-technical imaginaries to the background. In Austria, the state-sponsored *NanoTrust* project<sup>6</sup> was undoubtedly part of such risk governance strategies. It was initiated to collect and make existing knowledge on possible health and environmental risks publicly accessible, and was less concerned with starting a broader public discussion about nano's societal and ethical dimensions. In this "new deficit model" (Brown 2009), knowledge about risks is assumed to lead to public acceptance and trust, while ignoring that there will always be unknowns and other pressing issues on how to govern technoscientific innovations under these conditions. Reducing nano to matters of health and environmental risks insinuates that public concerns only revolve around issues for which science provides closure, when in fact science may not provide definitive answer and

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<sup>6</sup> See <http://nanotrust.ac.at> (accessed 12 May 2012)

nano may also raise more fundamental questions concerning the ways societies create and govern new technologies or the values inscribed in certain technological applications.

#### **1.4 Technophobic publics and past experiences in Austrian nanopolicy**

Many Western nation states as well as the EU emphasize the role of investments in nanotechnologies to uphold their economic strength in a worldwide technological competition. In order to maintain their leading role, working groups are set up whose task is to develop recommendations for action, generally in the form of action plans (European Commission 2005). The “Austrian Nanotechnology Action Plan” is a good case in point here. It represents the output of a government-induced discussion process by a consortium of relevant actors in the field of Austrian nanotechnology governance, among them policy makers, scientists, and NGOs. The following call for action stems from this action plan:

Technophobia due to ignorance is a well-known phenomenon based on the fear of the unknown. The only way to counteract such fear is through education and information. (...) Dealing professionally with aspects of “innovation resistance” in the light of former neo-technologies. It is necessary to avoid polarizing the debate, especially in the direction of “nanotechnology is fundamentally dangerous.” The discussions need to be depersonalized in order to ensure that Austria remains attractive as a place of business, which may generally attract companies to relocate to Austria. The public debate must be conducted fairly, with a discussion of the opportunities as well as the risks. No secret should be made of the fact that “Nano” is nothing new in innumerable (natural) fields, but no secret should be made of the fact either, that there are still knowledge gaps in some areas. (ANAP 2010, 20f.)

This quote relates to several issues at the core of this dissertation, one of them is the entanglement of constructions of “the public” with specific governance activities. Here, the Austrian public is described as generally averse to innovations due to a knowledge deficit. Such a characterization frames the public as problematic and as standing in the way of a bright nanotechnological future. Information policy then is presented as a legitimate strategy to solve this problem and to counteract “technophobia”. The action plan here reproduces the “myth” of the technophobic public that persistently keeps circulating among Austrian policy circles, scientists, and in the media. Few are the examples that question rather than intensify this “myth”.<sup>7</sup> As has been pointed out by STS scholars, such

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<sup>7</sup> Interestingly, one such contesting example has been produced by Thomas Jakl, a central policy actor in Austrian nanogovernance from the Austrian Ministry of Life, who also was the policy representative speaking

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generalizing attributions of “innovation resistance” to the public—which can also be found on the European policy level—tend to disregard the “manifold ways in everyday European life where science and technology are implicitly trusted, taken-for-granted, depended-on, and enthusiastically embraced by European publics. (...) An intrinsically ‘mistrusting’, ‘risk-averse’ European public for science is a serious mischaracterization.” (Felt and Wynne 2007, 10)

Such a critique is founded on extensive research into the public understanding of science (short: PUS)—a growing field of political and academic interest since the 1980s that originated in the seminal Royal Society report on “The Public Understanding of Science” (The Royal Society 1985). Back then, a lack of public appreciation for science was thought to result from a knowledge deficit, earning it the title “deficit model”. The goal of early PUS initiatives hence was to inform the public about the merits of technoscientific progress and to dispel existing ignorance about science. Since then, however, numerous critical PUS studies have provided empirical evidence that speaks against the deficit model as a legitimate way to describe lay people’s orientation towards and assessment of science and technologies (Wynne 1995; Irwin and Wynne 1996; Irwin and Michael 2003).

These mostly ethnographic studies have emphasized the complex and contradictory character of public responses to risk-fused science and technology and the fact that citizens do not simply take over information communicated by experts, but rather have their own heuristics and knowledge resources based on which they build their understanding. These cannot be regarded as ‘defective’ compared to expert knowledge and reasoning—quite the contrary, lay people tend to address a wider set of considerations than technicians and other experts, and hence can enrich the narrow form of expertise represented by these actors (Horlick-Jones, Walls, and Kitzinger 2007). Another important result of the critical PUS research tradition is that lay people’s knowledge has to be understood as rooted in a local cultural context. There exists not one “public” but rather locally situated groups with their specific ways of ‘understanding’ tied to everyday life experiences and practices of being a sheep farmer, a patient, or mother. Today, it is widely acknowledged that “the public” is not a fixed, known entity but an imagined group (Irwin and Michael 2003). Although it makes thus sense to speak of “publics” rather than “the public”, I will write about this imagined entity in the singular to not complicate matters at this point. Moreover, by focusing on the actual interactions between experts and lay people, STS

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in the opening excerpt that started the introduction. In a newspaper commentary from “Die Presse” (10.03.2009) titled “Österreich mag sie einfach nicht” (“Austria simply doesn’t like it”), he refuses to accept that Austrians are technophobic mountain people afraid of technoscientific progress in general and he also underlines this with a reference to the ‘fact’ that as regards public acceptance of nanotechnology, Austria ranks above average in comparison to other European countries (Jakl 2009).

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researchers such as Brian Wynne were able to show that the ways in which scientific or political representatives address non-experts contribute largely to how scientific knowledge about risks is perceived.

While my research approach builds on these findings, it is less ethnographic because I concentrate on rhetorical moves in interaction (for a related approach see Myers 2007). In line with the growing porousness of the categorical demarcation between lay and expert reasoning (Irwin and Michael 2003), such a perspective allows avoiding any predefined definition of who is to count as lay or expert because expertise is conceptualized as “entitlement to speak” (Myers 2004); that is, the notion of “expert” becomes a category that is interactively established. Nevertheless, since the distinction between expert and lay identities is still powerful in the political and academic realm, I will also refer to the participants in the discussions groups as “lay” in the sense that they “were not (at the start of the process) in possession of specialized technical knowledge directly related to the scientific and technical aspects of the technology in question” (Horlick-Jones, Walls, and Kitzinger 2007, 97).

While critical PUS studies have contributed much to deconstruct the deficit model, it also needs to be mentioned that quantitative surveys of public opinions have likewise questioned the assumption that a lack of knowledge were responsible for negative public perceptions. Such studies have shown that more knowledge on scientific issues tends to amplify existing attitudes rather than change them, and that people who resist new technologies most strongly are often also the best informed (Evans and Durant 1995; Torgersen and Seifert 1997). Another relevant issue addressed in the quotation of the action plan concerns assumptions about which knowledge resources citizens “need” to form opinions about nanotechnology. A critical PUS perspective would ascribe citizens’ ‘resourcefulness’, in the sense that they might already possess the necessary resources based on their everyday experiences to talk about nano and identify relevant issues.

The discrepancy between these findings and current policy imaginations demonstrates that there might be a need to examine the grounds on which unwarranted perceptions of “the public” emerge in the political sphere. Here, the quote from the Austrian Nanotechnology Action Plan hints that analogies might play a role here. As the metaphorical phrase “in the light of previous neo-technologies” suggests, policy actors and other stakeholders in nanogovernance may form their models of the public based on past experiences with public reactions towards new technologies. That is, analogical processes are involved in how policy makers try to learn from past public debates for the future and how they design policies. Simultaneously, this also highlights a problematic feature of analogies: they may serve as important signposts to navigate an opaque future, but the light

they throw is only partial, which is why we need empirical research on how the public engages with science and approaches new technologies. Thus, as paradoxical as it may sound, the aim of this dissertation is to question existing guiding analogies and assumptions about the public in the policy realm by exploring analogical processes and arguments among lay citizens.

## **1.5 The rise of upstream public engagement with nano**

While the previous section indicates that in Austria the public is still largely imagined as a receiver of scientific information when it comes to nano, at the same time, science and technology policy in Europe has undergone an alleged shift to more democratic modes of governance or is even said to have entered an “age of engagement”. This turn to engagement or participation—both terms are often used interchangeably<sup>8</sup>—means that “the public” is ascribed a relevant role in the political decision-making process relating to science and technology. The public is seen as a partner in dialogue with scientists and policy makers, deliberating on how to best shape the future of new technologies and society. In such a framework, citizens are perceived as knowledge holders who can contribute relevant knowledge—for instance about past technological trajectories and previous governance responses—to public deliberation and policy-making.

This normative commitment to dialogue<sup>9</sup> has now largely replaced or stands alongside the rhetoric of information and education that dominated policy reports on science and technology hitherto. The beginning of this shift can be roughly traced back to the end of the 1990s; a time of public controversy over GMOs and of already decreased public confidence in scientific expertise in the aftermath of the BSE scandal and other trust-shattering events (Delgado, Kjølberg, and Wickson 2011; Kurath and Gisler 2009). A new “mood for engagement” (House of Lords 2000) was hence embraced as an effective and

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<sup>8</sup> It can be argued, however, that participation refers more to bottom-up initiatives in which citizens self-organize around specific concerns, while the notion of engagement emerged in the context of government-driven initiatives and hence is best used for such top-down contexts in which specific representatives of the public are invited. A distinction can also be made with regard to the openness for framing possibilities: while the former are potentially open to diverse framings and are often triggered by a need to challenge dominant orders, public engagement initiatives tend to impose frames and import epistemic norms on what counts as acceptable knowledge into these contexts (Wynne 2007)

<sup>9</sup> While a normative understanding of dialogue prevails in the context of public engagement, dialogue can also be applied in a non-normative sense, referring to all co-constructions that occur in interaction, without seeing some forms of discourse as more dialogical than others (cp. Cooren 2010). By contrast, a normative view would consider the mutual changing of roles and perspectives integral to any dialogic interaction. In a strict sense, then, a dialogue cannot at the same time be a heated discussion in which an argumentative battle is fought to convince interlocutors of a specific perspective.

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more timely way to restore public trust in science, to design more inclusive, anticipatory, and socially robust policies (Barben et al. 2007; Nowotny, Scott, and Gibbons 2001), and most recently to make innovation more responsible (Owen, Bessant, and Heintz 2013).

In many European countries, GM was the first case to put the new paradigm of engagement into practice, but often at a time when polarized views were already entrenched (for an example see e.g. Horlick-Jones et al. 2007). Against this experience, nano's emergence on the political scene was accompanied by calls to move engagement upstream in the innovation chain (Wilsdon and Willis 2004; Rogers-Hayden and Pidgeon 2007; RS/RAE 2004; Macnaghten, Kearnes, and Wynne 2005). Upstream engagement here denotes an early discussion process about new technologies between stakeholders, including the public, before research is pursued and crucial political decisions or investments are made. As nanotechnology was at that time (a) still in an early development stage, and (b) had not yet sparked a broader societal debate, the 'nano case' was seen to lend itself to moving the society-science dialogue upstream (Kaufmann et al. 2010). In short, nano became the test case for the early application of public engagement and dialogue-oriented models of S&T governance.

Although this commitment to upstream engagement was generally welcomed or even suggested by STS scholars—not least because it cast academics into the active role of practitioners or evaluators of these activities—concerns have simultaneously been raised over the true intentions behind and the practical implementation of policy-induced engagement initiatives. Rather than being a fundamental change at the level of practices, so the critique, engagement often serves as a new rhetorical device in the political discourse, employed to disguise the still prevailing deficit model (Wynne 2006; Irwin 2006). Moreover, upstream engagement has been criticized for reproducing the model of linear innovation process as well as for attempting to channel debates at an early stage into a positive direction in order to prevent a GMO-like future for nano: “dialogue and participation may also be read as just another way of educating and pacifying unruly publics resistant to top-down information” (Felt and Fochler 2010, 221). Thus, the wish “to avoid polarising the debate” (Austrian Nanotechnology Action Plan) about nano needs to be understood against the background of the controversy over genetically modified organisms. On the EU policy level, the GM controversy tends to be framed as a political failure, hence the need to learn from the GM debate was palpable in the title of nano-related conferences (European Commission 2007) but also in pamphlets written by STS researchers (Macnaghten 2008; Grove-White et al. 2004; Einsiedel and Goldenberg 2004): “the GM experience represents a warning, a cautionary tale of how not to allay public

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concern. Avoiding nanotechnology becoming ‘the next GM’ is seen as critical to the public acceptability of applications in the field.” (Kearnes, Macnaghten, and Wilsdon 2006, 15)

For many academic commentators, the constitutive question is whether the GM analogy is apt for nano and fruitful for guiding policy making (Sandler and Kay 2006). By contrast, my perspective on analogies, which will be developed in more detail over the course of the next chapters, aims to grasp the function of analogies rather than to provide normative judgment. For one, the pervasiveness of the GMO-nano analogy in the early policy debates about nano clearly indicates that the public backlash against GMOs figures as a relevant experience in shaping the future governance of nanotechnology. Building analogies here can be regarded as an essential mechanism for remaining capable of making decisions under uncertain conditions (Von Schomberg 2010). Both the aforementioned comparison with asbestos and the GMO analogy share a self-directed warning quality, albeit directing the precautionary gaze of policy makers into different directions. Whereas the asbestos analogy hints at the potential negative health or environmental effects of nanoparticles and the need to install procedures for risk regulation, the GMO analogy addresses the relevance of taking public reactions into account and to respond to them in a proactive manner. It follows that both analogies incorporate important performative functions in generating specific policy actions.

The fact that the public has been increasingly invited into upstream engagement settings in many European countries over the last decade might be taken as a proof of this performative power of the GM analogy. As can be gathered from overviews of these manifold experiments in engagement on nano (see particularly Delgado, Kjølberg, and Wickson 2011; Bowman and Hodge 2007), the typical format of engagement initiatives is to bring lay people together in discussion groups, sometimes with scientists, to deliberate on nano’s ethical, legal and social implications, as well as on its potential safety, health, and environmental risks. More often than not the focus of debate is on the latter, moving social and ethical issues to the background. Most of these engagement initiatives involve face-to-face interaction, but there have also been (rather unsuccessful) attempts to stage such discussions online (Selin 2011). The only Austrian public engagement inspired initiative on nano that addressed a broader public has been a “Risiko:dialog” organized by the Umweltbundesamt in 2007,<sup>10</sup> which was—as the name suggests—focused on health and environmental risks as well as regulation. It thus remained largely in the risk framing and was additionally staged as a traditional podium discussion forum, with experts sitting in front answering questions from the lay audience below (see also the example from the podium discussion at the beginning of this introduction). Such a setting certainly does not

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<sup>10</sup> see <http://www.risikodialog.at/nanotechnologie/nanotechnologie-dialog0/> (accessed 12 May 2012)



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correspond to current standards of public engagement that call for a move away from expert-dominated information-oriented events.

While many of these engagement settings on nano were modeled after formats that had already been tested in debates over genetically modified foods and other controversial issues (e.g. consensus conferences, citizens' juries or focus groups), more innovative methods were developed under the leadership of STS scholars, for instance as regards the development and use of future scenarios or science fiction in such contexts. In his master's thesis, Gernot Rieder (2013) provides an instructive in-depth analysis of the dimensions that contributed to the successful funding but also the limits of three such more "innovative" projects: the US-based NanoFutures project, and the EU-funded DEEPEN and TECHNOLIFE project. What makes these three projects stand out from the crowd of engagement projects is that they—and here particularly the DEEPEN project (Davies, Macnaghten, and Kearnes 2009; Macnaghten and Davies 2010)—not only develop innovative methods but also stress the complexity of public attitudes towards nano.

Yet despite the widespread application of engagement settings, even these more innovative spaces still resemble mostly blackboxes because their policy orientation often leads to a focus on succinct outcome presentations, thereby foreclosing any deeper occupations with how these outcomes are produced. There is, however, a need to investigate how deliberative and other—such as analogical—processes take place in these settings and how the ongoing interaction produces certain outcomes, since debated issues cannot be understood when disentangled from the interactive context in which they are produced (Harvey 2009; Veen et al. 2011).

Owing to the upstream nature of these debates and the low public awareness of nano (European Commission 2010), it appears reasonable to expect that most participants might not enter these engagement settings with a preformed opinion but would encounter an unfamiliar technology there, waiting to be explored and positioned towards *in situ*. Two important consequences can be derived from this observation. First, opinion poll research may not be of much assistance in this case because such quantitative approaches depart from the assumption that attitudes and opinions exist out there, just waiting to be operationalized, collected and then transformed into easily digestible percentages, charts, and diagrams. This highlights the need for detailed qualitative research into the ways in which opinions emerge and are worked up in interaction in reaction to specific stimuli (Myers 2004). Second, analogical processes might gain particular relevance for nano then, because they allow grasping the unfamiliar in terms of the more familiar. It has also been argued that the relevance of analogies in public debates about new technologies is time dependent; that is, they tend to come into play in the phase of the emergence of a new

technology, losing relevance when the meaning of a technology becomes culturally established (Hofmann, Solbakk, and Holm 2006a, 53). This brings us right to the existing literature on the role of analogies in public engagement settings and in discussion groups on emerging technosciences more generally.

## **1.6 Analogies in lay talk about emerging technologies: Findings and gaps**

Existing qualitative research leaves no doubt about the fact that analogies play a relevant role in how lay people talk about emerging technologies in discussion groups (Davies 2011; Burri 2009; Horlick-Jones, Walls, and Kitlinger 2007; Linell et al. 2001; Wibeck, Abrandt Dahlgren, and Öberg 2007; Marková et al. 2007; Michael and Brown 2004; Macnaghten 2008). Yet it remains less certain what this role is exactly. In order to explore the state-of-the-art of this corpus of literature, let us take a closer look at several of these studies, one by one, so we may gain important clues from their findings but also identify potential gaps left open for further research. After discussing three studies focusing on nano specifically, we will move on to studies on other emerging technologies.

Among the first qualitative studies based on discussion group material on nano, Macnaghten (2008) has pointed towards the relevant role references to the experiences with GMOs play in shaping emergent public attitudes of nano. He argues that the GM case works as a heuristic in the group discussion, however, rather than presenting an analysis of such references, the author himself engages in the comparative work by constructing parallels and differences of how people talk about GMOs (from his previous research) and nano. Hence, such an approach does not provide much insight into the actual use of analogies in the discussion groups, and, by focusing exclusively on the GM case, it also runs the risk of overlooking other potential analogical resources which participants might have brought up.

By contrast, Burri (2009) presents us with a much more analytically open approach in her analysis of a Swiss citizen panel on nanotechnology. She explores lay people's strategies of coping with what she defines as nano's "epistemically nonstabilized situation", and is able to show that analogies, especially to former "risky technologies" (among them nuclear power, asbestos, amalgam, GMOs, cell phone radiation) and nature, as well as personal experiences as patients and consumers serve as interpretative tools to estimate nano's risks. Although I would suggest to go beyond such a narrow conception of analogies as tools used to cope with unfamiliar representations of technoscientific innovations, Burri's analysis importantly highlights that one analogical resource, such as the debate over nuclear power, can be used to establish several analogical links and thereby assist in the construction of different arguments/analogies: "Nuclear technology, for example, was

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referred to many times in the discussions. “It is like it was with nuclear technology,” a man in Winterthur stated; “first, everything was seen as positive until the first accidents occurred.” [...] A third person compared nanotechnology with nuclear technology when looking at moral aspects.” (Burri 2009, 505f.) While Burri’s work thus broadens the horizon of relevant analogies beyond the GM case and informs us that analogies tend to have a critical bent, her analysis does not consider the interactional dynamics surrounding analogies, to interpret these analogical connections in more detail, and to reflect on their relevance in the wider socio-cultural context.

Particularly the last dimension is addressed in Sarah R. Davies’s (2011) elaborated analysis of discussion group material with lay citizens in Great Britain from the aforementioned European DEEPEN project. Her paper focuses on the cultural and linguistic resources people use to imagine and reach positions on nanotechnological futures. She identifies three sets of “tools” that are used flexibly in the focus groups to (de)construct positions and arguments: personal experiences and expertise; analogies and comparisons; and science fiction and popular culture. Davies argues that experiences and expertise emphasize the individual, whereas analogies/comparisons and fiction/popular culture are more directed towards shared knowledge. We will come back to this insight—that the construction of analogies may also work to invoke “shared knowledges of technological history”—in section 2.4, while noting that personal experiences and expertise are not necessary less related to shared knowledge. Davies’s perspective is informed by a strand of socio-psychological literature (Potter and Wetherell 1987; Myers 2004; Billig 1987) that also forms the basis for my discourse analytic perspective, developed in more detail in Chapter 3. This body of literature maintains the view that the articulation of attitudes, opinions, and analogies is dependent on conversational context; that is, we cannot proceed from the assumption that these exist in people’s mind as clearly defined, fixed entities. Although Davies proposes such a theoretical stance, she still holds on to a conception that sees participants’ resources as part of a larger process of opinion formation. By claiming that the essence of what is going on in public engagement settings—and the ultimate goal of participants—is opinion-formation, her analysis misses out on the rhetorical and argumentative character of such settings, and does not inquire about the function of these tools in the given conversational context.

As these studies indicate, nano is a perfect case to study the role of analogy in talk about new technologies, but that is not to say that nano is specific in this respect. Studies on former emerging technologies have likewise demonstrated that analogies occur frequently when lay people engage for instance with GMOs or xenotransplantation. In a paper on the ways lay people come to assess xenotransplantation in focus groups, Michael and Brown

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(2004, 379) conceive of analogies as “inescapable feature of sense-making” in the context of new (bio)technologies, allowing people to “draw out the continuities or stress the differences” between xenotransplantation and animal products. In their case, especially “meat” provides a cultural repertoire through which lay participants are able to grasp diverse meanings of xenotransplantation, but whose meaning also remains semantically open, thereby allowing to present the technology either in a more positive or negative light. While this flexible use of analogical resources echoes what we already encountered in the aforementioned studies, Michael and Brown’s treatment of analogies is promising in that it emphasizes that analogies also carry moral and political connotations, and vary in their persuasiveness depending on the specific cultural context in which they are articulated. Thus, taking the framing and persuasive side of analogies into consideration, the role of analogies in promoting certain technological futures is simultaneously brought into view—bearing in mind that both authors have contributed to the sociology of expectations literature, this does not come as a surprise (Brown, Rappert, and Webster 2000; Michael 2000; Brown and Michael 2003). In addition, by including longer excerpts of talk-in-interaction in their analysis, it becomes reproducible for readers and enables glimpses into the collective negotiation of analogies. In spite of these innovative features, the overall story Michael and Brown tell is still focused on the “understanding and assessing” of xenotransplantation and hence remains in the established, evidently highly entrenched cognitive framework of these studies on analogies in focus group talk.

Similarly, a paper on the interpretative resources lay people draw upon in discussion groups on GMOs in the UK (Horlick-Jones, Walls, and Kitzinger 2007) highlights the role of analogical reasoning—and particularly “analogies with other examples of technological innovation that had proven problematic, like the nuclear industry” (*ibid.*, 91). Although the authors trace accounting practices in talk, analogies are nevertheless conceptualized in cognitive terms as means to make sense of and learn about new technologies and their risks, thereby ignoring the argumentative side of analogies. Finally, the same diagnosis also applies to several analyses of Swedish focus groups on biotechnology (Linell et al. 2001; Wibeck, Abrandt Dahlgren, and Öberg 2007; Marková et al. 2007), which all emphasize the learning character of focus groups and hence the sense-making function of analogies. In contrast to the aforementioned studies, these authors notice that analogies are often complemented by distinctions, or in other words disanalogies, and form what they call “analogy-distinction cycles”. As will be explained in more detail in the next chapter, I consider such an extended conception of analogical processes—encompassing disanalogies and the deconstruction of analogies—as particularly rewarding, not least because the existence of “analogy-distinction cycles” indicates that analogies are contested in talk-in-

interaction, which leads right up to the conclusion that we need to pay more attention to the argumentative features of analogies in discourse.

As the discussion of these studies shows, they tend to conceptualize analogical processes mainly as heuristics in making sense of unfamiliar new technologies, and as cognitive tools employed to build opinions and anticipate sociotechnical futures. My argument is that such a cognitivist perspective diverts us from observing the actual practice of communication more closely. For instance, sense-making is a very basic process at the core of every social meaning-making human activity (Weick 2005), which includes analogical processes. But sense-making in discussion groups cannot be disentangled from interaction, because people likewise make sense of their interlocutors' talk and communicative intentions and this co-shapes which opinions they express, futures they imagine, and arguments they build. Thus, a perspective that focuses on the actions performed by/with analogies might be better suited to explore the role of analogies in talk-in-interaction (for a discussion of the tension between cognition and discourse see te Molder and Potter 2005).

A main ambition of the dissertation at hand is thus to avoid seeing analogies in conversational settings foremost as mental representations or tools and instead to conceptualize them as discursive devices used to achieve diverse effects in interaction (Wittgenstein 1986 [1953]; Potter 1996b; Potter and Wetherell 1987; Veen et al. 2011). Put differently, this dissertation seeks to explore how the emergence of analogies in discussion group settings is tied to social processes and how these also shape the way nano is talked about and into being. Analytically this implies a focus on the framing and interactional effects of analogies. The principal thesis of this dissertation is hence that we need not only to investigate the cognitive and imaginative aspects of analogies but likewise the action-oriented and argumentative side of analogical discourse.

## **1.7 Research interest and questions**

After having introduced central debates and studies from which my research interest emerges, I now want to formulate my research interest and questions in more detail. Crudely put, the research interest underlying this dissertation is to investigate the role of analogies—understood very broadly as comparative linguistic expressions or analogical discourse, which may include metaphors, idioms as well as disanalogies—in discussion groups where Austrian lay citizens talk about nano. More particularly, it is motivated by the objective to capture the functional orientation and effects of analogies in these engagement settings, as well as the general significance of analogies in public debates about emerging technosciences such as nano, their merits and limitations. This interest ties to broader questions concerning the public understanding of and public engagement with

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science and technology, such as what is going on in engagement settings and how the interaction unfolding there can be best understood.

The research interest will be tackled in a two-step manner: First, I will develop a perspective that allows seeing analogies as more than cognitive means used to make sense of a new phenomenon. Part I of this dissertation consequently represents a theoretical—but empirically informed—attempt to sensitize our gaze to the functions of analogies, which are also other than cognitive ones. The second empirical part then tries to translate this perspective into a fine-grained analysis of analogical discourse. With analogical discourse I refer to sequences of talk in which nanotechnology and its issues are discussed by “evoking another, distinct, conceptual domain. The relation established between these domains can be either a relation of similarity or of contrast.” (Filliettaz, de Saint-Georges, and Duc 2010, 121) This indicates that my notion of the analogical goes beyond the construction of likeness to also include dissimilarities. In order to explore the role of analogies in discourse I investigate *how* (and to a lesser extent also *which*) (dis)analogies are constructed, maintained, modified or rejected in interaction. I will further specify this broader interest into more detailed interest clusters and questions below. It should be noted that these interest clusters may appear distinct in this form of representation, while they are in fact intertwined with each other in several ways.

### Function and action-orientation

As addressed before, my interest is first and foremost in broadening existing perspectives on the role of analogies in talk-in-interaction by conceiving them as part of actions performed for a specific purpose and function. One main research interest of the empirical analysis is hence to explore the action-oriented functions of analogies. Rephrased as questions we will inquire in the analysis: *What have analogies been constructed to do in interaction and beyond (the broader societal context)? What actions do speakers try to accomplish with their analogical discourse?* In addition, it will also be relevant to ask *what underlying concerns, dilemmas or problems drive the use or invocation of analogies and discourse as such.* This may be achieved by paying close attention to the tertium comparationis that was active in the construction of analogies; the tertium comparationis being the point at which the two compared phenomena are supposed to match.

While these questions may be addressed at specific analogical moves, on a broader level I am also interested when analogical discourse generally tends to occur in the discussions on nano. Moreover, I also seek to explore with which other discursive elements analogies are entangled or co-emerge to avoid a reductionist analysis. Hence, it is also relevant to explore *how other devices interplay with analogies in talk to accomplish specific actions.*

### **Framing and effects**

Analogies construct reality in specific ways (of course, this could be seen as one action they perform). As will be explored in more detail in section 2.3, this means that analogies inescapably frame nano and may thus be used to argue for specific assessments. The main question here is: *How are analogies used to construct nano, specific versions of reality, and futures—and what do these constructs entail?* While this question can be tackled by analyzing individual utterances, the benefit of examining talk-in-interaction is to trace their entailments, framing effects and rhetorical forces in discourse that stretches over several turns. By considering reactions to analogies we hence may be able to see how assessments and framings of nanotechnological innovations are co-shaped by specific analogies. Put differently, the interest lies in *how framing nanotechnology as something else is connected with certain assessments and imaginations of the technology and its governance.*

This second interest cluster departs from the assumption that analogies have agency and hence make a difference in terms of how nano is understood and how interaction proceeds. You may notice a certain tension between assumptions about people's passivity and activity at this point—in fact, this tension between the active use of analogies and the way they shape views and assessments of nano is at the core of this dissertation and may only resolve in the empirical analysis.

### **Agreement and contestation**

The general research interest underlying this dissertation is how analogies are talked about and into being—a process that may express or lead to agreement or argumentation/contestation. The value of approaches that reconstruct discourse is that they allow us to carve out “how certain perspectives gradually become dominant in the discourse, while other perspectives withdraw into the background” (Wibeck, Abrandt Dahlgren, and Öberg 2007, 258). Discourse analysis can elucidate what works better argumentatively in a specific discursive context. Here, I depart from the presumption that socio-cultural sharedness may contribute to the acceptability and robustness of analogies in talk, and that what is accepted and works argumentatively among carefully composed “mini-publics” (Goodin and Dryzek 2006) is indicative of what may work in the broader socio-cultural environment.

My interest is to trace *how and which analogies prove to be persuasive and hence shared (or contested) in the Austrian context.* In other words: *Which analogies prove to be assertive, robust or capable of surviving in immediate interaction, and thus point to socio-culturally accepted analogies and shared experiences among Austrian citizens? Which repertoires, experiential and referential domains are accepted or contested as basis for credible comparisons in the groups?* Hence, what should be considered a ‘good analogy’—

that is, credible or acceptable—is a situational achievement of interlocutors and not an assessment made by the detached analytical observer.

### Comparing application fields

This dissertation is at its core about how people compare phenomena, and since nano is generally not seen as a homogeneous field but an array of different technologies diverging into different application fields (Felt 2009), the question as to what role the comparing or contrasting of different nanotechnological fields plays in the discussion groups becomes a relevant one. The guiding question here is *how and for which purpose participants use comparisons between different application fields in talk*. Evidently, this question could also be phrased as a subquestion in the first interest cluster, but I put it separately because it ties to another interest, namely, of comparing how analogies are used when talking about different application fields. Given that application fields might bring with them certain “sticky frames” (Jasanoff 2005a) and people may have entrenched socio-cultural practices in these existing application fields (Veen et al. 2011), these may influence the assessment of nanotechnology and the construction of analogies in the respective field then. This research orientation can be captured with the following questions: *(How) do analogies vary in discussing different nanotechnological application fields (e.g. such as medicine, food, ICTs and other consumer products)?*

## 1.8 What follows

The dissertation at hand is divided into two parts. The first part represents a detailed account of the theoretical and methodological approach that shaped the empirical analysis that follows in the second part. Chapter 2, titled “The powers of analogy”, carves out different characteristics and introduces various perspectives of seeing analogies as cognitive, imaginative, argumentative and constructivist, communicative, and culturally shared devices. Section 2.1 starts out by describing and critiquing cognitivist approaches from an STS perspective. The next section introduces the concept of *analogical imagination* as an alternative to analogical reasoning, because it accounts for the anticipatory character that characterizes analogical processes on emerging technologies. In section 2.3 we turn to examine the power of persuasion and framing which is inherent in analogical arguments. Next, we explore the question as to how analogies relate to collectivity and how the concept of *cultural analogies* ties to that of civic epistemology and sociotechnical imaginaries (2.4). Although all perspectives presented in Chapter 2 are equally relevant for an analysis of analogies, I argue that it is worthwhile to engage more with the argumentative and reality-making aspect of analogies.



## Introduction

Chapter 3 presents a discourse analytical approach that focuses on analogical discourse rather than individual analogies and considers the action-orientedness of discourse as a way to gain new insights into the interactive role of analogies. I will begin by giving a brief overview of the main tenets and the roots of discursive psychology (DP), followed by a more detailed account of the concepts of interpretative repertoires and ideological dilemmas. Afterwards, I will sketch how DP urges us to approach attitudes and opinions as argumentative when occurring in discourse. The chapter continues to relate my understanding of analogies to *factualization*, *plausibilization* and *deresponsibilization*, and it closes by explaining my understanding of *analogical agency*.

The fourth chapter introduces the reader to the empirical material on which the analysis is based, the four IMAGINE discussion groups on nano, and it also addresses the methodological issues pertaining to group discussion settings more generally. In a subsection on reflexivity I try to turn a reflexive gaze onto the methods and analytical tools I draw upon. Finally, I will describe methodological and practical issues concerning data collection and analysis.

Then, the empirical part of the dissertation begins. Part II is structured into four distinct empirical chapters that each tries to tell its own story, while of course they also share the underlying storyline that is determined by the research interest on the role of analogies. The traces of this storyline will then be woven together in the general discussion after the four empirical chapters. In Chapter 5, I engage with how promissory futures of nanomedicine were contested in the group on nanomedicine with the help of analogies and metaphors. Chapter 6 explores how analogies were used in two discussion groups when the issue of human enhancement was debated. The issue of enhancement is a complex and highly futuristic one, which is also why we encounter an abundance of analogies here. In Chapter 7, we move to material that emerged in several groups around the highly contested issue concerning the labeling of nano-enabled products. At the center of these discussions rests a dilemma that discussants find themselves confronted with, but they also provide several analogy-based solutions to how this dilemma could be solved in the future. Chapter 8 then examines how participants used analogies to anticipate futures (e.g. of broader governance processes or health and environmental risks) in order to mobilize for action to prevent these futures from materializing. Afterwards, the general discussion merges the central findings of these chapters pertaining to the role and function of analogies in the discussion groups and tries to draw some more general conclusions. The coda, finally, closes this dissertation with several more general and programmatic thoughts that emerged throughout writing this dissertation.



## **Part I**

### **Theoretical and methodological approach**



## 2 The powers of analogy

To work on analogies as a social scientist is a bit like stepping into foreign terrain. While disciplines such as psychology, the cognitive sciences, philosophy, literary studies or linguistics can look back to a vast amount of fundamental literature on the subject, social scientific work on analogies is scarce and scattered into many subfields. In more applied fields such as law (Weinreb 2005) the important role of analogies for reasoning and argumentation has long been acknowledged, focusing particularly on the question of how an analogical argument can pass in court. Likewise the relevance and limits of analogies in ethical debates on emerging technologies such as biomedicine (Hofmann, Solbakk, and Holm 2006a; López 2006) or moral issues such as abortion have been explored extensively (Post and Leisey 1995; Smith 2002; Thomson 1971; Wiland 2000).

In science and technology studies (STS) and philosophy of science, scholars have researched the function of analogical processes in science and shed light on the innovative character of analogical reasoning in developing and gaining new knowledge—be it for the development of experiments or in the formulation of theories—as well as on how specific analogies contribute to conceptual change by making whole epistemic communities think of a phenomenon from a novel perspective (Knorr-Cetina 1981; Hesse 1966; Leatherdale 1974; Maasen and Weingart 2000; Montuschi 1995; Hallyn 2000). Additionally, more recent research on analogies in science communication (Anderson et al. 2009; Hellsten and Nerlich 2008; Nerlich 2007, 2008) and education (Aubusson, Harrison, and Ritchie 2006; Filliettaz, de Saint-Georges, and Duc 2010) reveals that analogies work as important means to make complex issues and concepts more tangible by drawing on familiar and culturally shared knowledge. In section 1.6 of the introduction I also gave an overview of more recent studies that provide insights into the relevance of analogies in public engagement on emerging technologies, but that have interpreted analogies largely in cognitive terms.

This chapter starts out with such a cognitive approach but aims to move away from it slowly by introducing alternative perspectives for understanding the phenomenon of analogy, when encountered in discussion group settings. In this process we theoretically carve out the various powers of analogies—the term “power” here is used to refer to both an enabling and constraining force. First, in section 2.1 on analogical reasoning, we start out by tackling the enabling power of analogies, which corresponds to a view of analogies as empowering cognitive means that can be employed to cope with new phenomena. The lesson of this section, however, is that as social scientists we should not be content with cognitive explanations. The aim is thus not to deny the cognitive power of analogies, rather

## *The powers of analogy*

I argue for a different conception of empowerment by linking analogical processes with imagination, conceptualized, in recourse to Ricoeur, as the power of the possible. The second section, then, seeks to highlight that practicing analogical imagination can foster citizens' capacity for exploring and anticipating nanotechnological developments. The concept of analogical imagination likewise attributes importance to the critical scrutiny of analogies, because it is through the continuous process of constructing and deconstructing analogies that knowledge is gained.

Yet power can also be understood as a restraining force through which people can influence others, take control of a situation, or manage to construct specific knowledge or evidence. This largely refers to what I call the persuasive, argumentative, and framing power of analogies. The third section in this chapter thus provides a mainly rhetorically influenced perspective on how analogies can be used for persuasive purposes when mobilized as resources in argumentation and the framing power they unfold when circulating in discourse. It is here where we will come to see that analogies allow us to imagine the world (or aspects of it) in specific way, but in doing so they cannot but simultaneously frame how we perceive the world. I will hence use the phrase "double-sided character of analogies" as shorthand for the understanding that imagination and framing are impossible to disentangle. However, partly due to its theoretical inclination, this chapter tackles the two sides of analogies in turn and thus discretely. The move from seeing analogies as cognitive to argumentative can also be exemplified by the difference between deliberating and advocating. While the deliberator is conceptualized as someone who uses her analogical imagination and in this process swings back and forth between analogies and arguments, the determined advocate has already decided upon an analogy or argument to be defended in debate (cp. Billig 1987, 156).

While section 2.3 on analogical arguments thus highlights the contested character of analogies, the next section tries to counterbalance this by focusing on the cultural aspects analogies can express. Like technologies analogies are designed or constructed, which implies that they reflect the values, imaginations, and interests of their designers—and this makes them apt for social scientific investigations aiming to tease out value-laden, culturally grounded sociotechnical imaginations. Hence, an exploration of analogies can provide insights into the more widely shared imaginations of a culture. A third power of analogies, then, lies in evoking shared cultural knowledges and experiences and enabling a negotiation about "acceptable" interpretations and imaginations. Even if interpretations of past events are not shared, bringing them up as analogical resources can reveal their contested meanings, thereby likewise binding communities and actors together.

Let me again stress that although this chapter is structured into four separate sections, each presenting a particular perspective on analogies, naturally, these aspects cannot meaningfully be separated from each other. The sections should thus best be understood as providing different theoretical perspectives that could pave the way for specific analytical avenues. Reading this chapter should make it obvious that I consider the argumentative and collective powers as the most easily empirically accessible for social scientists. While I do not attempt to provide any cognitive explanations, I nevertheless find it helpful to draw together and discuss the imaginative, argumentative, and cultural sides of analogies. Note that this chapter is neither an attempt to build a framework that will structure the empirical analysis, nor a methodological guide on how to trace these powers of analogy in the empirical data, but that it is supposed to establish a theoretical foundation for our empirical investigation of analogical processes in talk-in-interaction.

## **2.1 Analogical reasoning: Cognitive approaches and their limitations**

Think back to a situation in which you were confronted with a phenomenon you did not know much about or you encountered for the first time. Chances are high that you—knowingly or not—tried to search for similarities with a more familiar phenomenon. Cognitive scientists and psychologists call this analogical reasoning. The notion of analogical reasoning describes the human ability to organize and better understand novel, complex or abstract phenomena by comparing them to more concrete, known or structured ones. Cognitive scientists also tend to subsume analogical processes as a form of categorization, that is, as a way of ordering something into an existing mental category (for a recent example see Hofstadter and Sander 2013). Categorization—and consequently also analogizing—is taken to be an ubiquitous and vital mental process that has assisted humankind from its beginning, for instance by allowing people to identify harmful food and generate predictions (Mervis and Rosch 1981; Billig 1987; Bar 2007). The idea is more or less this: If this new berry resembles the berry that killed my fellow human being, I better not eat it or I might die too.

Since metaphorical thinking is a process closely related to or even indistinguishable from analogical reasoning, it is unsurprising that a similar argument has also been made for the universal character of metaphor. In their seminal book *Metaphors we live by*, Lakoff and Johnson (2003 [1980]) claim that everyday discourse presupposes conceptual structures which are organized metaphorically and that human thought processes are therefore largely metaphorical, filled with “conceptual metaphors” deriving from our physical as well as cultural experience in the world (for a recent popular science book making a similar argument see Geary 2011). The linguistic expression of metaphors is thus

not taken as representing figures of speech but surface structures of deeper metaphorical thought processes. Such a perspective was already proposed by Friedrich Nietzsche (1979) and another philosopher, I.A. Richards (1936), who both argued for the cognitive omnipresence of metaphor. As Nietzsche put it:

we possess nothing but metaphors for things—metaphors which correspond in no way to the original entities. [...] Every concept arises from the equation of unequal things. [...] The drive toward the formation of metaphor is the fundamental human drive, which one cannot for a single instant dispense with in thought, for one would thereby dispense with man himself. (Nietzsche 1979, 82ff.)

In a similar vein, others have highlighted the unnoticed ubiquity of analogical processes (López 2006) and have even likened analogies to the air we breathe (Post and Leisey 1995, 47). While this is an interesting line of argument, the story this dissertation tells is a different one, which allows us to avoid chiming in with such claims about the universal, permanent character of analogical and metaphorical thinking in our lives. Nevertheless, it is relevant to consider cognitive viewpoints and research on analogical reasoning, because this has become one of the most dominant perspectives on analogies today. So, let's enter this foreign territory called cognitive science.

Here, in particular cognitive psychology has a longstanding tradition of investigating analogical reasoning as a cognitive process for problem solving and learning. Most research on analogical reasoning has thus been carried out in areas that examine knowledge representations and tasks that require structured knowledge—usually in the form of experimental studies in combination with computer modeling (Holyoak 2005, 121f.). These studies on mental models have revealed that analogical reasoning is an important heuristic for lay people facing technological systems in their everyday lives, be these motion (McCloskey 1983), electricity (Gentner and Gentner 1983) or home heating control (Kempson 1987). This line of research has also shown that lay people use knowledge from their social and cultural fields of experience to make sense of novel and unfamiliar technologies and phenomena. For instance the study on lay mental models of electricity (Gentner and Gentner 1983) elucidated that lay people compare electricity with human beings due to the fact that the flow of electrons in electrical circuits reminds them of the flow of people in a crowded subway tunnel. The key similarity here was located in the relations rather than the character of the objects within the two domains that are brought together by analogical reasoning.

Based on this empirical work, analogical reasoning has generally been conceptualized as a process in which two domains are structurally aligned or mapped due to structural



similarities. In this ‘structure-mapping theory’ analogical reasoning is understood as a mapping in which course knowledge from one domain (source) is mapped onto another less familiar or known one (target), because both seem to share a similar relationship among their elements (Gentner et al. 2001). The source domain is thus used to draw inferences for the target via analogical transfer. Besides the structure-mapping theory, further research on the role of analogy in problem solving also lead to the formulation of a ‘multiconstraint theory’, stating that “pragmatic factors such as the importance of elements and relations for achieving a goal” (Holyoak 2005, 122) also figure relevantly in the construction of analogies. Thus, there have also been attempts to integrate interests and goals into this line of research.

Although the mental models approach dates back to the early 1980ies, it is far from dead: More recent studies in this vein have broadened the scope of studied phenomena to lay people’s risk assessments of environmental risks (Morgan et al. 2002), lead paint hazard, global climate change, smallpox disease and vaccine (Bostrom 2008) and—most recently and of most relevance for my work—also to lay understandings of nanotechnology (Bostrom 2011). This last study on mental models of nanotechnology investigates not only lay or non-expert mental models in decision making situations—for instance when consumers are confronted with nano labeling on sunscreens—but it also aims to compare these to expert models.

From a STS perspective, the mental models approach to lay perceptions of technological systems, risks and emerging technosciences bears various shortcomings. Central scholars in the critical public understanding of science paradigm have already identified some of these in reaction to the early mental models studies, while a set of new problems arises with the new version of mental models research. I will devote quite some space to these points of critique, because this differentiation also allows us to simultaneously accentuate the aspects that should be considered in studies on lay citizens’ analogies in response to new technoscientific developments such as nano.

To begin with, since studies in the mental models tradition are experimental, they deal with analogical processes as isolated phenomena in individual people’s minds and thus “there is little examination of the social and cultural contexts of these models” (Michael 1996, 110). What is criticized here is that the socio-cultural embeddedness of analogical processes, which contributes to the way analogies are created, is concealed. In his critique of mental models studies, Michael has also raised concerns over their neglect for the social, moral, and institutional ‘baggage’ or framings that scientific and technological phenomena carry with them—and that they are instead treated as neutral. Moreover, it might make a difference with regard to institutional, moral and political dimensions, whether people are

thinking about home heating control systems, ionizing radiation (in Michael's study), or nanotechnology. As we saw above, the more recent studies on mental models have now turned to scientific and technological issues with much more socio-political dimensions and stakes, yet these dimensions are still largely excluded from their research agenda. This continuing disregard seems then less to be a result of choosing phenomena that lack such aspects, but rather a structural feature of this approach. The mental models approach might be able to show how the similarity of relations in two domains contributes to the construction of an analogy, but it in general neither attends to the relations that lay people have with science, technology or politics—and particularly with their institutional forms—nor to the social and interactive dimensions of interview data.

The mental models approach can further be criticized for devaluing lay knowledge and folk theories, thus pursuing a hierarchical expert-lay division (Wynne 1995, 371). This is most evident in a study in which lay mental models are explicitly referred to as “naive theory” (McCloskey 1983), but it is also implicit in the study on lay mental models of nanotechnology (Bostrom 2011). In this study, the semi-structured interviews with lay participants started by asking what they knew about and associated with nanotechnology. Given that factual knowledge of nano is scarce in the general public, it is unsurprising that respondents had problems coming up with “right” answers. Lay participants were hence framed as ignorant from the beginning. A presentation of their answers at an STS conference (Bostrom 2011) even generated laughter in the mainly academic audience, because the mode of presentation made the responses appear ridiculous. By design such studies thus produce data that renders lay reasoning deficient to expert reasoning.

A preference for expert framings over lay understandings is also apparent in the evaluation of the findings in another study:

The results also illustrate how such analogies can be dysfunctional. The analogy with radon is misleading in several ways, in part because the accuracy of home tests varies depending on the specific technology of the test, in part because of the physical differences between human exposure processes for radiation and lead paint dusts. (Bostrom 2008, 113)

The lay analogies are here presented as not matching with the reality of conducting the test and are judged as “dysfunctional” without inquiring about their relevance in people's lifeworlds. Mental model studies do not approach lay analogies from a neutral perspective, but try to assess to what extent lay models conform with or deviate from expert and technoscientific templates that are given epistemic priority. They carry “tacit assumptions

about the conditions under which the theoretical models are valid and useful” (Wynne 1995, 372) but neglect to investigate if these conditions apply to other non-expert contexts.

Third, in hoping that their findings may assist in designing better risk communication such studies conform to the current focus on risk governance dominating the political debate on nanotechnology in many countries, and to instrumental approaches aiming to communicate technoscientific facts to the public: “Good analogies, metaphors and comparisons can simplify communication and improve learning and inference.” (Bostrom 2008, 115) Implicit here is an understanding of lay reasoning and perception impeding effective communication in a one-way sense from science to the public. These studies are still very much rooted in the deficit model of public understanding of science and most points of critique phrased against this way of conceptualizing the public and its dealings with science and technology equally apply to them (see e.g. Irwin and Wynne 1996). Certainly, the role of analogies for learning is important and their use for communicative purposes very valid, but the problem is that communication here is conceived as unidirectional and the conceptualization of learning hence is not mutual either. Defining some analogies as “good” or “better” additionally implies an assessment or ranking and, additionally, contributes to a misbelief that some analogies are value-free entities and foster mere learning (we will come to a different view in the next section).

Fourth, the mental models study on nano (Bostrom 2011) predetermined the identity of study participants as consumers by testing participants’ reactions to different sunscreen products with and without nano labeling. Other identities, such as citizen or patient identities, that could turn out to be equally or even more relevant in participants’ positionings towards nano are thus excluded. Moreover, it is likely that specific mental models and analogies co-emerge with certain identities, hence the prescribed consumer identity already confines the ways in which participants might imagine nano.

Brian Wynne (1995, 373) has also argued that the central notion of “domain” in the mental models approach is problematic, because it constructs technological systems as one-dimensional and coherent fields. Since such an understanding does not even apply to comparatively simple systems such as “home energy management” (Kempton 1987), it then might apply even less to highly diverse and complex technoscientific fields like nano. Thus, the concept of one domain should be given up and substituted with a perspective that recognizes the multiple and intersecting domains that are brought up by study participants, which implies a potential multiplicity of analogies (we will come back to this). Another point has yet to be made about how studies in the mental model framework fail to investigate what happens after a particular comparison has been drawn. Gentner and Markman (1997, 47) have admitted that it would take detailed knowledge of “the person’s

current psychological construal of the things being compared, including goals and contextual information as well as long-term knowledge” to predict the effect of an analogy. Knowing and integrating all this in a computational model is certainly difficult if not impossible. In the next chapter on discourse analysis, I will propose a perspective that allows investigating analogical effects by simply moving away from conceptualizing analogizing as an individual process.

The point of this section is neither to argue that cognition does not play a role in the construction of analogies, nor that the mental models approach is not fit to find answers to particular questions, for instance when it comes to specific narrowly defined problems and how to solve them in everyday life: “psychologists have tended to equate thinking with ‘problem-solving’, and they have investigated the sorts of problems for which there are unarguably correct and incorrect solutions” (Billig 1987, 96). Rather, the aim of this section is to show that the mental models approach offers only a restricted framework for exploring lay people’s relations to complex, novel technoscientific fields, which are far from being simple problems that can be easily solved in one correct or incorrect way by establishing one analogy.

Moreover, as I pointed out at the beginning of this section, cognitive scientists and psychologists have generally investigated analogical processes as a way of categorizing, that is, a process “in which people, actions, or events are subsumed under or associated with category labels denoting more general types or sorts of phenomena” (McKinlay and McVittie 2008, 105). Categorization is thus conceived as a way of ordering something or someone under a bigger category, or more broadly speaking, as any instant in which several objects or events are treated similarly (Mervis and Rosch 1981). But as Michael Billig convincingly argues in his seminal work *Arguing and Thinking* (1987), people cannot categorize information without being able to particularize, because it is likewise “to the organism’s advantage to be able to differentiate a special stimulus from the others when that differentiation is relevant to the purposes at hand” (ibid., 132). With this claim Billig criticizes the longstanding tradition of categorization research in social psychology for ignoring particularization as the opposite but equally important process of thinking:<sup>11</sup> “It is one-sided to suggest that as humans all we can do in our thoughts is to categorize information.” (ibid., 199) Particularization denotes a way of thinking that does not treat a case as equivalent to other cases but rather focuses on its particularity. This extended view is relevant because it sharpens our understanding of analogical processes as characterized by a *tension between categorization and particularization*, which allows us to develop a

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<sup>11</sup> Billig also points out that the one-sidedness in categorization finds expression in the current interest in metaphor, the “tropic expression of the principle of categorization” (Billig 1987, 261).

more complex conception of analogical processes; one that goes beyond similarity and includes distinction. In other words, what we can expect interlocutors to do is to shift between the construction of analogies and disanalogies in their thinking and talking: “We can argue that a given particular should be placed in a category and we can oppose this by the counter-argument that the particular should be treated in its uniqueness.” (ibid., 6) My claim is thus that if we want to fully grasp the character of comparative processes we also need to take distinctions and disanalogies into account. This becomes particularly relevant when we investigate talk-in-interaction, because there is always the potential for contestation: what for one speaker may count as an analogy, may seem like a disanalogy to another.

This already leads to the last reason that speaks loudly against cognitivism, namely that conceptualizing analogies as mere cognitive products would limit our understanding of the social processes and cultural contexts that contribute to their construction. Analyzing the excerpt from the podium discussion that I presented at the beginning of this dissertation from a cognitive perspective would miss out on important aspects that shape the articulation of analogies in this particular context. Consequently, from a STS perspective it is necessary to account for the socio-political dimensions, the interactive production and negotiation of analogies, as well as the cultural context in which analogies are constructed. As a way to avoid the mentioned limitations, I will in the chapter on analogical discourse present a discourse analytic approach that tries to implicate the fluidity of analogies and their interdependence with the social context, and that enables us to trace the effects of analogies and their responses in talk-in-interaction. Below, however, I will present at first an alternative way of conceptualizing the productive work analogies might be able to do in debates about emerging technosciences.

## **2.2 Analogical imagination: Stimulating exploration and anticipation**

Analogies force consideration of threads of similarity that tie together the otherwise apparently dissimilar; they grip the imagination, the affections, and reason; they are more than charming illustrations. They often encourage finer distinctions than would otherwise be made. (Post and Leisey 1995, 52)

Another way to look at analogical processes is to see them as a way to stimulate imagination in debates, public engagement settings or any decision-making situation on emerging technologies. I seek to capture this with the concept analogical imagination, which I develop in the following by turning away from a mentalist conception of imagination to a philosophically inspired, socio-cultural one embedded in practices.

Imagination is without a doubt a complex concept with multiple meanings and a long history in human thought and science (see e.g. Stevenson 2003), thus there lies a certain danger in using this term. In order to avoid confusion it is hence essential to first decide on a definition of imagination. For my purpose here I conceive of imagination as the power of the possible that can assist in teasing out the potentialities of reality (Ricoeur 1965, 127; 1978). Such an understanding should hence be distinguished from mere perception, but it equally should not be confused with escaping from reality into fantasy, illusion, or fiction. Even though this conception of imagination may seem to be more about what is not present—it is clearly directed into the future—, in its essence imagination is fundamentally rooted in the present and a reaction to the present, sometimes also fueled by an urge to transform what is present. In the way I propose it here, analogical imagination includes three main dimensions, which I will address in turn below: first, the exploration of a case by drawing out its similarities and dissimilarities with other cases; second, the retrospective prospective character of anticipatory analogical processes; and third, a move beyond the notion of rationality and the inclusion of affective aspects.

### **2.2.1 Exploration: Defamiliarizing, contextualizing and deconstructing**

To start with, the term analogical imagination highlights that via the construction of analogies (and disanalogies) the various dimensions of a new issue, case, or technoscience can be explored, and inferences about not yet observed aspects of a new case or situation can be made by mobilizing knowledge from a more familiar case. Trying to work out new similarities can equally assist in destabilizing old ways of seeing an already familiar case and thus guide attention to areas that have been overlooked so far. This process could be described as *defamiliarization*, which is also a much sought-after effect in qualitative research and in art (Timmermans and Tavory 2012). The term defamiliarization goes back to Victor Shklovsky (2004 [1917]), a representative of Russian formalism in literary criticism, who saw the power of artistic techniques and devices such as metaphor or science fiction in presenting the familiar in ways that make it appear unfamiliar. The goal of the artistic process, then, is to enhance perception in making us think about the taken-for-granted from a new perspective. This view corresponds with Nietzsche's (1979, 89), who saw in myth and art a means to yield "new transferences, metaphors, and metonymies" and hence confuse the traditional conceptual systems we live in. But instead of following Nietzsche's elitist view of a few people with a "liberated intellect" engaging in such work, we should not reserve the manufacture of innovative analogies for intellectuals, but instead turn to everyday talk of novel phenomena such as nanotechnology that lend themselves to engender disturbances.

Furthermore, it can be argued that engaging in the construction of analogies does not simply lead to a closer or different understanding of the case in question, it more particularly helps to understand its relation to other cases, because while drawing analogies “we come to know something about that object case over and above its existence as an allegedly isolated occurrence; that is, we see how it relates to other cases” (Smith 2002, 246). A case, then, is contextualized or recontextualized as it is arranged in relation to other cases (for how analogizing in science can be understood as recontextualization see Knorr-Cetina 1981, 52). In contrast to the structure mapping theory developed in the mental models approach, (re)contextualization does not conceptualize analogical processes as an unilinear mapping from one domain into another, but rather comprehends them as continuous, non-static, interactive stabilizations of relations between different cases. The basic assumption is that the stimulated conceptual interaction is symmetrical, meaning that both domains undergo a change in the process (for more on the interactional view see Black 1962) and that through the conceptual interaction a “creative extension of knowledge” (Knorr-Cetina 1981, 50) is produced.

Understood in such a way, the main goal is not the end result of analogical processes—as in, the construction of one robust analogy—but the process itself, because it stimulates the imagination beyond the isolated case and helps to see it in context. Such a conceptualization has two main benefits. First, it is able to account for the fact that drawing one analogy does often not suffice to grasp all the relevant dimensions of emerging technologies. As we will see in the empirical part of this dissertation, complex entities and issues and the varieties of communicative situations simply demands more than one analogy, thus consequently lay people tend to draw multiple analogies (see also Collins and Gentner 1987; Bostrom 2008). In the cognitive framework, multiple models or analogies, however, are seen as problematic because inconsistencies may arise that then need to be managed. From the conceptual viewpoint of analogical imagination such “inconsistencies” can be reframed as expressing the complexity of the issue and its different dimensions (cp. Wynne 1995, 373). Building multiple—also contradicting—analogs then does not signify inability but rather creative ability and also addresses situational needs.

The second benefit of the concept is that it does not treat analogies as stable and immutable objects. As Knorr-Cetina (1981, 51) has claimed, “the similarities which underlie a metaphor or an analogy are complex rather than primitive, fragile and temporary rather than basic and stable”. This highlights the constructed and temporal nature of analogies, to which I will come back in the next chapter, where I introduce a discourse analytic perspective that translates this idea of multiplicity, instability, and

temporariness into analytic practice. When observed in talk-in-interaction in particular all these features come much more to the fore.

From this we might also learn the lesson that it is worthwhile to devote some effort to the critical scrutiny and deconstruction of analogies—an idea connected to Billig’s claim for particularization. Analogical imagination hence equally includes carving out dissimilarities, reinterpreting analogies as disanalogies, and constructing alternative analogies to the ones already proposed. When we adopt the perspective that a movement between categorization and particularization characterizes analogical strategies, we can conceive such comparative work more flexibly. Categorization—and classification—may be useful processes, for instance in science (Bowker and Star 2000), but in other contexts their use and explanatory power may be limited. Characterizing human beings’ analogical imagination as just based on categorization would run the risk of not doing justice to the more complex processes actually at work. Knowledge about a case is just as well developed in trying to revoke an analogy in dialogue—be it internal or in interaction with others: “Thus, to be in a position to declare a proposed analogy as weak (or non-existent) presupposes a certain amount of knowledge concerning that which the analogous item is weak with regard to.” (Smith 2002, 246) In particular if there are already dominant analogies in a discourse, it is important not to eschew critically engaging with them, as it is in this process that we can gain insights into their implicit moral, social, and political agendas. We will come to this later in more detail; at this point we can acknowledge that for analogical imagination to act as a productive force it needs to move beyond the mere construction of an analogy towards a simultaneous critical examination of existing analogies.

With such a conception of analogical imagination we can leave behind an understanding of analogies as single, robust and completed entities, and come to see them as necessarily multiple, unstable and incomplete, because no analogy can “capture the whole, or truly unique aspects, of the target domain” (Forlini and Racine 2012, 622). In such light the creation of an ongoing dialogue appears more conducive than establishing a robust analogy. Just like it is not necessary to find universal moral laws in ethics (Johnson 1993), the aim in debates about nanotechnology might then less lie in constructing perfect analogies—which would also ignore that the issues at stake change over time—, but rather in exercising analogical imagination as a way to test out different perspectives in an attempt to identify what should matter. We then can conceive of analogical imagination not as something belonging to individual minds, but rather as being accomplished discursively in specific social settings, where analogies are collectively negotiated.



### **2.2.2 Anticipatory imagination: The power of retrospective prospection**

Imagination can be directed into different temporal directions: It connects an understanding of what is with what could be or has been, looking beyond the perceptual present. Thus, thinking back to something in the past is always a way of imagining, just like it is to think of future possibilities. Recently, the notion of imagination has gained relevance in academic debates on emerging technologies mainly due to its prospective dimension, where it is thus often put synonymous with anticipation. For instance, imagination has been described as “an important cultural resource that enables new forms of life by projecting positive goals and seeking to attain them” (Jasanoff and Kim 2009, 122). It has thus gained relevance as a necessary ingredient in envisioning the potential ethical, social, legal or political implications of new technoscientific endeavors. With the turn to upstream engagement, the question arises how imagination might be stimulated in political or public debate at an early stage, when a technology is still in-the-making. STS scholars have turned to actively encourage lay people to look forward with the help of scenarios, envisioned future applications and science or morality fiction (Barben et al. 2007; Rip and te Kolve 2008; Swierstra, Stemerding, and Boenink 2009). Without a doubt, future scenarios represent relevant tools that can help to explore the consequences of decisions and actions on the individual and collective level. Similarly to what was said above with regard to analogies, scenarios gain their significance in the process of engaging with them, testing them out, and not in defining a fixed one: “When we deliberate, we test out various scenarios in our imagination.” (Coeckelberg 2007, 13)

The perspective I want to add is that analogies have to be understood as equally powerful for stimulating (and steering) prospective imagination in early debates about emerging technologies. In contrast to scenarios, moral or science fiction, which can be developed without explicit references to the past and the known, analogies—due to their structural features—always incorporate and make explicit a retrospective and prospective component. Analogical imagination systematically includes a retrospective dimension, since in order to draw an analogy one has to draw on past experiences, cases and knowledge.<sup>12</sup> Analogies also contribute to what Brown and Michael (2003) call “prospecting retrospects”; a notion coined to describe how people use memories of once imagined futures—in particular with regard to the promises and their (un)fulfillment—to construct new futures. What I want to put forward is a perspective that recognizes analogies as assisting elements in anticipatory processes and hence as complementary to

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<sup>12</sup> Certainly cases in which an analogy is drawn based on knowledge of science fiction or by transferring an imagined scenario are special in this respect. I will not consider these here theoretically, but will address them in the empirical part later.

more explicitly future-oriented devices such as scenarios or visions, because they more explicitly integrate past knowledge into future-oriented imagination. Put simply, they connect future visions with the past, and may hence also prove fruitful to ground debate in a historical continuum.

It is fundamental for social science exploring how the future is mobilized in the present not to lose sight of how the same is achieved with the past. The active inclusion and consideration of analogical imagination might constitute an adequate way of counterbalancing such exclusively future-oriented tendencies. We can thus think of analogies as anticipatory means actors draw upon, for instance to draw lessons from the past for the future (see also European Environment Agency 2002, 2013). Even though, for instance, previous technologies are never tailor-made analogical sources for new technologies, they can still supply important learning experiences that can be used for enhancing anticipatory capacities (see e.g. Kuzma and Priest 2010, 1696f.). This is particularly important in areas such as politics where precedent experiences are relevant for meaningful decision-making: “This is apt in ethics and politics where we inevitably and rightly draw upon what has been historically accepted, on established judgments or endorsed values within a tradition, not on rock-bottom principles that arise from nowhere.” (Aronovitch 2007, 85)

### **2.2.3 Are analogies innovative or conservative?**

It has become clear so far that the picture I painted of analogical imagination is one that empowers people to shake up old ways of seeing the world. However, the contrary has often been argued, namely that analogies are conservative rather than innovative and thus perpetuate what is already known (Johnson and Burger 1996; Lessnoff 1997; Knorr-Cetina 1981). It is certainly right to claim that an analogical connection is not innovative per se, but that the degree of novelty it creates depends on what elements are linked. Yet to make use of existing cases and knowledge does not automatically lead to following and continuing the past—as human beings we can only draw on what we know and combine our knowledge in new ways. As I argued above, using one’s analogical imagination (e.g. by coming up with new and creative analogies), is one way among others, that can potentially induce a broadening and opening up of established perspectives. From such a perspective, analogies might well assist in assessing present developments on different grounds. That is not to deny that analogies incorporate limiting aspects, as will become evident in the following section on analogical arguments (see also Hofmann, Solbakk, and Holm 2006b).

To me, the innovation-or-conservatism question arises from an overly narrow definition of analogical processes as being only about categorization—the making of

similarities. When we integrate particularization—the making of distinctions—into our conception of analogical processes, the question simply disappears, because there is always the option that one comes to reject an analogy with an existing case. Besides, a discourse analytic perspective that conceptualizes people less determined by structures but rather as active users of discourses to construct new meanings also dissolves the infertile question. Most discourse analysts conceive the production of discourse as an inter-textual practice that has to draw on existing meanings and orders, but that also includes an innovative element by combining these in new ways, thus contributing to change and not just reproduction. From a more fundamental perspective, we could then see every discursive practice to be essentially about change and stabilization simultaneously, because no social practice can neither exist without drawing on and continuing existing practices or discourse, nor can it copy them without adding new aspects no matter how minimal they are. From a discourse analytic perspective, analogical discourse opens up moments for innovation/change or stabilization/conservatism, depending on the very resources and discourses that are combined in the construction of analogies. An analogy or disanalogy will be innovative when it transgresses existing ways of viewing the world. If the aim is to shake up preconceived ideas and ways of perceiving the world, people have to give birth to new analogies and metaphors.

#### **2.2.4 Imagination: Beyond rationality and with emotion**

Another reason why a conceptual move towards imagination and away from reasoning might be fruitful is that imagination is historically less associated with rationality and thus can bring other aspects into technoscientific debates that are neglected by a focus on reasoning. Imagination has even long been regarded as an antonym to rationality and its role in science was denied by such central figures as Francis Bacon. Of course, we always have to inquire first what imagination meant back then in the first place. An understanding of imagination as thinking of something as possibly being so in fact might be perfectly compatible with what is understood as rationality. It can be argued, as I did above, that analogical imagination is integral for developing different views and conceptions of phenomena and can thus enhance rational thinking. Smith (2002, 247) states that the construction of analogies requires an “imaginative expertise”, while at the same time the judgment of an analogy as good or bad takes a certain amount of “theoretical and logical skill”, whereby he devises the construction and assessment of analogies as a two-step process. Such a conception clearly perpetuates the dichotomy between imagination and rationality, when it would be more fundamental to break up this compartmentalization and instead regard rationality and imagination not as separate but rather as more

intertwined and indistinguishable. Similarly, Lakoff and Johnson (2003 [1980], 193) have referred to metaphor as “imaginative rationality”, thus ascribing metaphor the status of a nexus between imagination and logic. Moreover, I would not want to claim that the assessment of analogies always adhere to local criteria, because analogies withdraw from logical scrutiny.

In more recent years a turn towards imagination in ethics can be observed, resulting from a search for alternative or additional views to ethical deliberation. Ethics has traditionally attached great importance to reason, which has contributed to a distance between ethics and everyday practices including lay people’s interpretations (Coeckelberg 2007, 11). Consequently, the shift to analogical imagination fits with the current attempt to bring lay perspectives back into ethical debates about emerging technosciences (see e.g. Felt et al. 2009; Strassnig 2008).

In part, the acquired distinction of imagination and rationality might arise from an assumed close connection of imagination with affect (Warnock 1980; Sartre 1948). While emotion and imagination have thus been excluded from reason, there have also been attempts over the last decades to “put them back, in a certain way, into rationality” (Ricoeur 1965, 31). Conceptualizing analogical processes as related to imagination, thus, may also help to acknowledge the power of affective aspects in debates about emerging technosciences. To approach analogies as mere reasoning tools ignores their role as conveyors of values and emotions. Analogies can have the power to transfer emotional attitudes and evoke emotive assessments (see also Thagard and Shelley 2001). Depending on what knowledge (or source) is drawn upon in their construction, a phenomenon will not only be understood differently, but the emotional positioning towards it may also change. Although an affective component certainly is not a requirement for comparative processes, it can be a way of making analogical imaginings more powerful in discourse (more on this in the next section). My aim here is not to fully theoretically explore the relation of analogy and emotion, but simply to draw attention to the articulation of affective elements in the data and their potential relation to analogical expressions.

What I tried to do in this section is to accentuate the imaginative side that is constitutive for the construction and deliberation of analogies. Talking about future technoscientific developments—just like problem solving and research—always requires imagination. Describing public engagement exercises or any debate about emerging technosciences as mere rational processes would exclude that there are people present with emotions and motives that go beyond leading a rational debate. In public engagement settings, analogical imagination is also tied to analogical arguments and their discussion, which is far from

being only about the creation of new knowledge and of innovative ideas, as we will see in the next section.

### **2.3 Analogical arguments: The power of persuasion and framing**

Analogies can be productive means of imagination and innovation but they also represent a limiting force. This section aims to draw attention to the fact that when analogies are mobilized in debates, they can be rather persuasive tools for justifying actions and also powerful argumentative and framing devices that conjure specific realities and construct “the truth” in a particular way, while pushing aside other possible versions. This power of analogies can be conceptualized in rhetorical or ontological terms. I will address both in the following, however, I will also express a stronger preference for a rhetorical perspective. The reason for which will become clear shortly.

To begin, let us define rhetoric. Here, Potter’s (1996b, 33) definition works best for our purposes since it is located in the discourse analytic paradigm that I will introduce in detail in the next chapter; he conceives of “rhetoric as discourse used to bolster particular versions of the world and to protect them from criticism”. This definition, in fact, is a perfect example that conflates the ontological with the rhetorical, for the first part of it highlights how rhetorical discourse creates realities—it is constitutive—and the second stresses the strategic role of rhetoric in defending one version over others—it is argumentative or persuasive.<sup>13</sup> This conception does not reduce rhetoric to a gloss of language or seduction, but rather defines it as the “study and practice of persuasion” (Throgmorton 1993, 119). A central principle of a rhetorical perspective is thus that utterances or arguments are replies to other utterances and arguments. Rhetoric as a form of persuasion is always oriented to someone, be it oneself or an audience. More specifically, rhetoric can be understood as “a feature of the antagonistic relationship between versions: how a description counters an alternative description, and how it is organized, in turn, to resist being countered.” (Potter 1996b, 108) From such a rhetorical perspective, analogical arguments create realities but simultaneously defend and shield them against potential counter-arguments and realities. An analogical argument, then, due to its persuasive character, works to alter perceptions of reality. Thus, analogizing is one world-making

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<sup>13</sup> I here largely use the terms argumentative and persuasive synonymously, but there is of course also a difference between them. Persuasion takes place when someone tries to get agreement on a particular issue, usually only by presenting one point of view as valid. While argumentation is also characterized by attempts to gain acceptance for a viewpoint, it also acknowledges that opposing views exist. To make an argument hence is also more connected to the use of evidence and reason, while persuasion may resort to other means that are generally not taken as “reasonable” (Lunsford, Ruskiewicz, and Walters 1999).

process (Goodman 1978) among others that frames and shapes the realities of the worlds in which we live. It follows that a rhetorical perspective on analogies is related to ontological concerns.

This aligns the rhetorical perspective with recent developments in STS that have moved from the empirical study of epistemology—constructivism—towards ontology (Woolgar and Lezaun 2013; Lynch 2013). A central claim, particularly of ANT scholars, is that we better speak of different ontologies existing and thus account for the multiplicity of realities as well as their fluidity and instability (Law and Lien 2013; Mol 2002). While studies in this vein are remarkable for how they allow to see entrenched distinctions of what counts as human and nonhuman or natural and cultural as effects of specific ontological politics (Mol 1999), they strikingly tend to focus less on the struggles between these realities. Let me give an example. In his recent work, John Law shows how a specific version of reality is accomplished and entails what he calls collateral realities (Law 1999, 2011); that is, the realities (and framings) that are unintentionally produced and accompany practices. Although he claims to look at moments of struggle between different worlds, we cannot get rid of the intuition that all we get to see is rather a singular reality, missing opposing realities and their contention in action. The current ontological approach lacks a concept of the relations and interaction of realities and counter-realities, and seems therefore less apt to attend to power struggles. Merely describing how different realities are done in different places and thus exist alongside each other, does not pay enough attention to how these realities undermine other potential realities and why some come to dominate over others.

A rhetorical perspective is able to provide just that, for it is always oriented towards identifying arguments and counter-arguments. As Michael Billig maintains

to understand the meaning of a sentence or whole discourse in an argumentative context one should not examine merely the words within that discourse or the images in the speaker's mind at the moment of utterance. One should also consider the positions which are being criticized, or against which a justification is being mounted. Without knowing these counter-positions, the argumentative meaning will be lost. (Billig 1987, 91)

It perceives arguments for a specific kind of reality as being imbued with implicit reactions to counterpositions and realities. Analogies, then, are rhetorical in the sense that they not only constitute a specific understanding or version of the world but also (indirectly) counter opposing depictions. As Potter (1996b, 184) has pointed out: "One of the aspects of making any description is that it will pick out a particular range of phenomena as relevant and ignore other potential ones. This is the extended sense of ontological

gerrymandering; one realm of entities is constituted in the description while another is avoided.” He here draws on Woolgar and Pawluch’s (1985) concept of *ontological gerrymandering* (again, ontology!), which was coined to describe the ways constructionist arguments are being protected from their own constructionist analysis. Yet Potter uses the concept more broadly to refer to how descriptions do the work of gerrymandering by selecting one element or version of the world over another. In this broader sense, it relates to what I try to capture with the argumentative function of analogies, for it draws attention to the power of analogies that may also lie in what they do not construct to be similar.

This aspect brings us to another kindred theoretical perspective: framing analyses. Among an array of vastly different approaches in that corner of scientific inquiry, the best known is probably Goffman’s *Frame Analysis* (1974), where framing refers to how a social situation is understood. But my perspective is neither on the framing power of analogies modeled after Goffman’s conception nor is it aligned to the notion of framing in research on social movements (Snow and Benford 1988) or media effects (Gamson and Modigliani 1989; Scheufele 1999). My rhetorically (and ontologically) inspired notion of analogical framing is relatively straightforward: Since analogies structure how to imagine an issue or phenomenon, they are framing devices in talk. Making oneself or others see a phenomenon or situation in the light of another frames how to understand it. In another—more ontological—wording, a different kind of nano emerges with each analogy that is drawn, and nano only becomes a “stabilized object” through the analogies drawn between it and other objects (cp. Michael and Brown 2004). Is there a difference between such a conception and other rhetorically-oriented approaches towards framing? Consider the following quote that captures the idea of framing nicely with an analogy:

If you have ever had a picture framed, you know that the frame you chose emphasized some elements of the picture at the expense of others. Similarly, if you were to reframe the picture, you would notice that the very elements previously emphasized—colors, patterns, composition—would subsequently be de-emphasized by the new frame. Instead, a different combination of elements would be highlighted. Similar to pictures, ideas and events—facts—are also framed. When we frame in a particular way, we encourage others to see these facts in a particular way. Framing in this sense can be understood as taking some aspects of our reality and making them more accessible than other aspects. (Kuypers 2009, 181)

The difference from the more ontologically-oriented perspective is that Kuypers seems to depart from one, albeit multidimensional, reality existing out there: There is still one and the same picture, the frame only accentuates its parts differently. If we take the ontological

stance seriously, we have to give up the idea of one picture entirely and instead imagine an infinite number of pictures. No matter which we choose, the idea behind framing is that one version of a phenomenon is created, highlighted etc. while obfuscating other possible ones. Analogies, in that sense, channel imagination by acting like a “filter” (Black 1962, 3) through which the world not only looks but *is* different. Hence, the framing effect of analogies denotes the process whereby communicators—consciously or not—construct a particular version of reality by highlighting similarities of entities. By establishing one analogy, other alternative analogies are not established, and thereby undermined, hidden, or silenced. This aspect has also been stressed by Lakoff and Johnson (2003 [1980], 157) who argue that

[n]ew metaphors, like conventional metaphors, can have the power to define reality. They do this through a coherent network of entailments that highlight some features of reality and hide others. The acceptance of the metaphor, which forces us to focus only on those aspects of our experience that it highlights, leads us to view the entailments of the metaphor as being true.

We can call the analogically co-constructed dimensions of a phenomenon *entailments*, *by-products*, *concomitants*, or *collateral realities*; all these terms express the same idea, namely that analogies (and metaphors) frame and construct reality in specific ways that might not be explicitly visible.

What aligns my approach with framing analyses is that they generally tend to acknowledge the central role of analogies, metaphors, key words, and concepts in the construction of frames (see e.g. Kuypers 2009; Entman 1991).<sup>14</sup> Kitzinger (2000b) also relates her notion of media templates to the idea of framing, since certain media templates are used as analogies to encourage a particular perception and promote a specific frame. She argues that templates hence could be placed between framing devices such metaphors and exemplars, which Gamson and Modigliani (1989) identified, because they carry with them “an entire frame with closely circumscribed perceptions of the new cases to which it was successfully related” (Kitzinger 2000b, 75).

We could also think of frames as similar to meaning-making stories or narratives (Hajer 1995; Hajer 1993), or interpretative repertoires (see the next chapter for a detailed explication of this notion), because all of them are ways by which reality is organized and ordered differently. Analogies are central devices in the creation and invocation of narratives and frames in general, and in the case of future narratives (scenarios) in

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<sup>14</sup> Similarly, research on discourse metaphors (Zinken, Hellsten, and Nerlich 2008) explores how certain metaphors can become central framing elements in a specific discourse.



particular. Analogies suggest certain narratives and future scenarios, that is, they are imbedded in and give persuasive power to larger rhetorical entities that incorporate a temporal dimension. Hajer, who advocates a story-line approach, maintains similarly: “by uttering a specific element one effectively reinvokes the story-line as a whole. It thus essentially works as a metaphor” (Hajer 1995, 47). The point is, then, that analogies and metaphors can evoke a whole storyline, narrative, line of argument, or frame. In such larger meaning-giving entities, analogies, however, are generally only one resource interwoven with others, all of which contribute to the overall establishment and durability. It follows that larger narratives, arguments, or frames create the context in which analogies and other rhetorical resources gain their meaning and power (Throgmorton 1993, 122). It is thus important to bear in mind that *analogies function in combination and are intricately intertwined with other rhetorical resources and, together with them, work to underpin larger frames, arguments, narratives, or scenarios.*

Since the debate about nano deals to a large extent with future possibilities and developments, a better understanding of the role of analogies in the formulation of scenarios becomes particularly pivotal. For instance, in an analysis of public debates about the European Union in Britain and Germany, Musolff (2004, 2006) has argued that the study of source domains of analogies should be complemented with an analysis of scenarios, because these transfer the “‘typical’ aspects of a source-situation, for example, its participants and their roles, the ‘dramatic’ storylines and outcomes, and conventional evaluations of whether they count as successful or unsuccessful, normal or abnormal, permissible or illegitimate” (Musolff 2006, 28) to another situation. The interlinkage of analogies and scenarios needs to be considered especially when expectations, fears, or public debates in the trajectories of former new technologies are taken as analogical sources. Analogizing, then, becomes an integral part in developing and arguing for specific future scenarios, while always simultaneously constructing a specific version of the past.

### **2.3.1 The politics of analogical arguments and framing**

Since analogies frame our understanding of the world, we can find both “politics” and “struggles” in analogical arguments. The politics of analogical arguments refers to the persuasive use of analogies (and their performative power) in political debates, while I speak of struggles here to address the fact that different analogies generate different versions of the world and hence can cause contention. Rein and Schön refer to this in a comprehensible manner with the following:

### *The powers of analogy*

Framing is problematic because it leads to different views of the world and creates multiple social realities [...] [Frames make us] see different things, make different interpretations of the way things are, and support different courses of action concerning what is to be done, by whom, and how to do it. If people see the world as different and act on their different views, then the world itself becomes different. Expectations, beliefs, and interpretations shape the worlds in which we live. (Rein and Schön 1993, 147)

Since analogies, and their cousins metaphors, are as performative as expectations (Brown, Rappert, and Webster 2000), they also play a similar role in constructing the worlds and the future we imagine ourselves to live in: once established, analogies order and create knowledge, and in doing so they form our conceptions of reality and influence the way people position themselves and act towards new technologies. In that sense they can “be used to help the imaginary become real or true” (Wyatt 2000, 111) and to define how debate or future actions should be undertaken. What is more, when analogies or metaphors become embedded in discourse and actors do not actively reflect on their use, they can become active agents transporting tacit assumptions and expectation about the future of a technology (Wyatt 2004). This is why we equally need to attend to analogies and their framing power. I will revisit this central claim in the next chapter in the section on analogical agency as well as in the Coda.

When it comes to new or emerging technologies it is important to note that different social groups make use of different analogies to materialize their specific version of the future. It is thus hardly surprising that analogies are often drawn upon in political controversies and debates (Schön 1979; Musolff 2004) and may then influence positions towards political issues (Dunbar and Blanchette 2001). However, a recent study on the influence of analogies on political attitudes suggests that analogies may primarily actualize their persuasive power in the early stages of a political debate, that is, when people do not yet have developed strong positions (Lynch 2009). Such results point towards the powerful role that analogies might play in upstream debates about emerging technologies that are still in a phase where views have not become entrenched. Paying careful attention to analogies is therefore particularly important at such early stages in which they might also justify decisions and actions, and may be used to make new technologies appear unproblematic.

Take the example of the nano-asbestos analogy, which features prominently in the public and political discourse on nanotechnology (Kane and Hurt 2008). By identifying material similarities between carbon nanotubes and asbestos fibres, it appears reasonable to suppose that nanoparticles could turn out equally harmful in the long term. While the

analogy can be interpreted as an attempt to learn from past mistakes, it can also be understood as a way to channel the debate about nano in terms of health risks that can be examined by natural sciences—in particular toxicology—while ignoring the ethical, social or political issues nano might raise. From a framing-sensitive perspective, analogies with asbestos or GMOS are never simply attempts to learn from the past to structure future actions (Von Schomberg 2010), but they are also powerful in the way they legitimate funding policies, communication activities, and governance approaches (McCray 2008). In short, “analogies can serve as powerful rhetorical devices when one is advocating specific ways of managing or regulating a new technology.” (Johnson and Burger 1996, 60)

Attending to the argumentative and persuasive features of analogies inescapably brings power structures and struggles over authority into view. Attempts to change the dominant analogy of a public debate or to reframe it as a disanalogy are attempts to change the whole discourse. Such a perspective allows capturing that public engagement settings can potentially be spaces where power relations are stabilized, established, or challenged via arguments by analogy. Thinking of analogies as argumentative means thus co-emerges with a conceptualization of public engagement settings as battlegrounds, where people with different (pre-existing) positions meet and enter a controversial debate, different knowledges and orders collide and struggle for dominance (see also section 2.3). It should be clear that from this vantage point, analogies cannot be simply characterized as reasoning or imaginative devices employed to acquire knowledge or a new perspective on a phenomenon but may as well, or even more so, be seen as discursive, target-oriented weaponry. Despite their strategic potential, analytically we best remain agnostic as regards the imputations of intentional use or action because it is “particularly difficult for an analyst to distinguish those occasions where there is strategic planning from those where there is none” (Potter 1996b, 64f.). What matters is how interlocutors treat utterances and which persuasive and framing effects analogies engender, not whether they do all these things on purpose. Persuasion in the rhetorical sense is not to be confused with intention.

Let us consider the central term “*tertium comparationis*” at this point, since it refers to the quality that two compared phenomena or cases are claimed to have in common. As Billig has pointed out: “If there are infinite ways of organizing the stimulus world in terms of similarities and differences, then we need to select appropriate patterns of similarities and differences, and reject a whole host of others.” (Billig 1987, 133) We may think of the *tertium comparationis*, then, as the patterns of similarities and differences that are selected and hence taken to matter when two or more cases are compared—similar to a frame of comparison. Struggles or agreement over analogies can inform us about what is considered to be a relevant or disputed *tertium comparationis*; in other words, what should count as a

relevant type of similarity, which thus might bring more latent values, concerns, and principles to the fore. In this way, debates about analogies are always concerned with the essences of things and situations, or with ontological politics (Mol 1999): “What one side claims to be the essential set of differences, the other claims as less crucial. In this sense, they would be arguing about essences.” (Billig 1987, 138) In arguing about their analogies, people then argue about much more, namely about the reasons and underlying dimensions they find relevant or should dominate in the construction of reality. In effect, controversies about analogies can thus be expected to be about which *tertium comparationis* should be selected and applied. It follows that changing the *tertium comparationis* is an effective way “to shift the essence away from one set of social values to another set” (ibid., 145).

The persuasive potential of analogies is fully actualized when an analogical argument becomes accepted and thus dominant. Analogies thus provide evidence that makes certain realities, futures, or conclusions appear more likely or plausible than others (a point we will come back to in the subsequent section), but they do not meet the standards of absolute proof in logical argumentation, as there exists no logical rationale why two phenomena must be the same or work in the same manner, just because they share some characteristics (Mill 1879; Myers 2007, 293). It is precisely their “logically imprecise” character (Latour and Woolgar 1986 [1979], 173) that makes analogies apt for rhetorical investigation: “Discursive processes of persuasion such as the use of analogy and metaphor are of interest, then, in part because their persuasive effect does not rely upon what a logician would recognize as valid argument nor upon what the scientist would accept as the presentation of empirical evidence.” (McKinlay and McVittie 2008, 124) The central point is this: analogical “facts” or “accounts”<sup>15</sup> are established through persuasion since there exist no logical criteria for why one analogy should be truer than others.

Still, logicians and ethicists sometimes cling to the idea that the value of a posed analogy can be judged by criteria such as whether the compared aspects are of relevance, dissimilarities annihilate the similarities, and parallels are sufficient to support the conclusion (see e.g. Post and Leisey 1995). Outside of philosophy and ethics, and particularly in the empirical social sciences, the question remains how (and why) some analogies manage to become accepted as evidence, and thereby gain factual status, while others fail to accomplish this effect: “differing analogous associations are far from equally applicable and are likely to vary considerably in their relative persuasiveness” (Michael and Brown 2004, 380). This draws attention to the varied power of persuasion inherent in analogies. We could assume that other factors than those considered to be of relevance by

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<sup>15</sup> In this case, we could hence argue then that there is indeed no difference between analogical facts or accounts (Latour and Woolgar 1986 [1979], 40).

ethicists might turn out to be more decisive in everyday situations. In contexts where lay people—and not philosophers—meet, analogies simply cannot be considered to enter a logical vacuum bowdlerized of all their social, cultural, or political adhesion as well as the status and credibility attributed to the person articulating an analogy; all these might contribute to their persuasiveness.

In a similar vein, Lakoff and Johnson have pointed out that power and status contribute to the robustness of metaphors, regardless of whether we look to the area of politics or everyday interactions: “people in power get to impose their metaphors” (Lakoff and Johnson 2003 [1980], 157). For instance, it is well-known that two powerful people in the Third Reich, Hitler and Himmler, likened Jews to vermin (Raffles 2010), thereby collapsing the distinction between humans and insects—a move that made certain actions appear more morally acceptable than it would have been were Jews still be understood as human beings (for more on metaphor and the Holocaust see Musolff 2010). STS scholars are generally acutely aware of the fact that the processes by which people engage with a new technology are “socially mediated in the sense that judgments of trust will have to be made regarding whose analogies, metaphors, and so on are credible” (Michael and Brown 2004, 381). I will add to this perspective in the section on analogical repertoires that credibility in debates about emerging technosciences might also be tied to collectivity.

### **2.3.2 The affective and moral side of analogical arguments**

We now come back to the affective component or emotional appeal of analogies, which is captured in rhetoric with the term *pathos*. Along with *logos* and *ethos*, *pathos* forms one of the three modes of persuasion identified by Aristotle in his classic *On Rhetoric* (Aristotle 2007). Making use of *pathos*, analogies can be strategically employed to convince an audience to adopt a specific emotional response towards an issue or situation. In political contexts, the power of analogies’ to influence public opinion should not be underestimated (see the ‘Jews are like vermin’ example above), in particular since the emotional transfer can be accomplished on a subliminal level:

If I want to get someone to adopt positive emotions toward something, I can compare it to something else toward which he or she already has a positive attitude. Conversely, I can try to produce a negative attitude by comparison with something already viewed negatively. [...] Of course, the emotional appraisal could be represented verbally by terms such as “wonderful,” “awful,” and so on, but for persuasive purposes it is much more effective if the particular gut feeling that is attached to something can itself be transferred over

to the target. For example, emotionally intense subjects such as the Holocaust or infanticide are commonly used to transfer negative emotions. (Thagard and Shelley 2001, 344)

The quote highlights that an analogy can represent a more subtle, indirect mechanism for emotional transfer than the use of explicitly positive or negative adjectives to convey assessments directly. This is especially the case when analogies appear in the form of metaphors: “metaphor is often considered as an area where descriptions are being used performatively. Literal descriptions may be just telling it how it is, while metaphorical ones are doing something sneaky.” (Potter 1996b, 180) It has thus been acknowledged, particularly in work on “discourse metaphors” (Zinken, Hellsten, and Nerlich 2008), that when metaphors stemming from the same source domain occur frequently in discourse they “can set hidden agendas which are influential because they are hard to spot and therefore hard to counter” (Mulholland 1994, 181). Thus, metaphorical framings of technoscientific innovations can be applied to influence public assessments and judgments. For instance, synthetic biology has been wrapped up in metaphors referencing benign and ethically rather uncontroversial processes such as sewing or stitching (Hellsten and Nerlich 2011). Such metaphors, Hellsten and Nerlich argue, frame synthetic biology in terms of the industrial revolution, but they also warn that such a framing could backfire, as the public might be repulsed by the idea of life as mass production. Public responses simply cannot be predicted.

Yet, in order to employ analogies and metaphors effectively in a persuasive way, a certain anticipatory knowledge of their effect on the receiver is required. This already alludes to what will follow in the next section, namely that a shared understanding of the case, domain, or situation that is drawn upon for comparative purposes is a precondition to produce the anticipated (affective) effect. This anticipation might be more problematic in cases where the source domain carries a multiplicity of also contradictory meanings. Admittedly, with language use there is always the possibility of multiple meanings, but nevertheless some terms may be more prone to assemble multiple meanings in a certain cultural context than others. To counteract the potential problem of multiple meanings, speakers might rely on analogies with cases they assume to carry a dominant and widely shared meaning.

For instance, comparisons to World War II have been frequently invoked by US presidents to justify foreign military interventions, whereby they make use of a largely nation-wide consensus on the participation of the US in World war II (Holyoak 2005, 125f.). In such cases, aspects that do not contribute to a sound analogy are usually not addressed and thus moved to the background. This links up with a second aspect addressed

in the quote from Thagard and Shelley above, namely that certain topics seem to elicit particularly strong emotional reactions due to their widely shared moral meaning in a particular context. To not react in a certain way and display a certain emotion, then, would amount to violating a social norm. As analogies and metaphors carry moral and political connotations, the consequences of successful analogies are thus also that the moral connotations of the source impinge on the assessment of the target: “Many of the analogies used are value laden, and if I can convince my interlocutors to accept a particular analogy as a good analytic tool, I may also convince them to accept the valuation implicit in the analogy.” (Hofmann, Solbakk, and Holm 2006a, 53)

The Holocaust, Hitler, or Nazi references are excellent examples that evoke such a shared moral understanding. But overusing or abusing such powerful analogies can also involve a certain risk of backfiring and hence weaken the argument. In the US context, the Nazi analogy has recently been mobilized by Conservatives with regard to the Obama administration and its attempts to reform the US health care system as well as in ethical controversies about science and medicine: “‘If X is done, then we are on the road to Nazi Germany’ has become a commonplace claim in contemporary bioethical debates.” (Caplan 2005, 535) In all these cases, strong criticism was voiced against an overly casual and unjustified use of such analogies. While it can be argued that Nazi analogies exploit a widely shared moral understanding, making use of Nazi analogies can also convey desperation and signal that the speaker has run out of better arguments.

The case of the Nazi analogy is also interesting due to an Internet meme—an idea that spreads through the World Wide Web—that emerged around it. It began with Mike Godwin, who came across the Nazi analogy frequently in online newsgroups and discussion forums in the early 1990ies, where they were used to close debates, which prompted him to ask “how debates had ever occurred without having that handy rhetorical hammer”.<sup>16</sup> In doing so, he addressed the fact that Nazi analogies often were phrased as personal attacks—which are easier to perform protected by the anonymous realm of Internet fora—and thus worked to derail discussion. Additionally, he reacted to the unproductive use of such analogies by ironically coining “Godwin’s Law of Nazi Analogies”, which states that “as an online discussion grows longer, the probability of a comparison involving Nazis or Hitler approaches one”. Godwin’s intention was to highlight that an overuse of such strong analogies diminishes the impact of the comparison when appropriate. Since then Godwin’s law has spread in Internet fora and is usually referred to when unwarranted parallels with the Third Reich are established, with the result that a thread is closed and the user who brought up the analogy suffers from a loss of

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<sup>16</sup> [http://www.wired.com/wired/archive/2.10/godwin.if\\_pr.html](http://www.wired.com/wired/archive/2.10/godwin.if_pr.html) (accessed 19 June 2013)

credibility. This practice thus represents a good example for how certain analogies may be discredited or even forbidden in certain context to make debate more productive.

Although face-to-face talk follows different rules than online discourse, the question whether certain analogies might cause similar reactions in debates about emerging technosciences is an interesting one that is open to empirical exploration. For instance, it could be possible that analogies comparing critical positions on nano to former unwarranted public “fears” of new technologies (the iconic example here would be the fears that rail travel might cause death) could also function as a “rhetorical hammer”. Such an argument powerfully intertwines emotions and public reactions to denigrate critique and might thus be hard to counter. Would people dismiss such a parallel in face-to-face talk and would its enunciator also suffer from a loss of credibility, as with Godwin’s law? Based on their analysis of how lay citizens tried to grasp xenotransplantation, Michael and Brown (2004) draw such a conclusion, because they found that indeed simple analogies may contribute to a loss credibility of a speaker. Just like the construction of an analogy in science does not guarantee success in terms of producing an innovative outcome that becomes accepted (Knorr-Cetina 1981), the work of “making equal” in other contexts likewise can either lead to success or failure.

## **2.4 Analogical repertoires: The power of the shared**

It has been established so far that analogical arguments in their essence are context and audience-specific, and this context-specific character leads to the last feature of analogies to be discussed in this chapter: the power of analogies to evoke shared knowledge, which contributes to their role in enabling communication and stabilizing claims. Accounts of metaphor and analogy, particularly those rooted in a rhetorical tradition, have hence drawn attention to the fact that speakers and listeners need to share a “system of associated commonplaces” (Black 1962) or a “repertoire of commonplaces” (Kornprobst 2007), terms that all refer to shared interpretations of the world or specific historical events that guarantee a successful interpretation. The term commonplaces is very appealing for it brings forth the idea of common knowledge underlying effective analogies. Yet, used outside the circle of rhetoricians, the meaning of “commonplace” is more related to the banal, ordinary, and non-original, which may complicate its use for our purposes here. If we insert a hyphen, the rhetorical meaning becomes clearer, for a “common-place”, or *locus communis*, is literally a shared geographical space.

Let’s take up this central idea, but to avoid confusion and negative connotations let’s substitute the notion of commonplace with that of a *shared repertoire of knowledge and*



*experience*, which could but does not necessarily have to involve shared values.<sup>17</sup> Moreover, my conception of analogies differs from the notion of commonplaces that is employed by other discourse analysts such as Myers (2007, 285), who defines commonplaces as “generally applicable and generally known arguments [that invoke] shared, taken-for-granted perspectives embedded in familiar roles and everyday practices.” Analogies, by contrast, do not have to be generally accepted or taken-for-granted or to incorporate elements of agreement. Having said that, a speaker enunciating an analogy may still deliver with this speech act the assumption of a shared repertoire of knowledge and experience (but not necessarily the same assessment) among members of a particular speech community or culture. Put simply, speakers are very unlikely to make an analogy if they did not believe that the comparison might be understood by their audience. In turn, my understanding of repertoire implies that what falls inside or outside one’s scope of knowledge or experience defines the range of the repertoire that can be mobilized.

#### **2.4.1 Cultural analogies: Or the importance of national thought collectives**

Taking up the idea of shared repertoires of knowledge and experience, we could assert that when the repertoires of different people overlap this might contribute to the establishment of more socially robust analogies with regard to their power to persuade or connect with others. As discussed above, drawing an analogy is not in itself authoritative enough but other circumstances also need to apply to propose an analogy in a convincing way. To tie this thought of shared knowledge to STS literature, we may draw on the idea of “thought collectives” and their distinctive “thought styles” from Ludwik Fleck’s seminal *The Genesis and Development of a Scientific Fact* (1979 [1935]). Although Fleck employed these concepts to refer to scientists in intellectual interchange with each other, they can also be applied to any other group of individuals that shares an intellectual or experimental past. While people in a thought (or experience) collective may interact with each other, being in direct contact with each other is no *sine qua non* for the existence of a thought collective. Fleck’s basic idea was that not individual people but groups think differently, and that cognition is thus reframed as a collective social practice. We simply cannot deny that belonging to a thought or experimental collective constrains the individual by determining “what can be thought in no other way” (ibid., 99). But on the basis that people generally belong to different thought collectives it makes sense to conceptualize this determination more flexibly, because what counts as a relevant collective is negotiated from situation to

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<sup>17</sup> Billig (1987, 209) suggests that there is a resemblance between the classic notion of rhetoric and the modern concept of values, both alluding to objects of agreement.

situation. Thought collectives can potentially range from relative unstable to more stable communities such as a nation, a scientific field, or a group that only meets once to discuss nanotechnology.

In public engagement exercises, belonging to the same national or cultural collective plays a central role, because in such contexts people of heterogeneous backgrounds meet who might not share more than residence in the same geographical area. Moreover, the governance of emerging technosciences is still to a large extent located at the national level, hence the question of how to govern nano—that is often at the core of such processes—contributes to the importance of nationality. As studies have shown, a national context provides its citizens with a shared history, particularly pertaining to technoscientific governance, which participants in engagement settings can then draw upon (Horst and Irwin 2010; Felt 2014). This, unsurprisingly, also holds for the construction of analogies. In her work on how lay people in focus groups talked about nanotechnology in Great Britain, Davies (2011, 321) reveals that in order to build analogies participants mainly drew “on a shared culture in which speaker and listeners are familiar with the same examples and cases”—and this shared culture was nation-specific to a large extent. Although global events can also provide the resources for the construction of analogies, past experiences with technological failures and other risk related issues that have occurred in a narrower cultural context tend to overspill from one case to another (Wynne 1996; Petts, Horlick-Jones, and Murdock 2001). For instance in the 1990ies, mad cow disease was one such issue that overspilled<sup>18</sup> and was thus mentioned all the time in discussion groups about global warming, GMOs, or chemical pollution in Great Britain (Myers 2004).

Given these insights, it appears reasonable to expect that the borders of a nation state might confine the main collective of relevance in my work here. Belonging to the same national context may provide a basic shared footing for the construction of convincing analogical arguments. Accordingly with one of my research interests, I try to explore which analogies (and the issues and relevances they convey) are typically invoked in citizens' discussions in a specific cultural context. Or put differently, I am interested in identifying the central cases that are drawn upon in comparative talk about nano. Cooren calls elements that usually turn up in people's conversations “cultural figures” because “they are literally cultivated in our interactions and this is why we can indeed speak of culture” (Cooren 2010, 116). Following this definition, I refer to those analogies that are usually cultivated in a speech community or national context as *cultural analogies*. Such analogies

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<sup>18</sup> Brian Wynne and others use the term “overspill”. Note that in contrast to my conception that also includes active agency of people drawing on certain resources for particular purposes, “overspill” suggests that these experiences are like a natural force doing something on their own.

do not just make up a shared repertoire that people draw upon, but they are based on templates (Kitzinger 2000b) provided by a shared historical framework, always looming in the background waiting to be attended to. This presupposes that speakers are in a permanent dialogue with their “cultural sphere” (Bakhtin 1986, 76), with all that is taken for granted and circulated in their relevant communities. Those living in a specific community learn in an implicit manner that these cases or templates matter and thus have to be cultivated. Bringing up a specific analogy in a discussion setting is consequently always a test whether the relevance it carries and highlights are considered worthy of maintaining in a speech community or culture. When participants engage actively with a specific analogy in an affirmative manner (e.g. by taking it up and developing it further), they engage in a practice through which culture is stabilized (Filliettaz, de Saint-Georges, and Duc 2010).

In the above, I took up the idea of templates from Kitzinger, who in a study on the media coverage of sexual abuse identifies and explores the “key reference points in public understanding of sexual abuse”, whereby she is able to demonstrate “the importance of collective memories and historical analogies” (Kitzinger 2000b, 74). She calls these central cases for comparison templates because they remind her of the “template document automatically summoned up each time one starts a new text file on a computer” (ibid., 75). While nothing speaks against using the terms “template”, “dominant analogy”, “key reference point” or “cultural analogies” interchangeably to refer to how certain cases are continuously invoked in talk about a certain issue, I want to bring into consideration that the term template has a certain connotation of fixedness that I do not want to invoke. A template is a preset format for a document, it hence suggests that cases resembling templates are pre-existing, which tends to ignore the fact that these cases are likewise constructed for a particular purpose in the present and that there might exist contestation about how this template should look like.

#### **2.4.2 Constructing culturally convincing analogies**

Since the dissertation at hand is concerned with the function of analogies, we likewise have to investigate the function such cultural analogies may have in discourse. Indeed, it could be conceivable that invoking cases from a shared technoscientific history might assist in corroborating analogical claims in public engagement settings. Moreover, exploring cultural analogies might allow to examine nation specific, “culturally specific, historically and politically grounded, public knowledge-ways” (Jasanoff 2005a, 254), or “civic epistemologies” as Jasanoff has termed these. With this term she tries to capture what counts as a trustworthy argument or truthful evidence in a political context. The concept

raises awareness that political entities such as nation states share common understandings about how generally acceptable scientific and political claims should ‘look like’ in form and formulation. We are also reminded of Nietzsche (1979, 84) here who claimed that “to be truthful means to employ the usual metaphors”.

This aspect also ties to an argument about framing in political debates, which highlights that there exist certain basic standards about what is considered credible: “Not all frames, and not all stories in which they are expressed, are equally acceptable or compelling. But there do seem to be implicit, perhaps even consensual, standards by which to judge the adequacy of different frames for interpretation, understanding, and action.” (Rein and Schön 1993, 149) In a way, then, the concept of civic epistemology can be understood as an elevation of the idea of the thought collective and framing to the national level. Instead of dealing with the details of each analogy, my work could also seek to explore whether there exists a shared understanding about the form and ways of trustworthy analogical claims in the Austrian context. It follows that the civic epistemology would here define which analogical claims and arguments are to be considered legitimate or invalid. The notion of civic epistemology thus lends itself to underpin my research interest that is interested in how analogies should be made in public to resist potential criticism.

In her work, Jasanoff focuses on the cross-national variation of civic epistemologies, which entails a homogenization of nation states; however, nothing speaks in principle against the idea of multiple civic epistemologies in one national context, when we integrate the idea of multiple thought collectives from above. As Miller (2008, 1898) highlights in his discussion of the concept “complex judgments involved in knowledge making are products of dynamic social processes in which competing knowledge claims are articulated, deliberated, negotiated, discarded, and valorized”. Given that other thought collectives and epistemologies also matter in debates about new technosciences, national framings might be challenged, thus evoking a struggle over analogical claims even in a single national context. Following Felt et al. (2010, 550), it is hence worthwhile to zoom in on differences within nations.

### **2.4.3 The role of analogies in sociotechnical imaginaries**

With “sociotechnical imaginaries”, Jasanoff has more recently developed a concept that is closely interrelated with civic epistemologies. Sociotechnical imaginaries have been defined as “collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects” (Jasanoff and Kim 2009, 120); and later redefined as not necessarily nation specific, but always “collectively held, institutionally stabilized, and publicly performed visions of desirable futures,

animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology.” (Jasanoff forthcoming) For my purpose here, it still makes sense to conceive of imaginaries related to nation states and their investment (or non-investment) in certain emerging technosciences. In Austria, for instance, nanotechnology and nationhood are co-imagined in policy contexts with the durable (because it has been evoked in the past) imaginary of not lagging behind, which implies that Austria should invest in nano in order not to fall behind neighboring countries in the future. Although such an imaginary can be identified as dominant, in the sense that it is articulated by powerful political elites, it may also be likely that there exist competing imaginaries in Austria that are less visible to the general observer: “Multiple imaginaries can coexist within a society in friction or in a productive dialectical relationship. It often falls to courts, the media, or other institutions of power to elevate some imagined futures above others, according them a dominant position for policy purposes.” (Jasanoff forthcoming) This points towards the establishment of a hierarchy of imaginaries in a given socio-political context and the ways in which some imaginaries become entrenched while others lose ground by powerful mechanism of institutionalization. The relevant question to be empirically explored is whether citizens agree with or challenge existing sociotechnical imaginaries on nano.

But what is, then, the relation of analogies to imaginaries? To put it crudely, analogies relate similarly to sociotechnical imaginaries as to frames, narratives, or discourses, because imaginaries share many features with these. Jasanoff and Kim (2009, 123) claim that imaginaries are not only coupled with imagination but also with imagery, because they “reside in the reservoir of norms and discourses, metaphors and cultural meaning out of which actors build their policy preferences.” In a forthcoming book chapter, Jasanoff gets more precise in noting that verbal tropes and analogies can assist in identifying the elements of an imaginary, thereby highlighting the analogical underpinning of imaginaries. Put differently, specific analogies can be understood as resources in the construction, stabilization, or undermining of socio-technical imaginaries. As elements of broader imaginaries, analogies just as imaginaries “frame and represent alternative futures, link past and future times, enable or restrict actions in space, and naturalize ways of thinking about possible worlds” (Jasanoff forthcoming). Since sociotechnical imaginaries frame the future in certain ways they are obviously tied to the notion of framing that I elaborated in the previous section. The task of my analytical work is hence to shed light on the role of analogies in reinforcing or impairing specific imaginaries that are constituted around nano and its entanglement with visions of the collective good.

#### **2.4.4 Analogies as spatio-temporally situated**

It should have become evident by now that analogies are enmeshed with the (national) context in which they are drawn. Following such a perspective we have to account for the fact that the meaning of analogies is culturally grounded, which implies that in order to make sense of analogies, contextual knowledge—the wider cultural context as well as the more narrow context of the discursive situation—needs to be integrated into the analysis. The fact that analogies cannot be cut off from their cultural context also accounts for the difficulties of transferring analogies to other places and times. By exploring the large difference between the descriptions of chemistry in the pre-modern and modern age, Fleck (1979 [1935], 125) has provided us with a glimpse as to how the spatio-temporally situatedness of the thought style of a particular period entails specific comparisons that lose their meaning over time, even in the same thought community. A similar point has been made by Lakoff and Johnson (2003 [1980], 22ff.), who argue that metaphorical framings are anchored in their cultural contexts and its respective values; for instance while in one culture arguments might be metaphorically understood as war, another culture could imagine the practice of arguing as a form of collective dance. Following this, then, analogies can be acknowledged as possessing the power to evoke implicitly shared meanings, values, and imaginations. In turn, since “analogies are so deeply embedded in the language and traditions of a community of interpretation that the user is not directly aware of them” (Post and Leisey 1995, 47), they can become valuable resources for social scientists who aim to reconstruct culture and collectivity through language. Additionally, this may allow us to cast a critical gaze on the generally unnoticed structures that tacitly act in a culture.

#### **2.4.5 Polysemic analogies?**

With their ability to evoke commonly shared meanings, analogies and metaphors can also serve as “common ground” (Välvirronen 1998; Välvirronen and Hellsten 2002) for more instrumental communication. Analogies, then, can be employed as powerful tools in communicating technoscientific innovations to larger publics via diverse media (Anderson et al. 2009). Likewise, by drawing on shared knowledge, analogies become essential tools in science education enabling students to better understand abstract scientific concepts (Aubusson, Harrison, and Ritchie 2006; Wormeli 2009; Filliettaz, de Saint-Georges, and Duc 2010).<sup>19</sup> While this function is central for studies focusing on analogies in media and

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<sup>19</sup> The use of analogies in educational contexts more often than not is based on a unidirectional communication model and the assumption that there is one shared interpretation of the source used in a

educational communication, it is of minor concern for the interactive settings I explore. Nevertheless, the question whether specific analogies may serve as communicative mediators or translational devices is a relevant one. The question that is implicit here is whether we can think of analogies as polysemic, i.e. very simply put, if they can mean different things for different people.

While we may be urged to answer this question immediately with a “yes”, let us exercise caution here and explore this issue in more detail. As has become clear, I largely do not distinguish between analogy and metaphor in these theoretical chapters, because what applies for analogies mostly also does for metaphors and vice versa, but it is here where I want to emphasize a crucial difference. I conceptualize metaphors as polysemic but not analogies, because metaphors can be words but analogies—in the way I conceptualize them here—tend to go beyond that scope. Due to their polysemic nature, metaphors such as “biobank” can indeed be interpreted differently (López 2006; Lopez 2007). Analogies, however, are more complex than polysemic, in the sense that one GM-nano-analogy is not like another GM-nano-analogy, because the likeness can be constructed out of various similarities, whereby not only a different GM but also a different nano emerges. Of course, when we speak of a “GM-nano analogy” in a sentence, this word-compound is polysemic, but this is not how analogies usually emerge in public engagement or discussion group contexts. If analogies are developed in talk and not used as in the above sense, we cannot speak of “the GM-nano analogy” because there is neither one GM nor nano case but many, depending on the ways the analogy is constructed (for a similar perspective on the word “game/play” see section 4.3.2). Being familiar with cases from a shared national technopolitical history, then, does not mean that these cases will be used for the construction of the same analogies. The GM case as a source in an analogy might be shared, but it can nevertheless be interpreted and used in different ways.

This is also why I would argue that metaphors are more like boundary objects (Star and Griesemer 1989), which are robust yet flexible enough to connect and translate between different interests and actors in debates over contested issues: metaphors “can be shared across different contexts not because they have the same meaning, but precisely because they do not.” (López 2006, 62) As López thus rightly argues the same metaphor can be applied for diametrically opposed purposes and it is hence context that stabilizes the meaning of a metaphor. Analogies, by contrast, may not work like that but their sources may. The GM case, then, might be interpreted flexibly in discourse because an array of

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comparison. But there also exist other views (Heywood 2002; Filliettaz, de Saint-Georges, and Duc 2010) that do not subscribe to such a model of cognitive transfer and propose analogies as means for stimulating engagement and interaction in learning processes.

### *The powers of analogy*

different meanings can be associated to and different analogies can be built from it. By analyzing how people construct analogies differently, even when they draw upon the same sources, we can thus shed light on the varied imaginaries that analogies transport for different actors. This also links up with the persuasive power of analogies addressed in the previous section where I argued that groups and actors make use of specific analogies to promote their agendas and visions of how the future should unfold.



### 3 Analogical discourse: Adopting a discourse analytic framework

This chapter seeks to outline a framework that transfers the preceding theoretical and conceptual elaborations on analogies into a discourse analytic perspective. Since public engagement settings can be characterized as dynamic discursive spaces, I conceptualize analogies in these contexts as discursively co- and de-constructed in longer dialogic sequences by various speakers—neither being mere products of analogical reasoning in individual minds nor confined to individual or isolated utterances. The making and unmaking of analogies in talk-in-interaction is a collective endeavor and cannot be reduced to one specific speaker, hence we are forced to attend to the process-like development, elaboration, negotiation, and contestation of analogies. From such a perspective, *analogical discourse* becomes the main analytical entity (Filliettaz, de Saint-Georges, and Duc 2010), for it highlights the continuous interactive interplay of co-creating analogies (similarities) and disanalogies (distinctions). I conceptualize analogical discourse thus in a very broad sense as discourse that shares *a mode of comparing/contrasting—or analogizing—*, encompassing what is generally referred to as (dis)analogies, comparisons, metaphors, similes, metonymies, or idioms/proverbs. In a discourse analytic framework, analogical discourse represents a specific discourse type characterized by the specificities mentioned above, while analogies and other comparative elements are understood as specific discursive devices and rhetorical moves used in talk-in-interaction.

Why do I speak of *analogical moves* and *devices* here, and not for instance of words, statements, utterances? There are three reasons for this. First, I do so precisely to open my analytical gaze towards broader chunks of meaning and functional elements in discourse that reach beyond words or utterances. Although analogizing may find expression in mere words—as is often the case with metaphors—taking up Goffman’s (1981, 24) notion of move allows to avoid a narrow restriction of the analytical unit to words, sentences, or utterances, which opens up the analytical horizon towards comparative processes that stretch beyond these categories. Second, speaking of moves or devices allows highlighting the action-orientedness of language and the flexible use of analogies in talk-in-interaction. Conversation and other discourse analysts tend to speak of conversational moves as devices, whereby they refer to regular patterns in talk-in-interaction and foreground their tool-like use—an analogy that goes back to Wittgenstein. Tools, as we know, are taken up to carry out a particular function and to achieve a certain effect.

In addition, we need to note that speaking of specific moves or devices also implies that there may exist other types of discourse and devices that could connect and co-emerge with analogical discourse and devices. On a practical level, seeing analogical discourse as one among many other discursive features suggests that examining analogical discourse in isolation would likely be reductionist. To allow for a more holistic view, I therefore seek to examine analogies in relation to other devices. On a theoretical level, this requires underpinning the conception of analogical discourse with a more general discourse theory and a coherent discourse analytic framework. The following sections of this chapter are thus dedicated to this task. The next section aims to give an account of the discourse analytic tradition my approach feels most closely aligned to: discursive psychology (DP). Part of this introduction to discursive psychology highlights its roots, its demarcation attempts from other psychological and discourse analytic approaches, and its perfect integration with critical PUS research agendas. Then, I will introduce two central concepts from this research tradition in greater detail: interpretative repertoires and ideological dilemmas. A section on the argumentative character of attitudes and opinions follows, which aims to show how these significant socio-psychological concepts are reinterpreted and consequently eschewed by discourse analysts. Next, I will try to connect my interest in analogies with discourse analytic studies on fact-making, plausibilization and deresponsibilization processes. And finally, the idea of analogical agency will be explored in more detail.

### **3.1 Discursive psychology: An action-oriented approach to discourse analysis**

In order to embed the concept of analogical discourse in a broader discourse theory, defining discourse might prove a helpful first step. Let us refer to discourse in a broad sense as a specific way of understanding and constructing the world by linguistic means, characterized by certain patterns of organizing language. Discourse analysis is, very generally speaking, interested in excavating these underlying patterns. Discourse analysis is a vast field, encompassing a broad range of different approaches, yet most discourse analytic approaches share a social constructionist outlook, which means to view ways of talking not as mere reflections of the world but as active attempts of (re)shaping it. From such a theoretical perspective, language becomes an integral part of the social construction of understandings, actions, entities, and events: “the discourses, by representing reality in one particular way rather than in other possible ways, constitute subjects and objects in particular ways, create boundaries between the true and the false, and make certain types of

action relevant and others unthinkable.” (Jørgensen and Phillips 2002, 145) Despite their differences, discourse analytic approaches thus share a critical, constructivist stance towards taken-for-granted knowledge, because knowledge is no longer taken as a reflection of reality. When discourse is perceived to play a relevant part in stabilizing and changing social reality, this renders discourse analysis apt for analyzing societal power relations and for generating prospects for social change.

Discourse when encountered in talk-in-interaction or conversation is thus not merely giving an account of the world but also acts in and on the world by performing linguistic actions (Austin 1962; Wittgenstein 1986 [1953]). Wittgenstein perfectly captured this in three words: “Words are deeds.” (1998, 53) This simple insight helps to avoid the unproductive distinction between discourse and social practice, because talk is understood as a diverse set of discursive practices; discourse in such a conception becomes a powerful and omnipresent social accomplishment that co-constructs the social world and interplays with other practices. Such an action-oriented theory of discourse has been particularly put forward by scholars in a strand of discourse analysis known as discursive psychology<sup>20</sup> (DP) (Edwards 1997; Edwards and Potter 1992; Potter 1996b; Potter and Wetherell 1987; te Molder and Potter 2005). Discursive psychologists examine how people while talking—and making accounts<sup>21</sup>—employ discourse in flexible and consequential ways by focusing “on the *activities* which people perform when they make sense of the world and the *resources* (category systems, vocabularies, notions of person, etc.) on which these activities depend” (Potter 1996a, 150, emphasis i. O.). This interest in activities and resources resonates with my focus on analogizing as a discursive activity and analogies as discursive devices, but my approach to analogical discourse is connected to DP for three more reasons.

The second reason is that from a DP perspective the production of content is inextricably intertwined with interactional factors, thereby countering an individualistic perspective. And third, DP deals critically with cognitive psychology, which aligns it with my non-cognitive view of analogical processes: “Discursive psychology is concerned with action rather than cognition.” (ibid., 152) DP has developed an extensive critique of cognitivism by proposing to move away from experimental methods to a detailed analysis of talk in everyday contexts and to treat mental concepts as socio-discursive

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<sup>20</sup> I use the term discursive psychology here more broadly going beyond studies that examine how cognitive terms are used in interaction, including likewise analyses of discursive resources for fact making and more critical approaches. Others (Wooffitt 2005) even tend to equate discursive psychology with discourse analysis, which I find rather confusing because there are also other approaches under the heading of discourse analysis. For recent articles reflecting on discursive psychology, its history, impact, and current developments see the *British Journal of Social Psychology*, Volume 31, Issue 3.

<sup>21</sup> The term “account” is employed in DP in a non-technical sense as any kind of talk that expresses opinions and formulates versions of the world (Wooffitt 2005, 79).

accomplishments. Cognitive phenomena such as attitudes are thus rejected as explanations for social interaction (see also my critique of “sense-making” in the introduction, and the subsequent section on attitudes and opinions). A fourth reason why I prefer to take up a DP-inspired perspective is that it also allows an exploration of the rhetorical (and thus conflictual) aspects of talk and social life. Here Michael Billig’s work on rhetoric has been particularly meaningful for it draws attention to how people’s versions of the world are designed to undermine alternative versions and are situated in larger debates and controversies (Billig 1987, 1991). We will address this in more detail later.

For now I want to exemplify DP’s critique of cognitivism, since it is related to my interest in analogical processes. Discourse psychologists have for instance criticized Moscovici’s social representations approach that came to gain followers in the 1980ies and that has been influential to date (see for instance its recent application in the journal *Public Understanding of Science*). The social representations approach promises to provide a new conceptual framework for comprehending attitudes, opinions, and beliefs, conceptualizing them not as restrained to cognitive aspects but tied to specific, preexisting social groups. Like DP, it thus promotes itself as a counterposition to cognitive reductionism in social psychology and its focus on laboratory research. In essence, the social representations approach is built on a specific theory of analogical processes. Moscovici maintains that two processes located on the level of the individual—“anchoring” and “objectification”—attend to novel phenomena. Anchoring describes the process through which a new object is linked with an existing representation and related to typical cases in order to conceive the unfamiliar in terms of the more familiar—what others refer to as “categorization”. In a second step of “objectification”, social representation theory argues, the new phenomenon is “transformed into a concrete, pictorial element of the representation to which it is anchored, and this new version of the representation is diffused, in the course of conversation, throughout the social group” (Potter and Wetherell 1987, 142). Thus, social representations are understood to assemble around a central image (cp. Potter 1996a). Since the aim of social representation theory is not to investigate these processes empirically, but takes them as given, Potter and Wetherell have called it an “exercise in speculative cognitive psychology” (Potter and Wetherell 1987, 145). What is also criticized is that these processes are only located in individual minds, transmitted and hence made social afterwards via communication. Equally problematic is the tendency of the approach to presuppose consensus among predetermined social groups—since these are seen to share the same social representations—and thus not pay attention to the potential diversity within them. These conceptions and the very methods that studies based on the social representation theory use (e.g. word association or numerical averaging techniques) tend

to perpetuate their own assumptions and homogenize people's accounts (cp. Potter 1996a, 148f.; Potter and Wetherell 1987, 144).

### **3.2 The roots of discursive psychology and its meeting with PUS**

After having stated what DP opposes, let us move to the scholarly traditions it builds on, for this will help us to explore the alternative perspective it provides. Most interestingly from an STS perspective, is that DP finds its point of origin in the reception of a study from the *sociology of scientific knowledge* (SSK), which explored scientists' discourses in order to better understand how social factors affect scientific practices (Gilbert and Mulkay 1984). We will turn to this seminal work in the next section on interpretative repertoires in more detail. Among DP's other main sources of inspiration, we encounter the later Ludwig Wittgenstein (1986 [1953]), who provided DP with the central epistemological outlook to take psychological states for social activities and not as expressions of deeper meanings of words. Two other main intellectual sources for the development of DP were ethnomethodology (Garfinkel 1967) and conversation analysis (Sacks, Schegloff, and Jefferson 1974), both of which have become renowned for being interested in illuminating the rules to which people adhere in their everyday lives and interactions, as well as the techniques they employ to orient themselves while talking. Conversation analysis, in particular, has purveyed deep insights into the structure of talk-in-interaction by demonstrating for instance that utterances comprise "recipient design". This notion refers to the specific way that speakers form their verbal expressions to address recipients, thereby demonstrating their contextual framing and interpretation of the situation: "a multitude of respects by which the talk by a party in a conversation is constructed or designed in ways which display an orientation and sensitivity to the particular other(s) who are the coparticipant." (Sacks, Schegloff, and Jefferson 1974, 727) By making use of this mechanism, discourse analysts can validate whether their interpretations match those of the speakers. DP, like other discourse analytic approaches, relies to a large extent on such strategies and the analytic practice of many discursive psychologists is actually very close to conversation analysis as both focus on the detailed analysis of (mostly natural) linguistic data.

In contrast to conversation analysis, discursive psychology focuses more on the content of discourse, while still employing the structural features of discourse to learn more about its social embeddedness. Discursive psychologists are not so much interested in the structural features of everyday discourse per se but rather how psychological concepts and discursive devices such as analogies are drawn upon to perform actions: "One of the advantages of discursive psychology is that the rhetorical use of these kinds of metaphors

and analogies can be topics of reflexive study.” (Edwards 1997, 31) Poststructuralist thought is another scholarly tradition that has left traces in DP’s development (te Molder 2009). By blending the structural (*langue*) and practical aspects of language (*parole*), poststructuralism recognizes discursive practices as the site where structure is both stabilized and altered, thus implying that the search for structure has to take the route of speech analysis. As mentioned above and as will become clearer soon, a rhetorical perspective has likewise shaped DP significantly. And finally, further influences that are mentioned in the literature are sociolinguistics, speech act theory and literary criticism (Wooffitt 2005).

While I referred to DP so far rather as one distinctive approach, to describe DP as a homogenous field would not do justice to the diversity of aspects this line of discursive inquiry covers. For instance, DP studies differ with regard to their proximity or distance to poststructuralism and conversation analysis. On another scale, discursive psychologists’ interests range from rethinking fundamental concepts in social psychology (e.g. attitudes or memory) from a discourse oriented perspective, to the role of psychological terms such as seeing or remembering in everyday discourse, to being concerned with the underlying attributions implicit in talk (te Molder 2009). Recently, DP has been recognized for its potential to enhance analyses of public engagement processes (Davies 2011; Irwin, Jensen, and Jones 2013) and as a fruitful analytical perspective for examining lay people’s understandings of and responses to emerging technologies as social actions (Veen et al. 2011). Veen et al. propose DP as a non-traditional tool for technology assessment to understand people’s reactions in the context in which they emerge, taking into account identity issues and thereby seeing them as more than mere reactions to socio-technical issues.

It is here where critical PUS agendas (Irwin and Wynne 1996; Wynne 1995) and newer studies on public engagement might benefit from meeting with a discursive psychological perspective, for it would allow them to focus more on the ways in which interaction influences the form and outcomes of public engagement exercises. Several STS studies (for an example see e.g. Felt et al. 2009) have already shown that it is necessary to pay attention to the actions performed in such settings, but there is still work to be done to move our analytic gaze onto the role of discursive processes. Since STS and DP converge in many of their concerns, it can be a fruitful endeavor to combine the more methodologically elaborated DP approach with an STS perspective that is sensitized to the relationship between lay and experts. In a sense, this journey towards each other is for both approaches also a way back to their roots, which for DP lie in sociology of science and for STS after the laboratory studies in ethnomethodology. Therefore, this dissertation should also be read as

an attempt to further initiate processes of mutual exchange, the productive integration of findings, and a conscious recollection of a shared history between these two strands of research.

### **3.3 Conceptual tools: Interpretative repertoires and ideological dilemma**

In this section, I introduce two central concepts from the DP literature that can assist in grasping and organizing empirical data. Among the conceptual vocabulary developed in the context of DP, these concepts furnish the analyst with broader analytical units than terms from linguistics (e.g. phoneme, word, sentence) or conversational analysis (e.g. turn, adjacency pair, closing) (Potter and Wetherell 1987). The concept of interpretative repertoires took its origin in a study in the sociology of science and is hence particularly relevant as a bridge between STS and DP. With the notion of interpretative repertoire, discursive psychologists stress the fact that people use discourses and the various resources they provide flexibly in their talk—hence, discourse analysts who emphasize human agency in language use generally prefer this concept. Stemming from empirical research and not theoretical musings, the concept tries to offer an alternative to the more monolithic, broader and ideologically understood concept of *discourse*, as it is applied in critical discourse analysis. Potter and Wetherell define interpretative repertoires as “a lexicon or register of terms and metaphors drawn upon to characterize and evaluate actions and events” (ibid., 138). We may think of an interpretative repertoire thus as a relatively coherent way of talking about phenomena or events that construct particular versions of the world or argumentative threads based on culturally familiar resources (Edley 2001; Wooffitt 2005; Korobov 2001). Wetherell (2006, 154) summarizes the concept as follows:

They are recognizable routines of connected arguments, explanations, evaluations and descriptions which often depend on familiar anecdotes, illustrations, tropes or clichés. Interpretive repertoires are the building blocks through which people develop accounts and versions of significant events in social interaction and through which they perform identities and social life.

The concept was originally coined by Potter and Wetherell in their seminal *Discourse and Social Psychology* (1987), based on their reception of Gilbert and Mulkay’s *Opening Pandora’s Box* (1984). In their empirical study, Gilbert and Mulkay were interested in how biochemists talked about their work, and they compared this to their accounts in scientific papers. What was striking in the scientists’ accounts was their variability and inconsistency—even in the discourse of the same scientist. Instead of smoothing the data and forcing it into a neat coherent narrative, Gilbert and Mulkay (ibid., 57) conceived the

analytic reconstruction of these different interpretative repertoires or linguistic registers, as they called them, as

a first step in making sense of the ordered variability of scientific discourse. It helps us to begin to understand how scientists, as they reproduce different kinds of context within the social world of science through the use of different linguistic registers, come to generate discrepant versions of action and belief.

In their analysis, they found two such interpretative repertoires, termed the empiricist and contingent repertoire. While the empiricist repertoire prevailed in scientific papers, consisting of an account of how data contributes to theory formation that achieves to remove any traces of the active agency or judgments of the authors, the scientists also deployed a contingent repertoire in interviews to present scientific practices and beliefs (of other scientists) as influenced by factors outside of scientific work. Drawing on the empiricist repertoire assisted them in presenting themselves as the one's 'being right', whereas the beliefs of intellectual foes could be discredited through the use of the contingent repertoire. These two flexibly used repertoires thus "allowed each scientist to maintain a coherent version of their social world which featured their own beliefs as the unthreatened truth" (Potter and Wetherell 1987, 153). What is of analytical interest is then not whether one discourse is true or false, but how repertoires are constituted and work in rhetorical processes and for identity construction and stabilization:

Each repertoire constructed a different social world, populated that world with different kinds of characters (heroes and villains) and constructed different teleological histories and causal stories for the same events. These repertoires, separately and in combination, were used to powerful rhetorical effect in different contexts. (Wetherell 2006, 154)

Interpretative repertoires entail corresponding subject positions, that is, they construct selves in particular ways:

Subject positions can be defined quite simply as 'locations' within a conversation. They are the identities made relevant by specific ways of talking. And because those ways of talking can change both within and between conversations (i.e. as different discourses or interpretative repertoires are employed) then, in some sense at least, so too do the identities of the speakers. (Edley 2001, 210)

Potter and Wetherell (1987, 149) note that interpretative repertoires are often "organized around specific metaphors and figures of speech (tropes)", thus hinting at their potential



interconnectedness with analogical discourse. I already argued in the previous chapter that analogies can be devices that convey and stabilize specific arguments or frames. In a sense, then, the concept of interpretative repertoires is certainly closely aligned to these other concepts; however, it carries discourse-specific connotations with it. If it holds that interpretative repertoires articulate themselves most strongly in analogical form, a focus on analogical discourse might indeed prove a fruitful analytical strategy in the identification of central interpretative repertoires, frames, arguments, or imaginaries, for that matter. Yet we have to bear in mind that identifying different repertoires does not suffice, it is also essential to dig deeper into their functions and to explore potential dissonances created by conflicting repertoires. For instance, in Gilbert and Mulkey's study, the "truth will out device" in scientists' discourse served as an interpretative tool to align the two repertoires; it allowed the establishment of a temporal separation in which the present was dominated by the contingent repertoire, whereas the empiricist repertoire was imagined to take hold and make the truth surface in the future. In contrast to social representation theory, the discursive approach does not attempt to attribute repertoires to certain groups, but rather repertoires are conceptualized as discursive elements that are flexibly used to make sense of and act in different situations. By conceptualizing articulations of repertoires as action-oriented, the concept of interpretative repertoires helps to grasp seeming contradictions. Although the interest of my analysis is in the role of analogies and thus not foremost in identifying interpretative repertoires, we should keep in mind that as a side-product of analysis we might be able to shed more light on the relation between analogies and interpretative repertoires.

Evidently, the notion of interpretative repertoires coincides with what I sketched out in the previous chapter in the section on analogical repertoires. Particularly the idea of a culturally and historically grounded context provides a pool of different repertoires, which are however not all equally culturally accepted. While early work on interpretative repertoires highlighted the flexible use of repertoires, it did not focus on the hegemonic aspects that determine which repertoires are more culturally dominant and thus credible. I referred to this aspect with the concept of civic epistemologies in the previous chapter. In DP, critical discursive psychologists (Edley 2001; Wetherell 1998; Edley and Wetherell 1999) have tried to integrate hegemonic aspects into their thinking about interpretative repertoires by drawing on poststructuralism and Billig's rhetorical approach, all of which bring with them specific conceptions pertaining to speaker's agency and the wider political implications of discourses (see also next section). Consequently, my approach also shares a main interest with these more critical forms of discursive psychology, namely of examining

processes of normalization/naturalization and inquiring whose interests are embodied in specific discursive expressions (Edley 2001).

This issue of socio-cultural dominance leads us to the second concept that will prove helpful for the empirical analysis later: ideological dilemmas (Billig et al. 1988; Billig 1987). This concept aims to broaden the (Marxist) view of ideology as a coherent system of guiding beliefs, which is generally taken to exist in order to stabilize asymmetries in society. Billig et al. call such an understanding of ideology “intellectual ideologies”, but what they are interested in are the “lived ideologies”, that is, what is generally referred to as culture or shared values and practices (cp. Edley 2001). Their central point is that these lived ideologies are not as coherent as intellectual ideologies but rather “characterized by inconsistency, fragmentation and contradiction” (ibid., 203). In other words, they propose that culture does not guide people with clear instructions for how to think or act but rather that it leaves them in a struggle of arguments pulling into different directions: “for most social actions, there will be a complexity of principles pushing and tugging in different directions [from this would follow that] dilemmas, and potential arguments, are inherent in social life. [...] Such social dilemmas are not unfortunate accidents, but are an inevitable consequence of there being principles or values.” (Billig 1987, 212) This tension is what Billig calls an ideological dilemma. The claim is that much of everyday discourse is arranged around dilemmas and generates arguments about these. Thus, the term dilemma here does not simply refer to situations in which people have difficulty in choosing between two options, but it points to “moral and ideological complexities” (Billig et al. 1988, 12) that arise out of conflicting or contradictory socio-culturally entrenched values or practices.

These dilemmas, Billig maintains, are deeply embedded in culture and therefore also expressed in language, particularly in proverbs and idioms. Due to their indeterminacy, proverbs—and I would add that the same holds for analogies—cannot supply definitive solutions to a given problem, however, they can be used as flexible resources in interaction for rhetorical purposes, thereby impelling deliberation and ongoing argument. Consequently, oscillations between different arguments (and analogies) in talk can be taken as good indicator that an ideological dilemma is driving the conversation (cp. Edley 2001). The presence of a dilemma is thus accompanied with speakers’ efforts of managing it, and such moments are opportunities of witnessing potential shifts of cultural understandings: “in examining their attempts to manage these dilemmas, we should also see moments when this stock of shared understandings is transformed. That is, we should be able to see where common sense itself becomes a site of cultural contestation.” (Edley and Wetherell 1999, 183)

It should be clear now that there is interplay between the concepts of ideological dilemma and interpretative repertoire, for ideological dilemmas may result from a tension between interpretative repertoires. It has been argued that an analysis that focuses on this interplay runs the risk of disregarding a conversation analytical focus on participants' orientations in turn-taking because its main goal is "to make connections between patterns in talk and the broader social context, and the ways in which locally realized argumentative threads implicate discursive history" (Wetherell 2006, 155). In Edley and Wetherell's framework, the analyst's task lies in teasing out the ideological dilemmas that emerge when speakers draw on and engage with different culturally available argumentative threads or interpretative repertoires. Talk here becomes the battleground for opposing argumentative threads (Edley 2001). For my analysis, more specifically, the task is to trace the role of analogizing in the articulation and management of (ideological) dilemmas, and thus to contribute to a further understanding of value-rooted cultural dilemmas. Adopting these two broader analytical concepts assists my attempt to go beyond an analysis of the deployment of analogies as rhetorical devices in interaction and to also account for their wider cultural significance. In this respect I follow Wetherell's (1998) claim that discourse analysis should also be able to provide critical comments regarding ideological structures and the wider socio-political consequences of discourse, or at least give recommendations on how to better manage the dilemmas people face when encountering emerging technologies such as nano.

### **3.4 Opinions as argumentative**

After having outlined two central concepts in discourse analysis, let us come to the concepts of attitude and opinion<sup>22</sup> that both undergo a fundamental transformation in the DP framework. Discursive psychologists have established a view of attitudes and opinions that differs in elementary ways from the classic psychological perspective that perceives them as isolated, stable mental states (McKinlay and McVittie 2008). This classic view disregards the interactive co-construction of attitudes and opinions and considers them to develop and exist in a mental vacuum in individual heads. Discursive psychologists, by contrast, examine articulations of attitudes and opinions in talk and their role as social actions with a particular function in discourse, thereby eschewing preconceived

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<sup>22</sup> The terms "attitude" and "opinion" are often used interchangeably, and I will also do so here, but Myers nevertheless provides a useful distinction: "Opinions are the cognitive, affective, or behavioral responses that reveal these underlying psychological attitudes. In this view, opinions are indeed tied to a particular situation, and may be transitory [...] but attitudes are carried by individuals, and remain stable over time." (Myers 2004, 8).

assumptions of their preexistence. Thus, statements about one's attitudes or opinions are not conceptualized as a translation of a mental state into language but as a social action, performed to achieve specific effects in interaction (e.g. praising or blaming someone, deresponsibilizing oneself) (te Molder 2009). The same holds for emotions or memories, to mention just a few more psychological concepts that have been subject to discursive psychological reinterpretation. Articulations of opinions, memories, or analogies hence are understood as intrinsically tied to matters of self-presentation: "Discursive psychologists ask: What does a 'memory' *do* in some interaction? How is a version of the past constructed to sustain some *action*? Or: what is an 'attitude' used to *do*? How is an evaluation built to assign blame to a minority group, say, or how is an evaluation used to persuade a reluctant adolescent to eat tuna pasta?" (Potter 2000, 35, original emphasis) What should matter in studying opinions and attitudes, then, is their variability and contextual relevance, as well as how by voicing attitudes the attitudinal object is constructed, thereby leaving behind the idea of a "real" object, because the construction of the object implies evaluative aspects that themselves co-create an attitude: "The point is that there is not a simple attitude object which people are responding to; such objects are always constructed in talk and discourse. While this remains a problem for traditional attitude opinion research, it becomes a fascinating research area for discursive psychology." (Potter 1996a, 160) This implies that we should not proceed from the assumption that nanotechnology is a stable phenomenon existing out there but rather that it is always constructed *in situ* while talking about it. Such a view clearly echoes the ontological stance outlined in the section on analogical arguments (see section 2.3.1).

In addition, an action-oriented perspective towards attitudes counters a basic fallacy of many socio-psychological conceptions that take attitudes as consistent:

The social psychological work on attitudes seeks to explain consistency: why someone says one thing today, and something rather similar on a different issue and to someone else tomorrow. Discourse analytical work tries to explain contradiction: why someone can say one thing today, and something different tomorrow, or even a few minutes later. (Myers 2004, 10)

Studies in DP show that people frequently contradict themselves in talk, without attempting to solve such contradictions (Potter and Wetherell 1987). Based on such empirical observations that demonstrate that speakers hardly ever produce consistent talk (see the discussion of interpretative repertoires above), discursive psychologists are aware that the consistency the attitude concept promises cannot be empirically supported and hence simply avoid recourse to the notion of attitude. References to a lack of consistency,

then, can only be taken as indicators of speakers' or researchers' normative assumptions about how attitudes should be constituted. What occupies the analyst's interest is whether and why an account is taken as consistent or not by other speakers, because this turns consistency into an empirically explorable phenomenon.

Most notably Michael Billig<sup>23</sup> has contributed a novel, rhetorical perspective on the relation of attitudes and argument by focusing on the role of contradiction in talking and thinking (see also above on ideological dilemmas). In *Arguing and Thinking* (1987), Billig takes a historical route through ancient rhetoric to examine persuasive language and its role for social psychology. Billig's rhetorical psychology understands attitudes and thinking more generally as fundamentally dialogical, because thinking is seen to rely on argumentative structures. In this view "discourse is primarily argumentative, consisting of a variety of oppositional and ideological positions which inform everyday reasoning about the world" (Wooffitt 2005, 166). Rhetorical or argumentative talk means that speakers demonstrate an awareness of existing opposing views in their accounts. Expressions of attitude are rhetorical because they have embedded in them relations to counter-positions and an awareness of alternatives (see also Billig 1991). Attitudes, then, are taken to be "stances on matters of public debate. That being so, the possession of an attitude indicates a statement of disagreement as much as of agreement, and it signifies an implicit willingness to enter into controversy." (Billig 1987, 117) It follows that without attitudes there is no controversy, and vice versa—just as no public exists without an issue (Marres 2005)—and that attitudes "should be placed in their rhetorical context, as positions which are taken in wider controversies" (Billig 1987, 6). Hence, attitudes or opinions are inseparable from the controversy in which they appear, which means that we need to investigate them in their rhetorical context because "we cannot understand the meaning of a piece of reasoned discourse, unless we know what counter positions are being implicitly or explicitly rejected" (Billig 1991, 44). Rhetoric is thus no longer restricted to the obvious areas of politics or law but it appears to permeate all talk, as every speaker is acknowledged to possess and make use of persuasive rhetorical tools (Carranza 1999).

Departing from such an approach towards attitudes, it thus makes no sense to distinguish between the analysis of attitudes in talk and the analysis of persuasive discourse, since "descriptive talk is seamlessly woven into evaluative talk in the construction of attitudinal objects" (McKinlay and McVittie 2008, 123). Consequently, discursive psychologists do not distinguish between attitude formation, expression, and

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<sup>23</sup> The 'Billig school' is generally known as "rhetorical psychology" and thus distinguished from "discursive psychology" or discourse analytic approaches with a stronger focus on the action-orientation of discourse. Both strands, however, share many concerns (e.g. an interest in how everyday discourse is made persuasive), which is why I do not distinguish them for my purpose here.

attempts of persuasion, but rather the performance of attitudes and persuasion are understood as inextricably intertwined in talk. This largely concurs with what was discussed in the preceding chapter, namely that it is rather unproductive and often also impossible to distinguish between the cognitive/imaginative and persuasive aspects of analogies. Like with other generally cognitively understood concepts such as attitudes and opinions, the task of a discourse analytical study of analogies is to approach them from a rhetorical vantage point and to address the subtle art by which analogies persuade.

As inspiring as Billig's perspective on attitudes may be, I think it is important to address an overlooked aspect, presumably because Billig is not paying close attention to actual discursive material. What I am talking about is that there may exist a relevant difference in how people in interaction orient to others who display a personal opinion or establish a general claim in argumentation. Harvey Sacks (1992, 33) has insightfully noted that

one of the characteristics of 'opinion' is that it's something which lay persons are entitled to have when they're not entitled to have knowledge—in the sense that they can offer it without ever proposing to have to then defend it. Like they say 'My feeling is such-and-such on that, but I don't really know,' as a permissible way of talking, where one then doesn't try to find out what kind of defense you have for that statement.

Here, Sacks addresses that a recourse to opinion in talk can work as a “mediating device” between experts and lay people, that permits lay people to address experts without putting themselves on the same footing and having to resort to defense strategies. The more general point underlying this is that offering a statement as a personal opinion can be used to shield arguments from being undermined in debate—” opinion” can thus be used to establish a parallel discourse in which opposing opinions can exist peacefully next to each other, without the need for argumentation. An opinion, I assume, may not need the same kind of defense or argumentative structure as an account that constructs a view on the world as factual. Again, I think it is best to leave the distinction between opinion and factual accounts to empirical investigation: “we need to look at how claims are made and supported as people talk, what they take and don't take as a matter of opinion” (Myers 2004, 5).

### **3.5 Analogies as factualization, plausibilization, and deresponsibilization devices**

A rhetorical and DP-inspired perspective has not only been applied to attitudes and opinions but likewise to factual accounts (Wooffitt 1992; Potter 1996b). Following the

constructivist tenet, factual accounts are understood as inherently argumentative, and the aim of these studies is thus to investigate “the ways in which people present what they say as though it is the natural outcome of the way the world happens to be, rather than an individualistic point of view” (McKinlay and McVittie 2008, 14). A key concern of DP thus has become the study of the construction and organization of factual discourse, thereby pursuing a research interest already reflected in Gilbert and Mulkey’s seminal study. Wetherell and Potter’s (1992) notion of “rhetorically self-sufficient” arguments is interesting in this respect, for it refers to unquestionable or changeable principles, yet it applies equally to culturally entrenched idioms, clichés, and proverbs that do not require further explanation and therefore are very effective forms of persuasion in everyday talk (cp. McKinlay and McVittie 2008, 124ff.; Gándara 2004; Potter 1996b; Myers 2007), but that can also be resisted with certain strategies (Kitzinger 2000a). As Drew and Holt (1989, 1998) have shown, the figurative and vague character of idioms contributes to their robustness in discourse, making them hard to undermine in controversial situations. It remains an empirical issue to elucidate if certain analogies might function similarly as self-sufficient and robust arguments in discourse.

The interesting question is whether analogizing could be used as a device to erasing speakers’ agency in the construction of analogies and thereby establishes the factuality of analogical arguments. Do analogies function as devices in constructing versions of the world as natural outcomes of certain similarities/differences? In other words, does analogizing in talk assist in making what is claimed “appear solid, neutral, independent of the speaker, and to be merely mirroring some aspect of the world” (Potter 1996b, 1) rather than a construction of a specific version of the world? Although I pose this here as an empirical question, I nevertheless want to approach it in a more theoretical manner. In discussing Gilbert and Mulkey’s study on scientists’ discourse above, we have seen that the empiricist repertoire produces exactly such a framing of out-there-ness of scientific phenomena by erasing personal stakes. A similar effect might also be achieved by “constructing consensus and corroboration by presenting a description as shared across different producers, rather than being unique to one” (Potter 1996b, 150). Potter<sup>24</sup> draws on Woolgar’s (1988, 1980) concept of *externalizing devices* to describe such practices of fact construction. To Woolgar externalizing devices, such as specific metaphors that present the scientist on a journey towards discovery, establish that “the phenomenon described has an existence by virtue of actions beyond the realm of human agency” (Woolgar 1988, 75), that

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<sup>24</sup> In his book, Potter assembles and analyzes a range of discursive devices used for establishing the authority of accounts and preventing accusations of personal interest (what he calls stake inoculation). Interestingly, analogies are not among them.

it exists “out there”. Agency is thus rhetorically transposed away from the speaker onto the entity being talked about in order to hide the active work of construction and the interests of the speaker.

This ties to what I addressed above with the notion of cultural analogies, namely that those analogies that manage to invoke widely shared experiences and knowledges may be able to pass as factual. From a constructionist perspective, the factuality of an analogical claim does not preexist but is situationally established by mobilizing certain resources (e.g. drawing on shared repertoires, reported speech, expertise) and the collective negotiation about whether these resources count. It is in interaction that the factuality or “realness” of analogies is constructed or deconstructed, and where versions of reality are enacted and negotiated via analogical arguments. The important point, then, is that analogies that are perceived as factual manage to “undercut attempts to discount them as the product of a particular person’s stake or concerns” (Potter 1996b, 150) and hence as mere personal opinions.

Since many nanotechnological applications are at present only circulating in the form of future visions and scenarios, analogies could also be used to plausibilize visions and imaginations of the future. It hence makes sense to speak of plausibilization instead of establishing factuality in the context of future scenarios. Plausibility can mean a variety of things, for instance that something is seen as “feasible, realistic, possible, tenable, credible or defensible” (Selin 2011, 732), all of which however share an intent to encapsulate a future-constructing statement from being undermined. Similar to the interest in the social nature of remembering (Middleton and Edwards 1990), studies on emerging technologies should engage with the social nature of envisioning futures by taking account of the ways in which visions and scenarios are corroborated against imputations of implausibility or personal stake. When imagining future scenarios of emerging technologies speakers might hence be confronted with a need to construct plausible scenarios—it remains an open question whether such futures can also be presented as mere opinions or whether they always rely on plausibilization. From a discourse analytic perspective, plausibility should be taken as an

interactional accomplishment that entails processes of validation and negotiation in specific intersubjective, social, and cultural contexts. In this respect the accomplishment of plausibility is treated as synonymous to factualization, the discursive establishment of accounts as mere descriptions of the world, uncontaminated by biases, faults, and interests of their producer. (Georgaca 2004, 14)



Plausibilization thus addresses how anticipatory accounts of the future can be presented in a valid and trustworthy manner. It is here where rhetoric again becomes helpful, because from this perspective, a statement appears plausible when its audience takes it as credible or truthful: “Assessing the plausibility of expectations means, then, that one should explore how expectations are constructed and how and why different audiences, situated at a particular point in time and space and within a specific background knowledge on the topic, perceive them as (im-)plausible.” (Lucivero, Swierstra, and Boenink 2011, 132) While anticipation may not seem to be about historical evidence, many expectations and future visions may become plausibilized when integrated and tied to shared past experiences. If we disregard the role constructions of the past play in constructions of the future, we remain blind to why certain futures appear more plausible than others.

Having dealt with factualization and plausibilization, I finally want to address another way in which analogizing could be used to erase agency as regards a speaker’s past actions. I will refer to this as deresponsibilization. An example of this strategy can be found in François Cooren’s (2010) book *Action and Agency in Dialogue*, where he explores the defense of Nazi criminal Adolf Eichmann in court, which has also been famously analyzed by Hannah Arendt (1963). Cooren shows how Eichmann tries to present himself as not being accountable for his actions by invoking a precedent: “According to this logic of the precedent, the only decision Eichmann appears to make concerns whether or not a given case looks like a previous one, which then allows him to know what to do in the current situation.” (Cooren 2010, 69) In Eichmann’s account, the work of identifying similar cases is staged to deny his active contribution in deciding over the death of millions of Jews. By presenting himself as being merely concerned with ordering new cases into existing categories, Eichmann’s account acts to circumscribe a closer engagement of ethical questions: “Once his mind is made up about the similarity of a given case with a precedent, that is, once this type of technical decision has been made (which implies a judgment of comparison on his part: whether this case fits with a precedent), it is the preceding case that tells him what has to be done.” (ibid., 70) This highlights the danger of seeing actions merely in terms of categorization rather than also paying attention to the particulars of a case. As Billig (1987, 124) has pointed out, the “person as a categorizer of information can be compared either to a prejudiced individual, whose errors arise from a narrow thoughtlessness, or to a bureaucrat, who seeks little more than well-ordered routines”. Eichmann here casts himself into the role of dutiful bureaucrat just fulfilling the categorizing work he was entrusted with. The example of Eichmann’s argumentation in court thus draws attention to the way analogizing—when understood as categorization—can be used to deny individual responsibility or accountability. It remains an empirical

question, however, whether analogical discourse in the settings I explore may be employed to perform similar actions of deresponsibilization.

### **3.6 Analogical agency: The difference analogies can make**

While the previous section outlined potential ways in which analogizing could be used to hide individual agency, this section seeks to explore the idea of analogies having agency on their own. We may think of this as a countervailing analytical perspective to the strong speaker-focused action-orientedness of discursive psychology, which allowed capturing how speakers may employ analogical devices flexibly to accomplish specific actions. With the term *analogical agency* I try to address the difference analogies make for how discourse develops and nano is imagined. Taking the idea of analogical agency seriously, we have to treat analogies as agents that produce both framing and interactional effects. An interest in analogical agency hence targets the ways in which analogies are bearers of certain frames or imaginaries, and how specific analogies may also impinge on discourse dynamics. The issue at this point is how to best acknowledge (and grasp) the role of textual agency (analogies are semantic—i.e. textual—products) on a theoretical level. In order to establish such a conception I will try to do so by drawing again on François Cooren's book *Action and Agency in Dialogue* (2010).

Cooren encourages us to shake up the widely taken for granted understanding of talk or conversation as a locus where merely human beings speak to each other. One of his main theoretical moves is to include non-human actors into analyses of what makes actors speak and speaks through them.<sup>25</sup> This conception of non-human actors populating talk is strongly influenced by Actor Network Theory (ANT) and its principle of symmetry (Callon 1986; Latour 1991), but it goes beyond clearly identifiable materialities and technologies that act in people's lives. The agents and figures Cooren refers to also comprise immaterial entities such as collectives, principles, values, emotions, or in my case analogies, which materialize when people activate them in discourse. The point is not to deny human beings their intentionality but to acknowledge that the world acts on them just like they act on the world. That is to say, speakers may construct certain analogies to achieve some effect, but we should not only look for agency in the speaker but also in the analogy as such. Yet, it is in the nature of the thing called language that these different kinds of agencies cannot be disentangled in practice. Paying attention to and not

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<sup>25</sup> Cooren here moves beyond what others (Wooffitt 1992; Potter 1996b) have called active voicing (e.g. "he said...").

overemphasizing any of these different agencies in empirical analysis certainly is a difficult balancing act.

Nevertheless, moments of crisis and failure can assist here in drawing attention to what normally remains tacit and unnoticed: When technologies break down or speech acts fail to deliver what they were intended to do, their part in co-creating a certain reality suddenly manifests more clearly and simultaneously reveals human beings' limited control over them. At such moments their agency solidifies in a problematic way. Agency is thus at work whenever something or someone makes a difference in a certain context—and this understanding of agency is not restricted to goal-oriented behavior (Cooren 2010, 24). Cooren proposes to go upstream in the chain of agencies and to equally focus on what makes people say and do what they do, be these emotions, desires, values, principles, and I—of course—would add specific analogies. From such an angle, we can think of analogies as relevant textual agents in discourse when they make a difference to how discourse and imaginations develop. Indeed, it is very likely that analogies make a relevant difference since the establishment of similarities between objects is ontological work (see section 2.3.1). This conception of analogical agency also implies that analogies themselves incorporate the power to persuade or convince rather than the persons bringing them into discourse. Thus, this broader conception of agency allows us to shift the analytical focus from tying analogies to individual people and to see them as autonomous entities that can potentially do something on their own. Such a conception changes our understanding of talk-in-interaction because humans suddenly do not appear anymore as the full masters of what they are saying, rather they are floating in a stream of language and agencies of which they always run the risk of losing control, even becoming haunted by their figures of speech, so to speak. The fact that speakers rely on a broad repertoire of repair mechanisms (Schegloff, Jefferson, and Sacks 1977) makes perfectly clear that “we can be betrayed by what we say or write precisely because of this relative autonomy of the signs we produce” (Cooren 2010, 31); but rather than being a merely problematic feature of language, it enables linguistic signs to keep being active without the permanent presence of their producers. Seen the other way around, whether they like it or not, speakers also become representatives of the analogies they bring to life and then may also be held accountable for their non-intended effects.



## 4 Material and methodology

While the previous two chapters share a theoretical and epistemological tendency, this chapter is designed with a more pragmatic intention in mind. It gives a detailed account of the empirical material on which the following analysis is based, turns to the employed method in a reflexive manner, and addresses methodological and practical issues concerning data collection and analysis. The chapter is divided into four main parts. The first section introduces in an uncomplicated manner the empirical material and the way in which it was collected by the card-based discussion method IMAGINE. The ensuing section then is dedicated to focus group discussions and some further reflections on the role of analogies in such settings. Next comes a rather long interjected subchapter on reflexivity issues that is structured into four sections which explore: (1) IMAGINE in a more complicated manner than at the beginning of this chapter, (2) why calling IMAGINE a “game” seems problematic at first, but no longer does after consulting Wittgenstein, (3) several metaphorical framings of the discussion group settings that seem useful for capturing the features of engagement and discussion groups settings, and (4) why comparison is also a useful and widely practiced method to develop theories in qualitative research. The chapter then closes with a section presenting the steps and heuristics applied in the empirical analysis.

### 4.1 Empirical material: IMAGINE discussion groups

In the following I introduce the empirical material that I use for analysis later. My data consist of the transcripts of four 4-hour discussion groups with Austrian citizens (also called *Nano IMAGINE citizen workshops*), carried out in Vienna in the course of the project “Making Futures Present: On the Co-Production of Nano and Society in the Austrian Context”.<sup>26</sup> These discussion groups differed from the way public engagement is typically carried out because the workshops were not initiated by a political institution or intended to generate direct outcomes to inform nano-related policies. Rather, being part of a basic research project, the aim of conducting these groups was to better understand the processes going on in public engagement settings and the articulation, formation, and negotiation of arguments in them. This is not to deny our research its political relevance,

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<sup>26</sup> This FWF (Austrian Science Fund) sponsored project was located at the Department of Science and Technology Studies at the University of Vienna. The project, as well as my collaboration, lasted for four years. My project collaborators were Ulrike Felt (principal investigator), Simone Schumann and Michael Strassnig. Within the project two students, Martina Kainrath and Gernot Rieder, wrote their master theses.

quite the opposite, our inquiry was also motivated by the intention to provide basic knowledge on such settings, which could then feed back into policy making and the implementation of public engagement processes.

All four discussion groups were conducted in Vienna and within the timeframe of three months: Two each were held in November 2009 and in January 2010. Each workshop focused on one specific nanotechnological application field, covering medicine, food, ICTs (information and communication technologies) and consumer products including energy applications. The idea was that nano as a broad and diverging field might best be discussed in depth when focusing on one application field in each group. Additionally, such a division would allow a comparison of citizens' assessments of these four fields. Each workshop was designed for six participants, but as two did not attend, the total number of participants amounted to 22. Participants were selected from a pool of 51 applications, which we received after having sent out invitation flyers to households in several Viennese districts via bulk mail and also distributing them at various places where we expected to reach people interested in science and technology issues (Long Night of Research 2009, a technical museum, and several adult education centers in Vienna). On the flyers, people were requested to fill out their socio-demographic details, describe their interest in the topic, and indicate their preferred field of discussion. We also intended to include people with a strong interest in specific topics as representatives of relevant societal groups. On the whole, we tried and were able to compose relatively heterogeneous groups by selecting people differing with regard to gender, age, level of education, area of occupation/studies and interest in the topic. Our choice for heterogeneous composition was guided by the assumption that it "allows one to observe not only how people theorize their own point of view but how they do so in relation to other perspectives and how they put their ideas 'to work'" (Kitzinger 1994, 113). In that sense, heterogeneous groups could be expected to enter into a more argumentative debate than homogenous groups.

Before we developed the IMAGINE discussion group methodology, we conducted an explorative street poll with 36 respondents at a public square in Vienna in August 2009. This pool confirmed our assumption that nano was unfamiliar to many people at that time. Thus, in order to stimulate debate in our group discussions, we developed a specific card methodology to provide resources for participants, without merely providing them with "information". Inspired by the deliberative tool PlayDecide,<sup>27</sup> we designed the Nano IMAGINE card-based discussion method. IMAGINE is characterized by a choreography of four stages, each with one particular type of cards (story cards, application cards, issue cards, future cards). The cards were compiled from material generated by previous

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<sup>27</sup> For more on this tool see <http://www.playdecide.eu/> (accessed last 30 July 2013).

research on each application field; they depicted current positions, issues, debates, and expectations with a specific focus on the Austrian context. We also drew on prior stakeholder interviews with scientists and policy makers and on material from media articles, websites, the PlayDecide card-game as well as various nano-related documents. The cards were thus created from existing and mostly widely available resources, so that in principle participants could have encountered their content before.

At every stage, participants were supposed to look through one of their four stacks of cards individually, choose the most relevant cards and put them on the board in front of them. In this phase no debate is taking place yet. This selection phase is then followed by a longer discussion phase in each of the four stages. The groups also included a moderator whose role was to encourage participants to explain their card choice and to stimulate talk. It is important to note that we were not primarily interested in the choice of cards but in the following discussion. A card can be chosen for many reasons, which only becomes apparent in the discussion phase. The cards also served as a suitable instrument to integrate absent voices and societal positions (experts, politicians, scientists etc.) and make them virtually present for negotiation. There is a lot more to be said on the card methodology. Reflections on the creation of and assumptions behind IMAGINE as well as its appropriation by participants can be found in a paper by the research team (Felt, Schumann, et al. 2013) as well as in the upcoming section titled “Seeing like IMAGINE” in the part on Reflexivity.

## **4.2 Focus group discourse: Performing opinions and analogy-distinction cycles**

As becomes clear, the IMAGINE discussion groups resemble focus groups to a large degree, hence I want to present and reflect on the central characteristics of this specific method for doing qualitative research, with a particular focus on what the literature tells us about the role of analogies in focus groups. In the last few decades, focus groups have moved from outsider status to the core of qualitative research methods. While market researchers and social scientists alike have come to consider the focus group to be more like a group interview (Merton 1987; Merton, Fiske, and Kendall 1956) allowing for fast access to people’s preformed opinions and relying on what I referred to as the classic social psychological perspective of attitudes and opinions. As mentioned above, discursive psychologists, by contrast, have pointed to the action-orientedness of attitudes and opinions in focus group talk (Puchta and Potter 2004; Myers 2004; Edwards and Stokoe 2004). For discourse analysts, focus groups thus are discursive space that offer themselves

to explore more fundamental epistemological and methodological questions of how people construct and negotiate knowledge claims in dialogical processes (Puchta and Potter 2004; Marková et al. 2007; Myers 2004). This dialogical perspective on focus groups, however, has only as of late gained momentum. For a long time, little attention had been paid to the interactive aspects of focus groups, thereby ignoring the obvious fact that “focus groups are, above all, groups” (Marková et al. 2007, 31) and can provide keen insights into social processes which are not accessible by interview methods. After reviewing 40 published studies employing focus group methods Kitzinger (1994, 104) concluded 20 years ago: “I could not find a single one concentrating on the conversation between the participants.”

But not only does the prevalence of content analyses of focus groups attach little value to communicative processes, the group aspect is even considered a distorting factor to individual responses in such a framework (Myers and Macnaghten 1999). By contrast, discursive researchers highlight the interactive nature of focus groups by taking into account the interdependence of any utterance with preceding and subsequent ones, as this is essential to decipher the action-orientedness of utterances as well as the effects of analogies in my particular case. If these interactive aspects are ignored, the performative character of talk, the shared creation of knowledge and the argumentative aspects of these settings remain obscured.

Additionally, the role of the moderator who usually guides the discussion in focus groups, the questions and mere presence of the moderator affect the course of discussion and hence also have to be considered in analysis. But it would be misleading to see the moderator as the dominant person setting the tone, rather research on focus groups shows that themes are opened and closed collaboratively between participants and moderators (Myers 2004). The moderator may even be “used” by participants to avoid disagreement; for instance participants can address a statement to the moderator than to the participants they are disagreeing with, thereby mitigating the argumentative character of debate.

Of particular relevance to my research interest are discourse analytic studies that have shown that focus groups on emerging technosciences such as biotechnology are characterized by what I call analogical discourse (Marková et al. 2007; Wibeck, Abrandt Dahlgren, and Öberg 2007; Linell et al. 2001). As I already discussed in the introduction, these studies tend to interpret analogical discourse as an expression of participants’ attempts to distinguish the acceptable from the non-acceptable and “to sort out their understandings and confusions” (Marková et al. 2007, 132). While I have been strongly arguing against such an understanding, I agree with Marková and her co-authors’ observation that the construction of differences plays an equally relevant role in analogical processes in focus groups. Marková and co-authors insightfully note that we encounter



longer analogy-distinction cycles in focus groups, but their interpretation remains rooted in a cognitivist framework when they state that “participants try out examples, analogies, distinctions, metaphors etc. as candidate’ (provisional) means for understanding the issues-in-focus” (Marková et al. 2007, 139). Such an interpretation ignores that analogies and other resources may be used for argumentative purposes. This could also explain their astonishment that “[i]nterestingly enough, analogies and distinctions often appear to be in dialogue with each other [...] Actors use analogies and distinctions in argumentative chains or (sequences of) ‘analogy-distinction cycles’. Most often, an analogy is first proposed, whereupon a distinction is counter-posed (but the order can also be reversed).” (Marková et al. 2007, 146) Here, the authors fail to recognize that the concurrent appearance of analogies and distinction is a good indication that analogies and distinctions are actually expressions of one and the same process. As I discussed with respect to Billig’s (1987) concepts of categorization and particularization, analogies and distinctions should be better understood as two sides of the same coin—the coin here representing a comparative process or strategy. In order to account for the entanglement of categorization and particularization processes, I prefer to use the broader notion of analogical discourse that does not distinguish between analogy and disanalogy and thus tries to account for the fact that a comparative process underlies both. The outcome of that comparative process ultimately determines if the analyst names the phenomenon an analogy or disanalogy in the end. Additionally, the authors overlook that the way in which analogy-distinction cycles develop might be highly influenced by the homogeneous composition of their discussion groups. Analogical discourse might be performed quite differently (more argumentatively) in groups consisting of people with more heterogeneous backgrounds and consequently different agendas and life experiences.

### **4.3 Reflexivity**

In the social constructionist paradigm with its focus on knowledge practices and in the sociology of scientific knowledge in particular, researchers have signaled a propensity to turn their analytical gaze back on their own research processes and writings in a reflexive way, for instance by experimenting with new literary forms of representation to accentuate the constructive character of academic writing (Ashmore, Myers, and Potter 1995; Ashmore 1989; Mulkay 1985). In this subchapter I seek to engage in such reflexive practices, however, my goal here is more modest. I use reflexivity to refer to processes by which researchers lay open and investigate how the content of their research relates to the doing and writing about that research. Moreover, to me, adopting a reflexive stance means that the analyst should critically engage with her own role in the research process, thereby

demonstrating that she does not claim objective insights of the world, but acknowledges that her knowledge is just as socio-culturally situated as anyone else's. In my reflexive attempts that follow under the next four sub-headings, I first focus on the performativity of the IMAGINE method that was used for data collection. Next, I retrace and try to solve a struggle my fellow researchers and I experienced when calling this method a game. Then, I contemplate the powers of analogies in my writing while revealing what I think certain metaphors do for capturing relevant features of public engagement settings. And finally, I reflect on the role of comparative research strategies in qualitative research in general and in my analytical process.

#### **4.3.1 Seeing like IMAGINE: On the performativity of method**

In his paper *Seeing Like a Survey*, John Law draws attention to the performativity of methods by arguing that “they are practices that do not simply describe realities but also tend to enact these into being” (Law 1999, 240). The paper title deploys “seeing” in its metaphorical sense of “understanding”, alluding to the fact that in STS seeing is no longer conceptualized as an objective act but as a knowledge generating activity dependent on one's standpoint and preexisting knowledge. The grandfather of STS, Ludwik Fleck, already captured this with the following phrase: “In order to see one first has to know.” (Fleck 1986 [1947], 129) There is no objective seeing, then. The “seeing” metaphor—in the sense Law uses it—indicates that methods are applied as tools or technologies to assist scientists in forming a particular vision of reality. Hence, Law, similar to Haraway's concept of situated knowledge (1988), stresses that knowledge is always partial and “made possible by ‘visualising technologies’ to see with—whether these are spectacles, microscopes or theoretical constructions” (Jørgensen and Phillips 2002, 202). This applies to scientific methods and to public engagement exercises alike, be they consensus conferences or citizens' juries, because these exercises have built into them models and understandings of governance from their specific (national) context of development. Put differently, they are—just like surveys—“machineries for making publics” (Felt and Fochler 2010). Therefore, by describing how IMAGINE as a “technology of imagination” (Felt, Schumann, et al. 2013) made a particular view of the world possible allows to show how my knowledge practices are co-created by it. To explore what it means to see like IMAGINE also entails reflecting on the realities—including publics, issues, and so forth—it was intended to enact. Obviously, the empirical analysis following this chapter is a central element in coming to grasp the ways in which IMAGINE allows researchers to see. But for the moment, this section attempts to describe some of the assumptions that shaped the design of IMAGINE, bracketing thus its implementation and uptake by participants. There

are many respects in which IMAGINE gives rise to certain visions of reality, of which I will tackle three in more detail in the following: (1) the construction of publics and their identities, (2) the ways in which preset goals such as (not) reaching a collective decision, (3) and the presence or absence of experts shapes the dynamics and content of discussion.

(1) In the literature on public engagement, a central issue revolves around the kinds of publics and collectivities that are enacted by specific methods and settings. The widely held assumption is that publics do not exist ‘out there’ but are actively created by the composition of groups in public engagement exercises, whereby it is prescribed who is authorized to speak for society at large (Felt and Fochler 2010). Thus, to capture the performative power of IMAGINE we need to address its particular version of the public and the identities it assigned to participants. Here, it has to be noted that the project team did not want to construct a “public” consisting of solely, what are often termed, “ordinary citizens”, which would go hand in hand with excluding citizens with strong opinions on the issue—as it was done for instance in the British *GM Nation?* debate (Irwin 2006). As mentioned above, we also tried to invite people that could be expected to bring a strong personal agenda with them or who have an identifiable stake in a particular technoscientific issue; Michael (2009) calls these publics-in-particular in contrast to the public-in-general. A second aim was to invite representatives from social classes or minority groups who are generally less likely to participate in deliberative processes. We tried to achieve this for instance by mailing flyers to Viennese districts known for their high proportion of immigrants or blue-collar workers. Despite these attempts we only reached a few people who fit into these categories. Thus, the “public” we assembled was mostly well-educated and interested (for a reflection on the bias towards representatives with higher education in public engagement in Austria see Felt and Fochler 2010).

A second aspect pertaining to the construction of publics is the issue of identities, because it is not only important to reflect on who was invited but likewise which identities or subject positions were encouraged or marginalized by the discussion setting. As Law (2009) exemplifies, the Eurobarometer survey constructs the identity of a European consumer expected to act as a rational decision maker based on information. In developing IMAGINE we attempted to avoid predefining such a consumer identity, because we had noticed that this was one of the main pitfalls of previous public engagement initiatives on nano, which encouraged participants to adopt a consumer identity by using applications and consumer products as stimulus material<sup>28</sup>. That and the fact that we wanted to stimulate debate about broader governance issues was also the reason why we framed the discussion groups as “Citizen workshops”. To further avoid the consumer framing, we did

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<sup>28</sup> For an example see this project: <http://www.seberoc.info/> (accessed 20 June 2013)

not start with presenting participants consumer products or other applications, but we instead opted for “story cards” on which the positions of various actors were presented, thereby highlighting the fact that nano could be perceived differently depending on societal position. This choice can also be interpreted as a way to raise awareness for the situatedness of these positions. In this first phase, just like in all subsequent ones, participants could choose a card for any reason, i.e. also because they did not identify with it. In the second stage, we then introduced field specific applications, which we assumed might trigger the performance of consumer identities to some respect. In the last two stages, we again tried to include a plurality of potential identities in the formulation of the cards. Hence, I consider it productive to use the hybrid figure of the consumer-citizen (Michael 1998; Rose and Blume 2003; Trentmann 2007; Mol 2009; te Molder 2012), for it accentuates the potential entanglement of these subject positions. It however remains an empirical question whether participants orient to nano as consumers, citizens, or from another subject position.

(2) Public engagement methods shape their own processes and outcomes, and one way in which they achieve this is by being framed as decision-making sessions. Decision-making in such contexts usually implies that a resolution needs to be reached at the end. In other words, consensus should be formed. If participants comply, this entails a general orientation towards consensual statements, pushing more controversial issues to the back. As Felt and Fochler (2010, 231) have noted for a participatory event where this was the case: “The participants of the citizen conference were so clearly devoted to working towards a specific aim that they even perceived dissent and debate on ethical issues as ineffective use of their time, as opposed to ‘gathering facts’ to be used in the final statement.” This indicates how a focus on decision-making impinges on epistemic decisions during conversation, making certain ways of reasoning and knowledge appear as ‘faster’ and therefore more suitable for these contexts. The fact that participants are urged to form opinions in a predetermined time period is problematic in itself, but even more so is the assumption that controversies have to be solved in it as well. Being free from the need to provide results to be integrated into a political decision-making process, we chose to refrain from forcing collective decision-making at any point of the debate (although by having to select cards participants were urged to at least occasionally make individual choices), leaving it up to the group process whether consensus emerged on certain issues or not. This relates our groups more closely to focus groups than the generally more decision-making oriented public engagement initiatives. At the same time, this framing might influence discourse dynamics and particularly participants’ willingness to enter into argumentative debate with each other. In focus groups, participants tend to take for

granted that different opinions can exist relatively harmoniously next to each other, which might contribute to a less argumentative and persuasive discourse (Myers 2004), whereas in group settings with supposedly collective decision-making at the end the need to convince others might be much more pronounced.

Finally (3), there is the issue of expert or stakeholder capture, which “refers to undue influence over participants by individuals who are technically knowledgeable or invested in particular views” (MacLean and Burgess 2010, 487). Previous experiences with public engagement demonstrate that, in the presence of experts, public deliberation tends to mimic expert discourse and thus may reinforce rather than bridge the lay-expert divide (Kerr, Cunningham-Burley, and Tutton 2007). In an Austrian public engagement setting with experts and lay people, for instance, lay participants restrained from addressing controversial issues and articulating more personal experiences, but rather tried to gather facts from experts and stressed “their own professional experience” (Felt and Fochler 2010, 233). The use of the same professional register can be understood as an attempt to put themselves on equal footing with the experts, thus displaying the underlying order of epistemologies, with professional knowledge assumed to be more persuasive than private knowledge. The effect of expert presences more generally demonstrates that public engagement settings do not resemble fora in which mere rhetoric counts and wit decides who will win the argument,<sup>29</sup> but that expert identities and knowledge exercise persuasive power in dialogue. Since we wanted to create a space in which participants would not feel restricted to draw on personal experiences or express disagreement with expert opinions (see also Myers 1998), the aforementioned effects advised us against inviting experts such as scientists, politicians, or NGO representatives into the fora. This, however, did not mean that these expert positions were totally absent from the groups. The card methodology provided us with ample opportunities to integrate their voices as absent presences, especially on the story cards (see Felt, Schumann, et al. 2013). To expect that professional expertise ceases to be a relevant resource in talk just because experts have not been invited, however, would be overly naive. Rather, what becomes of interest then is how in the

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<sup>29</sup> This ideal was characteristic for the ancient rhetoric culture in the Roman era in which only the means of common-sense were accepted in arguments. Due to its denial of expertise as an accepted rhetorical resource, this ideal of rhetoric can be seen as democratic: “Within an ideal context of pure witcraft, the powerful and the powerless meet upon equal terms. [...] For a courageous moment, when wits are the only weapons, subjects can triumph over their rulers.” (Billig 1987: 103) Such rhetorical contexts, with their predefined ‘licensed’ and ‘illegal’ rhetorical devices, only prove that this ideal situation has to be created by external rules, one of them being the exclusion of certain weapons such as professional expertise. We might interpret the dialogic turn in S&T governance as an attempt to level the playing field among lay people and experts, but as long as displaying expert knowledge—and behaviour, for that matter—can be employed as culturally accepted heavy weaponry, the positions in the playing field are just not equal. Only metacommunication about its epistemological and social status may contribute to challenging and changing this.

absence of experts, professional expertise still might play out in debate. As Myers has pointed out: “The experts that are relevant in talk are not necessarily just doctors, scientists, or officials. Participants in group discussions routinely offer themselves and others as having expertise that is relevant to a particular topic at this moment.” (Myers 2004, 166) Following Myers, I already proposed in the introduction to conceptualize expertise as an interactively negotiated entitlement to speak.

#### **4.3.2 What’s the name of the game? Struggling with “Spiel”**

As mentioned above, the idea to use cards as part of our discussion method was inspired by PlayDECIDE, a discussion game developed out of the DEMOCS card game. These facilitation tools convey by their name that they should be understood as games. But that was precisely what made my colleagues and myself uneasy: We were asking ourselves what the term “game” might convey and how this would consequently frame the discussion setting. The name “game” seemed relevant because it might influence what participants would expect from the setting and thus how they would orient themselves to and behave in it. What was even more unsettling than our discomfort with the word “game” was that we found ourselves continuously calling IMAGINE a “Spiel”—the German word that corresponds to the English words “game” and “play”. These references were typically accompanied by attempts of repair in which we would correct each other when the S-word had slipped once again from one of our tongues. The question I thus want to explore in this section is: What was going on here? Or: What was the problem and how to best deal with it? The answer I would give now in hindsight is that, speaking with Wittgenstein (1998, 13), we were “engaged with a struggle with language”. For further exploration, we might therefore seek help from my fellow countryman’s reflections on the meaning of names in *Philosophical Investigations* (Wittgenstein 1986 [1953]).

But beforehand, let us dwell a little longer on our struggle with “Spiel” or “game/play” and the fact that this word did not seem to appeal to us from a more detached position, while we tended to use it when our critical watchdog took a short nap. First of all, it should be clear that our use of the name has to be understood in a metaphorical sense (but that did not seem obvious to us then), which is exactly why I think it relevant to reflect on this “struggle with language” in the context of the dissertation at hand. The metaphor crept into our language because we found that our method certainly shared certain elements with card games—without a doubt the influence we got from the PlayDecide card game played a significant part here. Most evident was the materiality of the cards and the specific rules that were introduced with them (being allowed to choose only a selected number, placing them on specific spots on the board, explaining card choice in each round etc.). Calling the

discussion settings a “Spiel” would legitimize the existence of certain rules in this communicative space, which most likely also was intended by the creators of the PlayDECIDE card game, who aimed to minimize the likelihood of one person dominating the discussion. Certainly, we could have introduced rules without any reference to game settings and be assured that people would more or less comply, considering the fact that they also got a monetary allowance for their cooperation (non-cooperation could be interpreted to lead to a loss of this money). These points, then, might not furnish reason enough to take up the term “Spiel”.

What supposedly motivated us more to use “Spiel” had to do with the apprehension that participants would be rather clueless on how to behave in such a discussion group setting. While Myers (2004) argues that participants in focus groups are able to instantly draw on a variety of communicative types from everyday contexts because they “try to treat it as a version of a familiar practice” (Myers 2004, 47)—indeed, this is an analogical process then, Myers calls them “forums for comparison” (ibid., 48)—, others claim to have observed that participants have trouble with performing in focus groups since they are not part of their everyday life (Marková et al. 2007). In our case, Austria is neither a country with a strong participatory culture that would provide places for people to practice bottom-up democracy, nor might the average citizen be familiar with focus group settings from market research. In fact, being familiar with market research settings would even be debilitating in our case because these tend to frame participants’ roles as consumers and thus predefine the relevant identity for discussion (see above). Taking these thoughts into account, “Spiel” could provide an alternative framing that might have countered other less encouraged ones. Since many people are familiar with card games in Austrian culture, usually from very early in life, we hoped that participants would find a more natural access to the setting and that this would make them feel more comfortable.

What urged us to be critical of ‘Spiel’, on the other hand, can be mainly attributed to the fact that our research does not exist in a vacuum. In recent years, there has been a trend towards gamification and edutainment in science communication, particularly when addressed to young people or children. This trend can indeed be perceived critically for its implicit representation of science as interesting only when fun and playful, obscuring the fact that science nevertheless is work in the first place. Such a critique, however, is based on a distinction between game/play and work/seriousness that is itself problematic. On a deeper level, our struggle with game/play hence could have stemmed from a notion of game that is not considered part of everyday life but as something outside the usual (Huizinga 1980 [1944]); carrying this thinking further would imply that what happens in a game situation is irrelevant for players’ everyday lives. This, in turn, would surely be an

unsuitable framing for a debate about serious issues: If the discussion groups were to be just seen as play and fun, could this not inhibit the formation of a serious debate? Additionally, references to gaming could introduce the idea of a competition, which makes it less suited for dialogues that try to foster cooperation and collective problem-solving over winning with arguments.

And finally, let us not forget one further major complication that seemed to lurk in the back of “game”, namely that our research might not be taken seriously in the scientific community when called a “Spiel”, and we wanted to do serious research and not just facilitate public engagement as a form of science communication about technoscientific issues like it is aspired by the PlayDecide games for instance. Perhaps as a reaction to all these assumed problems and obfuscations, we then opted for calling the discussion groups “workshops” or simply discussion rounds, thereby stressing that we were expecting serious work from participants, while the board in front of each participant still read “Spielplan” (translatable with game schedule). Thus, there remained ambiguity, defining the setting both as work and game/play. But this ambiguity, I propose, should not be interpreted as a mistake or a proof of our inability to sort things out in our struggle with language. It unwittingly turned out to be a good solution for the problem at stake. Why this? I think one answer can be found by drawing on Wittgenstein’s (1953) thoughts on the meaning of words, which he—to my mere luck—illustrated with the example of “Spiel”:

66. Consider for example the proceedings that we call “games”. I mean board-games, card-games, ball-games, Olympic games, and so on. What is common to them all?—Don’t say: “There must be something common, or they would not be called ‘games’ “—but look and see whether there is anything common to all.—For if you look at them you will not see something that is common to all, but similarities, relationships, and a whole series of them at that. To repeat: don’t think, but look!—Look for example at board-games, with their multifarious relationships. Now pass to card-games; here you find many correspondences with the first group, but many common features drop out, and others appear. When we pass next to ball-games, much that is common is retained, but much is lost.—Are they all ‘amusing’? Compare chess with noughts and crosses. Or is there always winning and losing, or competition between players? Think of patience. In ball games there is winning and losing; but when a child throws his ball at the wall and catches it again, this feature has disappeared. Look at the parts played by skill and luck; and at the difference between skill in chess and skill in tennis. Think now of games like ring-a-ring-a-roses; here is the element of amusement, but how many other characteristic features have disappeared! And we can go through the many, many other



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groups of games in the same way; can see how similarities crop up and disappear. And the result of this examination is: we see a complicated network of similarities overlapping and criss-crossing: sometimes overall similarities, sometimes similarities of detail. 67. I can think of no better expression to characterize these similarities than “family resemblances”; for the various resemblances between members of a family: build, features, colour of eyes, gait, temperament, etc. etc. overlap and criss-cross in the same way.—And I shall say: ‘games’ form a family.

In the above, Wittgenstein discerns that a problem arises because the word/concept/category “game” seems to refer to a common feature, when actually such a feature does not appear after overviewing the broad variety of existing games and their relationships one after the other. Challenged to look closer, a network of likenesses and distinctions between different procedures that we tend to call games reveals itself. This insight could also be summarized with ‘a game is like a game and unlike a game’ because a specific game tends to both bear similarities and differences with other kinds of games. What characterizes a game thus is that it is part of—and cannot exist outside—a network of analogies and disanalogies with other games.<sup>30</sup> Along Wittgenstein’s line of thinking, fun or competition disappear as central characteristics or truisms of a game but they remain also there as implicit meanings, always ready to (be made to) emerge when the ‘right game’ is chosen as a case for comparison. Wittgenstein advises us thus to not speak of an essence of “game” that would apply to all phenomena referred to as games, but what constitutes a game is better understood as the accomplishment of the appearance or disappearance of similarities in the form of a network in a particular speech situation. Speaking of visibilities and invisibilities captures that these meanings are always there and that it is merely an issue of highlighting/articulating particular nodes to make them appear. Wittgenstein termed these similarities “family resemblances” (“Familienähnlichkeiten” in German), because a family is likewise not characterized by one feature that is shared by all its members but by many features that are not all shared by all its members: certain features may turn up in some of its members while being invisible in others and vice versa.

Such a perspective assists in our struggle with seeing IMAGINE as a game in the typical Wittgensteinian sense by dissolving the struggle as such. We thus can come to regard

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<sup>30</sup> Compare this with Saussurian semiotics, where words are also conceptualized as elements in a network of words, and the relational ties—similarities and dissimilarities to other words—are what constitutes their meaning. But in contrast to Saussure, Wittgenstein is not referring to the relationships between different words (and the world) but to how the meaning of an object is obfuscated by the use of one word in practice. Wittgenstein’s perspective integrates language use and thereby takes into account what semiologists tend to ignore, namely the fact that language is used to perform activities.

IMAGINE as a procedure that shares certain similarities with card games but we resist the apparently nonessential act of ordering IMAGINE into an imagined preexisting category termed “game”, just as there is no need to define what a game is. Thereby we learn to avoid the ever-present trap of fast and rigid categorization, the problematic practice of putting labels on people and things (note that the proposal to include particularization in studies of analogical processes shares a similar intention). The network perspective Wittgenstein provides for our dealings with word meanings allows to connect IMAGINE with semantic elements that convey the opposite meaning of “game/play” such as “work”: IMAGINE then becomes entangled in a network of meanings, and it is not one node but the network as such that constitutes its very own, individual, irreducible<sup>31</sup> meaning.

This is all very well in theory, it could be countered, but what do we do in practice? We certainly should not start out defining what either game/play or work is and then force these definitions onto those participating in IMAGINE. Instead, we could do two other things with words, which are both very close to what Wittgenstein proposed. The first is a recommendation for exemplification, which means to give specific examples because they already convey what we want to hint at:

One gives examples and intends them to be taken in a particular way.—I do not, however, mean by this that he is supposed to see in those examples that common thing which I—for some reason—was unable to express; but that he is now to employ those examples in a particular way. Here giving examples is not an indirect means of explaining—in default of a better. For any general definition can be misunderstood too. The point is that this is how we play the game. (I mean the language-game with the word “game”). (ibid., 71.)

In our particular case this could be accomplished by mentioning that the rules of IMAGINE are similar to the rules of a specific card game. The second recommendation also represents a specific way of playing with language. It is an invitation to deliberately play with—which presupposes an awareness of—the fuzziness of terms such as game, for instance by using metaphorical or figurative expressions. Let’s remind ourselves what a metaphor is: A metaphor is a way of presenting something as something else while at the same time it is understood that these two things are not the same; establishing similarity where there is none (expected). A metaphor does not resemble a clear photograph. But, as Wittgenstein (cp. ibid.) inquires, cannot an indistinct photograph (standing here for a fuzzy term or metaphor) be more helpful at times? Does not the broadness and vagueness

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<sup>31</sup> Note the way in which this argument is related to Latour’s (1988) principle of irreductionism that teaches “that nothing is inherently either reducible or irreducible to anything else: work must be done to make a connection between them, and this is always risky.” (Harman 2009, 116)

of metaphors and words offer a chance to bring in different interpretations, understandings, and experiences (cp. Law 2004)? When we acknowledge that there exists not one defining characteristic of games (or work, for that matter), the use of these words opens a space for the articulations of different meanings and experiences. Saying in a metaphorical way, then, that IMAGINE is both like play and work in specific ways does not simply create ambiguity but opens up a space for diverging practices and interpretations. Using a variety of metaphors flexibly thus can become a means for avoiding the ever-present temptation of fast categorization; establishing different analogical links is a way of opening up different networks of meaning, thus enabling participants to make IMAGINE a part of different families, so to speak. I will engage in such practice in the following.

#### **4.3.3 Public engagement settings are like a learning group, battlefield, stage, ...**

Analogies and metaphors are useful tools in scientific thinking and writing—and that includes qualitative social scientific research. Analogical processes can stimulate the qualitative researcher's imagination but due to their two-sided character they concurrently frame the way a phenomenon is perceived. Convincing analogies may persuade readers, but writers likewise may come to take the realities their analogies construct for granted. Just as metaphors can help to capture a phenomenon, there also lies a danger in confusing the phenomenon with the metaphor. Metaphors in science can become particularly powerful because they can guide research paradigms and hence frame which kind of research appears reasonable. Thus, one way of trying to change the direction of a scientific field is to change its guiding metaphor. In his study on the underrated argumentative dimension in social psychology, Billig (1987) provides us with a great example of such an attempt in that he traces how the negligence of the role of arguments in thought processes co-emerges with two dominant metaphors in this realm of research, which present social life as either resembling a game or a theatre play.

All this indicates that it is important to reflect on the often-implicit metaphors and analogies that guide our social scientific theories. Not reflecting on my guiding analogies in a work on the power of analogies would come close to denying the ways in I use them to shape my thinking about the material and the way I undertake the analysis. Making analogical framings explicit may also foster a better understanding of the purposes for which analogies are created. The reflexive use of analogies helps to see them as elements that can be flexibly used and reshaped. That is to say, a flexible reshaping in the sense of the epistemological thoughts I described in the previous chapter, which stressed the importance of decontextualizing and scrutinizing existing analogies in order to generate

new perspectives. Staying true to this dissertation's action-oriented focus on discourse, we should admit that such reflexive attempts could entail a rhetorical side effect by counterbalancing the air of distrust that sometimes arises around smooth analogies. If an analogy fits too well it may raise suspicion that one is too easily led and persuaded, or even worse, that matters are simplified. But the opposite perception of "false" or ill-fitting analogies can also be countered by a clear and detailed explanation of the work a specific analogy can do—including elaboration on its limits.

Thus, let us move to the analogies I consider helpful for grasping the role of analogies in public engagement settings and for describing such settings and the processes that constitute them more generally. Basically, I propose to take up a pluralist perspective because one analogy cannot do justice to the variety of communicative phenomena that express themselves in these settings. As mentioned above, others have argued that focus groups tend to contain elements from other fora such as teacher-led classroom discussions (learning); group interviews from market research or talk shows (displaying opinions); groups to discuss and decide on a relevant issue, like jury deliberations (this communicative activity type thus most of all resembles citizen's juries); business meetings (negotiation); and informal conversations, for instance dinner-table discussions (non-goal oriented) (Marková et al. 2007; Myers 2004). Thus, it can be argued that public engagement settings, too, incorporate elements of these other communicative settings<sup>32</sup> and thus are "hybrid forums" not only because the groups are constituted by heterogeneous subjects (Callon, Lascoumes, and Barthe 2009) but also due to the plurality of communicative activity types that can be observed in them. In the previous chapter I argued for two distinctive analogies that frame public engagement settings as both experimental spaces of collective learning/imagining and battlegrounds where arguments and analogies are defended or opposed, to make room for different communicative activities that can be traced in these discursive settings. I used these two metaphorical framings intentionally to break up the one-sided notion that prevails in cognitive science and psychology of analogical processes as being only about learning. In the previous and in this chapter, however, I also expanded this two-sided view when addressing performative and identity-related aspects of analogies, which suggests the integration of a stage metaphor. According to Billig (1987, 12ff.) theatrical metaphors frame social life as a staged performance, making 'role' the central concept in such a perspective, and emphasizing the ordered character of social practices. In such a framework, 'actors' are expected to follow a script that predefines the scope of their actions. Yet such a focus runs the risk of losing sight of the disruptions of

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<sup>32</sup> It is important to keep in mind that these familiar kinds of interaction are also heterogeneous and not as stable or idealtypical as we might think they are (Myers 2004).

social life and the fact that people do not always follow predefined rules but actively negotiate what these are. It “underestimates the argumentative aspects of social life” (ibid., 16). To compensate for the smoothness of the theatre or stage metaphor, the battlefield or battleground metaphor foregrounds the conflictual and argumentative aspects in communicative activities (for more on the ‘argument is war’ metaphor that dominates in Western culture see Lakoff and Johnson 2003 [1980]). I hence consider it fruitful to have at least these three metaphors in mind during my analysis: to see public engagement settings as (1) learning groups where experimentation and imagination is practiced, (2) battlefields with different parties struggling for dominance or acceptance of their worldviews<sup>33</sup>, (3) a stage full of actors that try to fit to (self- or other-ascribed) roles and display certain identities. It could be countered that it makes sense to focus analytically on either the imaginative, argumentative, or identity-related dimensions, but the point is precisely that focusing on one or the other might not capture the phenomenon in its entirety. Nevertheless, my analytical lens focuses more strongly on the argumentative aspects of analogical discourse, because this feature has so far been rather neglected in other studies. While each of the three metaphors makes the social world easier to understand by extracting from it the complexity and plethora of processes that constitute it, we simply cannot eschew investigating them in their entirety.

Thus, my main recommendation to counterbalance the tendency to rely on one-sided metaphors in science is the strategy of plurality. In search for a scholar who used multiple metaphors effectively as analytical tools, we inevitably come across Erving Goffman who was able to capture different sides of the habitual aspects of human interaction with his strategy of analogies (Lenz 1991, 57). Goffman is renowned for his theatrical metaphors that cover front and back stage (Goffman 1959), and thereby avoid the usual limitations of the dramaturgical perspective described above. Beyond the stage metaphor, Goffman also applied rituals and games as metaphorical-interpretative tools (Goffman 1970). He successfully used different analogies to distance himself from traditional understandings and as a way to stay flexible in analysis by concurrently opening up alternatives: “Goffman counters this relativity—that is, the specific blindness attached to every individual perspective in an investigation—with a pluralization of his own perspectives.” (Willems 2004, 25).

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<sup>33</sup> In the later chapters I will also use metaphorical vocabulary stemming from the image domain of “war” when referring the argumentative aspects of discourse. I am fully aware that this may seem to stabilize this metaphorical framing, but my intention is to highlight the antagonistic quality of such encounters. I much rather would like to see arguments as a dance, as Lakoff and Johnson have proposed, but then the characteristic of such a dance would be that dancers step on each others toes and always accuse the other of making a wrong move.

Without question there are also other ways to avoid the pitfalls of metaphors. Billig (1987, 11), for instance, proposes applying metaphors in the opposite direction, which could account for the interactional effect of metaphors: “instead of seeing rhetorical argument as being a game, we could see games as being rhetorical arguments”. Another strategy that he recommends is to “rescue the differences, in order to demonstrate the limits of the metaphor” (ibid., 14), which resonates with his advice to address particularization in social psychology. The point here is that in order to create a metaphor we simultaneously admit that there are differences between the two elements of the metaphor, because otherwise we would find it difficult to distinguish the two elements that are brought together by the metaphor. A metaphor works because it guides the analyst to search for evidence—similarities—that endorse the metaphor, while ignoring the differences that might be equally characteristic for the relationship between two cases. This strategy to also look for differences comes close to what I termed the scrutiny or deconstruction of analogies.

To conclude this reflexive section, I want to emphasize that all the mentioned analogies so far should be understood as temporary theses to put to the empirical test. This means that we need to be open enough to rework or drop them if they fail to provide adequate frames for understanding the processes arising in public engagement contexts. This is why the title of this section ends in an ellipsis, three dots indicating unfinished business.

#### **4.3.4 Why and how we compare**

And I will do so comparatively, using contrast as a way of gaining insight. (Mol 2008, 8)

As this dissertation sets out to explore the role of comparative processes in specific settings, I also want to provide the reader with a reflexive section on comparison strategies in (my) qualitative research. The use of comparative strategies is fundamental to most qualitative-interpretative research approaches that aim to construct theories from a close analysis of empirical cases. Consequently, my reflections here are of a more general nature, addressing why and how we as qualitative researchers compare our data, but without going into the details of different research approaches. Starting out with these more general thoughts, I will in a second step move to my specific comparative strategy.

First of all, as qualitative research is generally text-based (e.g. transcripts of audio and video recordings, field notes), comparing texts represents a central heuristic strategy to generate theories. By comparing one text with or to others its specificities come to the fore. The constant comparative method in Grounded Theory represents one of the most well-known comparative strategies in qualitative research (Glaser and Strauss 1967). Such a

heuristic aims to “compare new data excerpts with concepts under development to examine cases that could be expected to conform to the emergent theory and determine whether the theory explains their variation” (Timmermans and Tavory 2012, 178). It can be regarded as a strategy of defamiliarization that leads researchers to make sense of their data in new ways by seeing it in light of other cases, either stemming from empirical material, thought experiments, or literature. Comparing is hence one strategy among others that can foster abductive reasoning and generate new theoretical insights.

While rethinking her own research practices in a study on the Challenger disaster, Vaughan came to realize the usefulness of analogical case comparisons for theorizing in qualitative research: “Theorizing by analogical comparison also made sense to me because forms of social organization have characteristics in common, like conflict, hierarchy, division of labor, culture, power and structured inequalities, socialization, etc., making them comparable in structure and process.” (Vaughan 2004, 318) She argues that most researchers use analogical processes intuitively for theorizing, but that these thought processes could be made more explicit and thus taught to prospective qualitative researchers. A further argument of Vaughan’s is that not only similarity matters because cases or concepts regardless of their similarity or difference to our data can be enlightening. I am, as might be clear from above, in accord with such a perspective on analogical theorizing that highlights the constant shifting between categorization (similarity) and particularization (difference). Indeed, comparing cases to others that appear very different can often be illuminating for the specificities of a case; in that sense, we could speak of the merits of comparing apples to oranges.

Beyond the use of comparative sources from outside one’s empirical data, qualitative researchers mostly rely on comparing their own cases and materials to gain insights. For instance, the Documentary Method (Bohnsack 2004)—an interpretative procedure specifically developed for focus group material—fundamentally relies on continuously comparing and contrasting cases or text passages. In their examination of this process, Kleemann et al. (2009, 163f.) point to the relevance of a standard for comparison, also called the *tertium comparationis* or point of comparison, in order to compare two arbitrary elements. Hence, a challenge in the course of the research process is to determine constantly in which ways elements of cases are meaningfully comparable. The well-known idiom of “comparing apples to oranges”, which expresses the judgment that two categorically different things are illegitimately put on the same level and compared, is often used as handy rhetorical hammer in discourse, where it functions as a killer phrase used to delegitimize an analogy (see turn 7 from the excerpt at the beginning of the introduction).

But, in fact, there exists no rule why apples and oranges should not be compared if a relevant tertium comparationis is established or found (e.g. both are fruits).

As Vaughan already pointed out, comparative strategies in qualitative research do not stop when two elements are categorized as similar, rather the shared point of comparison should function as a starting point for particularization, whereby the differences of the two kinds of fruits should be explored. That is why the Documentary Method focuses on contrast in similarity (Bohnsack 1991). After such a comparative exercise a new tertium comparationis could be drawn on or made up, such as nutritional value, and the number of cases then could be expanded to include bananas or pears as representatives of other cases or text passages. The point of this systematic exercise is to construct a relevant tertium comparationis (this is never pre-given but has to be retrieved from analysis) and to reach a level of analytical abstraction. This methodological-comparative procedure can be usefully applied in not only the strict methodological framework of the Documentary Method but in any qualitative research process.

It is instructive in a second way, for it might help us to gain an understanding of comparative processes in discussion groups. Notwithstanding the fact that discussion groups are not interpretation groups of qualitative researchers, I would argue that participants in their comparative attempts still embark on a collective search for what should count as a relevant tertium comparationis. If the discussion reaches a point at which the groups find a common point of comparison for their analogical processes, this constitutes a moment where shared culture crystallizes. Thus, empirically, I am not only using a comparative method for my own purposes but I am also analyzing participants' comparative ethnomethods (Garfinkel 1967).

In the qualitative research paradigm, relevant points of comparison are generally assumed to emerge out of the material rather than being set by researchers themselves. This should however not be confused with a stance that dispels existing assumptions that were central in designing the research project. In my case, the assumption that different nanotechnological application areas might matter with regard to how nano would be discussed informed the methodological design and laid the groundwork for a potential comparison of different application areas. But taking up the above, either strategy—searching for differences or trying to work out similarities—would only get the researcher midway on the research path when applied on its own. The challenge for any research project that sets out with a thesis of differentiation is to throw this thesis overboard to be open enough to perceive potential similarities. My initial impulse in formulating my research question was to compare how analogies might be used differently when discussing different application fields. But in the course of carrying out the analysis this interest



moved more and more to the background and I increasingly started to ask myself what could be gain from such a comparative analysis other than making a statement about differences.

Finally, a note on a kind of comparison I am not pursuing: comparing/contrasting nation states or different cultural contexts. In the first chapter of her book *Designs on Nature* (2005a) titled “Why compare?”, Sheila Jasanoff gives many reason for why comparing nation states is an advisable path in technoscientific policy research. The question in my case then needs to be reversed: why not compare in such a way? A very pragmatic answer could be that I simply had no comparative material allowing for such a national comparison at my disposal. This answer would be close to the truth but it certainly would not satisfy scholarly readers and writers. Rather I thus want to point out the merits of not doing such a comparison for public engagement settings, for as I see it, there are two main drawbacks when doing national comparison in this area of research. One is that due to the sheer large amount of data, a detailed discourse analysis is hardly manageable for one researcher alone. Embarking on it alone would not allow the analysis to move away from a superficial level. A disadvantage I consider even more crucial is that national comparisons focus on what distinguishes one national context from another, and this tends to come at the expense of homogenizing publics and their discourses (see e.g. Davies, Macnaghten, and Kearnes 2009; Macnaghten and Guivant 2011). The merit of a non-comparative study thus lies in avoiding such simplification by working out the struggles and heterogeneities that emerge even in one national context, and to resist the urge to smooth out complexities for the sake of comparison. Such an approach can enhance our understanding of nation-states as conglomerates of different publics and positions that might be in tension with each other, and we might come closer to observing national specificities of how discourse about technoscientific issues is practiced.

#### **4.4 Becoming practical: Analytical procedure and strategies**

After having indulged in epistemological and methodological thoughts in the previous sections of this chapter, we now stand on the threshold to the chapters presenting the empirical analysis. It is thus time to become practical and document the analytical steps and heuristics that I employed in my analytical process and that have hence shaped the character and form of the following chapters. In terms of analytical procedure, I followed a pattern that is usually recommended by qualitative researchers of various schools (Glaser and Strauss 1967; Bohnsack 2004; Edwards and Potter 1992): to first do an overall coding and identification of recurrent themes, which is then used to select relevant excerpts for more detailed interpretation and discourse analysis. As discursive psychologists and other

discourse analysts generally have to do a very fine-grained—i.e. time-consuming—analysis to examine the phenomena of interest, carefully choosing a limited amount of analytic material is of central importance. In a second step these excerpts were analyzed in detail, always with an eye to the dynamics of talk and discourse organization. It was thus only in this second step that the actual discourse analysis took place.

Sequences can be identified by applying conversation analytic insights, such as that the closure of a sequence (or topic) is usually indicated by longer pauses, minimal responses, the use of idioms, commonplaces, and jokes and laughter (Marková et al. 2007; Myers 2004). The actual choice of sequences should, obviously, be guided by one's research interest and focus of analysis, which in my case meant looking for sequences of analogical discourse. Besides the obvious thematic focus, it is also deemed sensible to include what has been called "focusing metaphors" (Bohnsack 2004) or "sensitive moments" (Kitzinger and Farquhar 1999) in analysis. These terms describe parts in the material that are characterized by intensity or controversy of discussion and a high metaphorical quality (i.e. analogically rich), both of which are regarded as indicators that a group is working on a particularly relevant or controversial issue, representing points at which different arguments clash and are most strongly in interaction. As I argued before when discussing the concept of interpretative repertoires, moments of analogical discourse could represent a discursive nexus in which group members discuss central concerns (that may include shared or controversial concerns), most likely because analogical discourse is characterized by talk-in-interaction in which people claim and work out how one should or could understand an issue or phenomenon. Therefore, this discourse type could lend itself to debates about ontologies, in which different realities are enacted using divergent analogies and in which there might be struggles over the analogies that should count in reality-making.

When doing the actual analysis, the question of what constitutes relevant context becomes central. On one end of an imagined continuum of positions, conversation analysts have gained reputation for being purists with regard to the integration of contextual knowledge: From their perspective a detailed turn-by-turn reconstruction of talk reveals everything analysts need to know and represents the only way to warrant the validity of an interpretation. Most notably, Schegloff (1997, 174) has shown in detail how speakers discuss contexts into being and thereby articulate "the relevancies to which they show themselves to be oriented". On the other end of the continuum, critical discourse analysts such as Fairclough or Wodak consider external information as constitutive for their critical cultural research. For Schegloff, such an approach risks allowing analysts to impose their terms, theories, and contexts, while passing over speakers' own relevancies. Critical

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discourse analysts, on the contrary, worry that strict and overly-methodologically conversation analysis leads away from socio-culturally relevant research. Among the many responses to Schegloff's controversial paper, Wetherell's (1998) is representative for the middle-ground position of "critical discursive psychology", which seeks to employ the techniques of conversation analysis and simultaneously integrate cultural and historical context. Yet other discursive psychologists like Edwards and Potter (2005) see themselves more closely aligned to Schegloff's approach and take the analytical route via conversation analysis, warding off the appeal of external context as an analytical resource. Among these approaches, my own approach to context is situated fairly in the middle. I agree with conversation analysis's focus on a close orientation towards the material and its emergent contexts in a first step, but that should not rule out that external contexts and knowledge might become relevant at later stages of the analytical process in ways that enrich the depth of the analysis and highlight its relevance in a larger cultural contexts. This should not be problematic as long as the analyst refrains from using contextual knowledge as an explanation for a discursive phenomenon; that is, using context as a short-cut in the slow processes of discourse analysis. Eventually, it is the responsibility of each qualitative researcher to balance the ways in which external contexts are brought into analysis so that they do not "overwrite" the orientations found in the discursive material. The reader will have to judge whether I succeeded in this respect.

It should have become clear from the preceding chapter that my analysis focuses on the communicative interaction and the flow of discourse among speakers. For this purpose I consider a detailed turn-by-turn analysis indispensable. In the interpretative process, several heuristic strategies (see above for comparative strategies) were applied to grasp what is going on beneath the surface of the textual material. Following a discursive psychological approach, I tried to treat seemingly inconsistent utterances and variability of accounts as a resource for identifying different interpretative repertoires and ideological dilemmas (Potter and Wetherell 1987; Wetherell 1998). In general, a DP inspired focus on the action-orientedness of talk meant to examine what accounts are doing (e.g. plausibilizing, agreeing with or undermining other accounts, etc.) at a specific moment in discourse. Another heuristic strategy that I followed in analysis was to pay close attention to shifting pronouns (e.g. from 'us' to 'they' or from 'we' to 'you') and the use of subject positions or categories such as "the people" (Jørgensen and Phillips 2002; Myers 2004).

Since my analysis examines analogical processes, including metaphors among other rhetorical tropes, the reader might ask whether s/he could expect a metaphor analysis in the following. As I already mentioned at several points, this is an analytical route I am not taking here because my interest focuses on bigger units of analogical moves and discourse

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dynamics, although I also tried to integrate an analysis of central metaphors. Most methods of metaphor analysis to date have been derived from Lakoff and Johnson's cognitive linguistics (Lakoff and Johnson 2003 [1980]). While Lakoff and Johnson used made up examples in their original book, contemporary metaphor analyses tend to extract metaphors from a given discourse and categorize them under broader conceptual categories (for some examples from the German context see Niedermair 2001; Schmitt 2003; Moser 2000; Kruse, Biesel, and Schmieder 2011). Adopting such an approach hence would have implied to blind out the interactional aspects of discourse and isolating metaphors and analogies from talk, which would have contradicted my claim that we need to analyze them in relation to other mobilized resources and with regard to their action-orientedness in order to fully understand their role in discourse.

## **Part II**

### **Empirical analysis and general discussion**



## Introduction to empirical chapters

This second part of the dissertation is based on detailed empirical analysis of selected, longer excerpts of discourse from the transcripts of the IMAGINE discussion groups. I included longer excerpts along with their interpretation, because this mode of representation assures that “the reader has as much information as the author, and can reproduce the analysis” (Sacks 1992, 27). As I strongly believe in this mode of representation to warrant the quality of discourse analysis, readers should be prepared for long excerpts of talk hereafter. Since I know that long excerpts of talk-in-interaction can be tedious to read at times, I tried my best to paraphrase each excerpt afterwards in order to not discourage “fast” readers from following the analysis. The transcripts are numbered by turn to allow a quick reference to specific turns in the analysis. References to turns in analysis are indicated with (1), (2) etc. or referred to more explicitly in the text.

The analysis in the following chapters integrates content and form, since these two dimensions co-develop in talk and thus should not be examined separately. This also explains partly why I chose to structure the empirical chapters around thematic issues rather than roles or functions of analogies. Another reason for this thematic chapter-structure is that this allows retrieving more context-sensitive findings than a merely role-oriented structure would have. In the empirical chapters many roles of analogies will surface among and in relation to other discursive phenomena and devices. Roles of analogies will hence recur throughout these chapters. Again, I have to prepare the reader that this non-functional representation is also more challenging to follow because the empirical chapters oscillate between several analytic foci such as carving out the role of analogies, their relation to other resources, finding out what a stretch of talk is thematically about, and how analogies contribute to the development of discourse. The overall discussion that follows after the four empirical chapters then tries to gather and condense the main analytic insights on the role of analogies that appear more loosely in the empirical chapters.

In terms of chapter order, the first empirical chapter is dedicated to the exploration of the role of analogies in debating nanomedical applications. As it turns out, participants used analogies here mainly to counter promises of nanomedicine and to point to aspects that remain often unaddressed in techno-optimistic accounts. Since this chapter focuses on nanomedicine, the analyzed material stems from this group. The next chapter on human enhancement is related to the first one in that it focuses on the use of nanotechnological devices such as nano-chip brain implants for other than medical purposes. The debates about enhancement represent a particularly analogy-rich material and illustrate that the

invocation of analogies for the most part works to implausibilize enhancement futures. Analogies here become central devices used to avert nano-enabled enhancement scenarios by suggesting a likely rejection. The analysis of the enhancement debate draws on material from the medicine and ICT group. The third empirical chapter gives a detailed account of the essentially dilemmatic nature of the debate about nano labeling. It traces how analogies contribute to but are also used as means to deal with the dilemma that it is unclear whether nano should be seen as positive or negative when applied in consumer products. The analysis here is based on material from the ICT, food, and consumer product group. Finally, the last chapter is concerned with the ways in which analogies are deployed to alert of futures that should be avoided, either by the integration of the public into the governance of new technologies or the establishment of risk management strategies that reach beyond scientific predictions. The empirical material for this chapter originates from the groups discussing nano in medicine, food, and consumer products. As mentioned above, this part of the dissertation closes by bringing the findings on the roles of analogies together in the general discussion. The discussion, however, does not merely present a summary but also tries to reflect on these roles conceptually.

Before moving to the empirical analysis, a few words on two additional pieces of information that can be found in the appendix and that may assist in reading the empirical chapters. First, the appendix includes information on the transcription system employed. Although the employed transcription system is not a very detailed one, compared to the one usually applied in conversation analysis, it nevertheless involves some specificities that should be looked up. Second, I translated all excerpts in the empirical chapters into English with the assistance of a native-speaking lector. Readers of German may also take the opportunity to look up and compare the translation to the original quotes in the appendix. As every translation is already an interpretation, this may also assist them in validating the overall interpretation.



## 5 The role of analogies in countering promises of nanomedicine

This chapter explores how participants in the group on nanomedicine discussed specific application visions and used analogies in that process. Nanomedicine is an application field that emerged out of the futuristic vision of tiny nano-robots one day repairing the human body on the molecular level (Freitas 2005). The visualization of these nano-robots floating through the bloodstream became a key image for nanotechnology as such, often used to familiarize lay audiences with nano and gain public acceptance (Nerlich 2008). While such fictional ideas were widely spread in media, their feasibility remained contested in the scientific community, where, in the meantime, research had moved out of the fictional realm and gained momentum by following more modest technological visions such as drug targeting or nano-coated medical implants (Kostarelos 2006).

Today, nanomedicine is generally understood as the nanotechnological field that is most welcomed by the public, with other application areas performing considerably worse in public opinion polls (Zimmer, Hertel, and Böl 2008). This was also observable in our discussion groups, where participants regularly declared nanomedicine the field they would look upon most favorably, in contrast to other application fields. These positive expectations that are projected onto nanomedicine become particularly apparent in media articles on the issue, as was shown by a master thesis that was carried out within the scope of the “Making Futures Present” project (Kainrath 2012). Analyzing Austrian print media over the timeframe of a decade, the analysis indicates that media articles on nanomedicine draw heavily on narratives of techno-scientific progress, while an absence of risk, social, and ethical issues was notable. This stood in stark contrast to articles on nano consumer products such as foods or cosmetics where health and environmental risks prevail.

One aim in compiling the card material for the nanomedicine IMAGINE discussion group thus was to present participants with these existing expectations of potential nanomedical applications, particularly on the application cards. These applications presented on the cards ranged from ‘already here’ (nano-coated implants), ‘in the making or just around the corner’ (e.g. nano-lab on a chip, drug targeting) to ‘mere visions’ (nanobots fighting illnesses in the human body, or human enhancement, which is the topic of the next chapter). One analytical interest was to observe how participants in this group reacted to the promissory language of the application cards: Would they tune in to their techno-optimistic visions or would they voice critique and skepticism? As we will see in this chapter, even though participants endorsed the great potential of nanotechnology in

the medical field, a broadly shared tenor emerged among the group and they refused to add their voice to the chorus of technological promises emanating from the application cards.

In order to capture how participants understood and reacted to the techno-medical visions, I draw on the concept of interpretative repertoires, which I introduced already in section 3.3. This analytical concept urges the analyst to trace the different arguments and rhetorical resources in the material and tie them back to broader societal discourses on emerging technologies. Identifying different repertoires and observing their interaction in situ also enables us to grasp the power struggles between different repertoires. In the material presented in this chapter I identified two repertoires, which I termed the ‘techno-optimistic repertoire’ and the ‘techno-realistic repertoire’. It will become clearer in the following analysis why I chose these names, what is constitutive of these repertoires, and why they stand in opposition to each other. As people tend to shift between repertoires in talk, it is important to stress that these repertoires are flexible and variable resources—they are not fixed opinions of individual participants. Besides carving out these repertoires, a central aim of this chapter is to investigate the role of analogical devices in their articulation, amplification or contestation.

The chapter is structured into three analytical parts. It starts out reconstructing how a Nazi analogy was first employed to counter the metaphor of breakthrough stemming from the techno-optimistic repertoire, but the analogy was then inverted to undermine the techno-realistic repertoire. The second section mainly revolves around one participant’s continuing effort to establish the techno-optimistic repertoire as a frame for understanding nanomedicine and the attempts of other discussants to establish the techno-realistic repertoire as an alternative interpretative frame by drawing on a variety of analogical resources, with one analogical strategy finally succeeding in expelling the counter-repertoire from the interactional floor. In the third section, then, the techno-realistic repertoire is actualized in full force, assisted by medical metaphors and idioms, whereby the group establishes a general critique of technological fix solutions to societal problems. Finally, the discussion section summarizes what we learn more generally from this analysis about the role of analogies in countering the promises of nanomedicine.

## **5.1 A Nazi analogy in action: Countering the “breakthrough” metaphor**

Right at the beginning of the application card stage of the group discussing nanomedicine the application card titled “Nano-robots to fight diseases” (see Figure 1) initiated a controversial debate about the desirability of the vision that nanotechnology one day might be able to repair damaged DNA and thus impede the aging process. By referring to this vision as being “now beyond the means” (803), Franz made clear that he considered it

infeasible at the moment but he also indicated that this vision might be realized in the next 50 years and that he is not “super-euphoric” (795) about this possibility. His claim triggered the following longer interchange, which is relevant for how it is closed, namely by a powerful type of analogy we have already come across in section 2.3.2: a Nazi analogy.

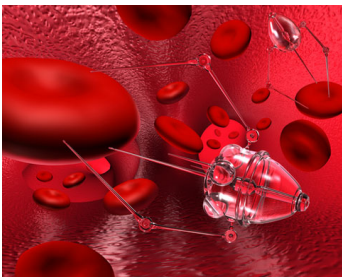
<b>Application card 3</b>
<b>Nano-robots to fight diseases</b>

Scientists envision that robots in the size of blood cells (“nanobots”) could one day navigate in our arteries and destroy pathogenic organisms and tissue. The vision goes as far as nanobots repairing damaged DNA to stop the aging process. In the brain they could establish new neural connections and thus extend its capacity.

Figure 1

### Excerpt 1

- 1 Bruno: And that would be, this DNA repairing I think, would be the biggest challenge. Well, if it was ever solved, or solved partly, I think that would be a great breakthrough (.)
- 2 David: To where?
- 3 Bruno: For the whole technology.  
[Loud collective laughter]
- 4 Christa: To where? [ ]  
[laughter; cross talk]
- 5 Bruno: Yes, of course, but who, that’s for me, it’s true, right? Who determines or who says then what parts should be repaired? What for? To where? For what?
- 6 Eva: And who defines what a perfect human being is? Because that’s a judgment, that [is
- 7 Bruno: [Yes, but that’s the biggest desire of human beings (cross talk) it’s the DNA, now they’re already trying with unborn children for instance, I heard, there it’s already being attempted to think in that way. I don’t know if it’s true, I just read it. And, and that must be the biggest goal of humankind, so to speak.
- 8 Eva: No, I don’t think that it must be the biggest [goal of humankind (laughs)

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- 9 Bruno: [Well, the DNA  
10 David: [It seems to be like that.  
11 Eva: Yes, the biggest goal of the Nazis was to exterminate handicapped people, [well that is  
so  
12 Bruno: [No, no, I think  
13 David: [That's right. Even when it's not good.  
14 Eva: I find that quite dubious. Yes.  
15 David: That's sick. (3) (Med, 805-40)

The excerpt starts with Bruno calling the technological possibility of repairing DNA “a great breakthrough”, in contrast to Franz’s more cautious assessment, Bruno’s account carries a very positive appraisal of this technological possibility. Bruno’s choice of the future-oriented metaphor “breakthrough” is relevant because it constitutes a central element of the techno-optimistic repertoire, in which the breakthrough metaphor is used to create excitement for the occurrence of an event such as the emergence of a specific technological innovation (Brown 2000; Hellsten 2000; Väliverronen 2004; Nerlich 2009). As Brown has shown in a media analysis of metaphors for techno-scientific developments, the *breakthrough metaphor*—unlike the *discovery metaphor*—has entered the science (communication) vocabulary relatively recently, in the 1950ies, and brings along a specific network of meanings:

Breakthrough arguably represents a new and more aggressive repertoire. By necessity it implies the requirement of considerable force to push through a barrier of some kind: there is very little that is modest about that! [...] breakthrough has become the metaphorical location of values and activities whereby knowledge is rewarded and validated in relation to actual and clearly defined problems or impasses rather than, as in the case of discovery, being prized for its speculative or serendipitous character. (Brown 2000, 92).

In contrast to the discovery metaphor, then, the breakthrough metaphor frames doing science as an activity needing energy to provide (technological) solutions to certain problems rather than gaining knowledge for its own sake. This meaning is also evident in Bruno’s account since he refers to the “biggest challenge to be solved”. What is most central for our interpretative purpose here is that Bruno, in drawing on the breakthrough metaphor, elaborates and reproduces the promissory discourse introduced by the application card (instead of distancing himself from it like Franz did), which renders the human body deficient but possibly repairable by nanomedicine.

In turn 2, David in a provocative move takes the breakthrough metaphor literally by asking “To where?” (if a barrier is broken you end up somewhere else). In doing so, he does

not simply challenge the metaphor but also the whole repertoire it represents and invokes. This indicates that a metaphor and its entailments (Lakoff and Johnson 2003 [1980]) can be challenged by taking a metaphor literally. With this move, David encourages the group to think about the consequences of such a technological innovation; in other words, what can be expected to follow after the breakthrough. Thus, ironically, “to where?” also works as a metaphor because it alludes to more than a mere spatial or temporal displacement. Bruno, understandably, has trouble grasping this meaning at first (3), only after laughter and some unintelligible cross talk, he engages with the perspective David has opened up (5); and he agrees that certain questions need to be asked, such as who might define what is perceived as deficient and in need of technological improvement. We thus see how Bruno shifts into this other repertoire, which is, however, rather unspecified at this point. All we know here is that it encourages participants to pose a specific set of questions. Eva (6) picks out the “who” question, and elaborates that the vision of repairing DNA entails a definitional authority of what should be repaired and constitutes a “perfect human being”. In this way, she claims that such technologies involve value judgments and powerful actors could use medical technologies for ideological purposes.

In his response (7), Bruno at first agrees but then presents it as a fact that repairing human DNA is a general human “desire” independent from ideology. In contrast to turn 1, he does not display a personal assessment anymore but merely reports what he claims to have “heard” and “read”. Put simply, he here erases his own opinion and interest by changing footing<sup>34</sup> (Goffman 1981). Clayman (1992) suggests that a shift of footing indicates that the emergence of a controversial issue calls for a disentangling of oneself from the issue. Thus, turn 7 can be taken as a sign of Bruno’s growing awareness that the invocation of the techno-optimistic repertoire creates resistance in the group (see all the instances of cross talk that underline this interpretation). Moreover, he changes tenses to underline the factuality of his report: it is not just a future vision but “now they are already trying” in the present. In the final part of his turn, then, Bruno presents his assessment that repairing DNA “must be the biggest goal of humankind” as being logically deduced from his observation.

Eva (8) disagrees with Bruno’s assessment explicitly by ironizing his account. In Potter’s (1996b, 107) usage of the term, “ironizing” refers to how other accounts are undermined, but also the everyday usage of irony—words being used in the opposite way than their intended meaning—fits here, because Eva builds on Bruno’s exact words to change their very meaning. Her adjacent laughter adds to the impression that she does not take his

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<sup>34</sup> The term “footing” refers to the variety of ways in which speakers can relate themselves to their own reports.

argument seriously. While Bruno sets out to defend his account (9), David interjects an appeasing statement (10), whereby he demonstrates to accept Bruno's report as true. However, this does not prevent Eva from further opposing Bruno, and she resorts to a powerful analogical weapon (11): a *Nazi analogy*. On a thematic level, the analogy warns that since the Nazis had an ideal of perfection leading them to exterminate (handicapped) people deviating from it, the ideal of a perfect human being and its realization via nanotechnology could give rise to a similar eugenic movement.<sup>35</sup> On a more implicit level, the analogy conveys that merely reporting what is on the scientific agenda is not acceptable, because what is done in the name of science might be ethically problematic. In turn 8, Eva thus emphasizes that the group should attend to these ethical aspects and take a stance rather than reporting neutrally as Bruno claimed to do. In terms of its action-orientedness, the Nazi analogy hence works to counter the techno-optimistic repertoire invoked by the breakthrough metaphor—it is integral to Eva's attempt to suggest a more reflexive repertoire as basis on which nanomedical research and applications should be discussed in the group setting.

In the last short turns of the excerpt (12-15), Bruno is first prevented from finishing his defense, as Eva and David concertedly display shared disdain for Nazi-like practices, evident in their choice of negative, emotionally charged words (“dubious”, “sick”). Collectively remembering the medical practices performed in the Third Reich here co-emerges with the discursive display of emotions such as outrage and disgust. After the above excerpt, Bruno moved on to another application card, which can be interpreted as a rhetorical move to save his “breakthrough” metaphor. This utterance will figure as the starting point for the next section. But now I want to focus on a later point in the debate, which is relevant for how Bruno then made use of a Nazi reference himself. In this context, however, the reference is not employed to counter an argument because Bruno here just reacts to a request from another participant to exemplify his view that nano might be misused.

## **Excerpt 2**

Bruno: I mean politically there has been misuse, right? Eh, Cyclone for instance, isn't it (laughs) and stuff like that (laughs). Gas, I mean [Christa: Mhm] Well, you can misuse all technological progress (.) or every medical advancement or every (2) what did doctors do under Hitler? Really now. (Med, 2695-8)

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<sup>35</sup> This could also be interpreted as a slippery slope argument in the sense of “if we start with this, we might end up in a Nazi-like society again”.

Bruno here invokes the use of Cyclone gas in the Holocaust as a proof that every technology can be diverted from its intended positive use for the political goals of those in power. His account entails that medical professionals have acted unethically in the Nazi period, whereby medical technologies are simultaneously purified from inscribed socio-political values. Such an argument renders technology neutral in technical, social, and political terms by decoupling the design and development of technologies from their contexts of use (cp. Woolgar 2005).<sup>36</sup> Put simply, in this argumentative framework negative effects of a technology are attributed to their users, not the technology as such, which allows him to continue a positive narrative of technological innovation. Bruno's reference suggests the inevitability of technological misuse, as long as people have the potential to act unethically. But what does he enact with this utterance? I suggest that it could also be interpreted as a delayed reaction to Eva's Nazi analogy that allows him to display awareness for ethical issues and thus counter Eva's allegation that he does not take a stance on such issues. The Nazi analogy thus exerted influence in the sense that it successfully claimed space for ethical issues in the debate about emerging medical technologies. Or even more so, ethics—in the sense of moral behavior—was made an issue that had to be attended in the debate and in participants' self-presentations.

Before moving on to how the debate developed after excerpt 1, let's pause to reflect on the use of Nazi analogies and references in the group discussion and their adjacent discourse dynamics. First of all, it is not surprising that references to the Third Reich appeared in the nanomedicine group, because Nazi analogies frequently turn up in debates on emerging medical technologies such as genetic engineering (Mulkey 1993). For instance, human gene therapy reminded participants in Swedish focus groups of "Nazi society, elitist society, the production of perfect human beings, which are all arguably bad things, and gene therapy is therefore, by implication, non-acceptable" (Marková et al. 2007, 145). But like in the nanomedicine group, the debate in the Swedish focus group moved beyond the Nazi analogy as participants (even those who posed the analogy) started to accept the proposition that any technological development can be either used for positive or negative ends. This is also what can be observed in the nanomedicine group, as in excerpt 2 above.

The Nazi references in the medicine group were not as face-threatening as Nazi analogies discussed in section 2.3.2, because they were not used to discredit interlocutors

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<sup>36</sup> Bruno's argument is reminiscent of the following quote that is generally attributed to Einstein: "Technological progress is like an axe in the hands of a pathological criminal." The fact that this quote is widely spread over the Internet demonstrates that this analogy resonates in Western culture where technology is still mainly understood as neutral. The fact that the analogy is ascribed to Einstein, the archetypical scientist genius of our time, certainly adds to its credibility.

by likening them to Hitler or the Nazis. An Argumentum ad Nazium or Reductio ad Hitlerum, or in more colloquial terms “playing the Hitler card”, is a rhetorical move in which an opponent in a debate is discredited by a comparison to Hitler or the Nazis. This might also explain why the mobilization of the Nazi analogies in excerpt 1 did not result in anger, a more heated discussion, or distract interlocutors from their arguments<sup>37</sup>.

## 5.2 Mobilizing analogies to counter techno-optimistic visions

We now turn to how the discussion proceeded after the Nazi analogy in excerpt 1. As established, Bruno did not directly respond to the Nazi analogy but switched to the second application card he chose (see Figure 2). This card presented the vision of a lab-on-a-chip as a tool for faster diagnosis and permanent surveillance, and as we see in the next excerpt, Bruno selected the card as another example for a promising development that he anticipates eagerly.

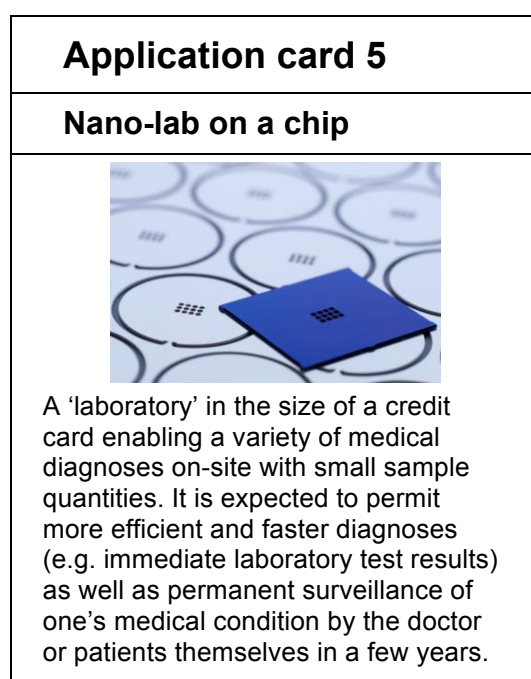


Figure 2

### Excerpt 3

1 Bruno: What, this I should add, fascinates me about this chip, if it exists one day, then it's of course a breakthrough of personal responsibility. Because then you could explain to the patient, the responsible patient, what he, and not because someone says it, but

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<sup>37</sup> Cp. <http://www.fallacyfiles.org/adnazium.html> (accessed 13 July 2013)



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- because an objective signaler declares (.) what he's doing right or wrong, to stay healthy, [to
- 2 Christa: [Yes, but that again
- 3 Bruno: [Yes, yes, of course, of course, yes, of course, again.
- 4 Christa: It's an ambiguous gateway. That's to say, it's lost then totally [Bruno: Yes] because if you take it away from him, he collapses and is dead because he thinks he can't breathe by himself anymore.
- 5 Bruno: [It, yes, of course] but in the end it comes down to the eh (.) famous ethical attitude towards the whole subject.
- 6 Eva: Well, I chose this nano-lab on a chip for a different reason. Because to me that sounds like perfect, exactly like permanent surveillance, it's even written on the card. And permanent surveillance is something that I find not in the least desirable but rather a terrible fantasy of a [ ]
- 7 Bruno: [But dear colleague, don't you want somebody telling you what you're doing wrong and what you're doing right? (.) Is this, is this something evil?
- 8 Eva: What do you mean by that?  
(Collective laughter)
- 9 Bruno: Well, if the chip for instance cries out loud. As an example.
- 10 Eva: [If I if I if I decided somehow now that I want my coke and my McDonalds food everyday, then I'll do that and that's it. And when I get a heart attack, I get a heart attack. [Bruno: Well, this, that's, that's ] That's probably wrong from a medical point of view, right? But it's my decision.
- 11 Bruno: But that it beeps and you can switch it off then or so, I don't know (laughs), that's a different subject, right? But if it existed I would find that a great advancement. To decide, it's like with smoking, everyone has to decide for themselves. (laughs)
- 12 Eva: That's the point, smoking is becoming more and more, less and less a free decision but more and more a legal regulation. In that sense, it's another step in this direction that many people precisely don't choose what pleases them but that it's just decided from above, even when they are against it. (Med, 842-92)

Bruno presents himself captivated by the lab-on-a-chip vision (“fascinates me”): he expects it to induce positive change in the future. While still using the breakthrough metaphor, he no longer talks about a technological but a socio-cultural breakthrough of “patient responsibility”. In his imagined sociotechnical future, the doctor relies on the impartial lab-on-a-chip technology to monitor and assess a patient's behavior. The chip here is envisioned to provide objective, unambiguous data in contrast to an obviously less-objective “someone”—presumably the doctor. This framing of the chip as an objective technology matches with the already identified technology-as-neutral perspective in excerpt 2. Bruno remains in the techno-optimistic repertoire here, which evidently also includes a techno-deterministic model that ascribes technology the power to induce

predetermined socio-cultural change.<sup>38</sup> Bruno's scenario is also interesting for how it reshapes the role of the physician thanks to a new technology. Although the physician remains the authority in voicing normative instructions, these instructions are no longer based on the physician's own assessment but on an external technological device<sup>39</sup>. The lab-on-a-chip is depicted to provide indisputable facts. It becomes an externalizing device par excellence (Woolgar 1988, 1980), rendering the physician a mere animator (Goffman 1981) of these facts, with the effect that the physician can no longer be held accountable for "wrong" instructions. It is, however, less clear how this change relates to what Bruno calls a change towards more patient responsibility.

To make sense of Bruno's use of patient responsibility, it is helpful to go back to what the group discussed before. In a relative long passage (line 575-637) the group established collectively that patients and consumers should act responsibly, and they came up with various stories of how they themselves perform in a responsible, non-expert reliant way (e.g. reading labels on consumer products and medication). At the same time, they complained about how this orientation towards personal responsibility was impeded under present circumstances. Bruno in particular admitted that it is considered to be reasonable for patients to rely on physicians as experts, but he also argued that patients should scrutinize physicians' prescriptions and not "rely on what the so-called expert claims". We can take two clues for the interpretation of Excerpt 3 from this previous passage. First, knowing that Bruno questions the expertise of physicians explains why he welcomes the lab-on-a-chip: to him it becomes a technology that provides objective knowledge to the physician and thus rebuilds his trust in physicians as experts. Second, at this later point in the debate Bruno obviously invokes "patient responsibility" as a rhetorical resource, for he argues that the lab-on-a-chip may foster a realization of this shared value—as the debate before has shown to him—in the future. His use of "patient responsibility" can thus be interpreted as a way of gaining approval for the lab-on-a-chip vision and the broader techno-optimistic repertoire in which it is enmeshed.

Moving on to how the discourse unfolded after Bruno's move in turn 1, we encounter a discourse dynamic similar to the one analyzed in the first section of this chapter: Bruno again meets with opposition from the other participants. The dispute built up in excerpt 3 revolves about Bruno's claim that the lab-on-a-chip might facilitate patient responsibility. Without going into the details of each turn, the interchange demonstrates two different

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<sup>38</sup> It goes without saying that STS is famous for refuting both a conception of technology as neutral and techno-deterministic arguments.

<sup>39</sup> Physicians already use many technologies for predictive, diagnostic and treatment purpose, but the interesting observation is here that this new technology seems to provide a fundamentally new avenue for outsourcing diagnosis to a technical device.

ways of imagining the implications of the lab-on-a-chip in terms of responsibility. Christa and Eva both envision the lab-on-a-chip making its user more dependent on the technology and thus not contributing to more personal responsibility. Bruno, however, anticipates that the lab-on-a-chip would realize his wish for external guidance based on objective information (7). In his scenario the technology is a caring actant that can perform a broad range of discursive acts to guide his actions: it declares, tells, cries out, and beeps. By contrast, Eva—by referring to the card—imagines the lab-on-a-chip as a surveillance device (6) designed to undermine her personal freedom in making lifestyle choices (10). From her perspective, it does not advise but dictate. In an imagined act of resistance she envisions herself disobeying the chip, just to gain control of her decisions, even when it means risking her own health by eating the epitome of unhealthy food.

It is obvious that we encounter incommensurable framings in this excerpt; hence it is interesting how particularly Bruno tried to solve the argument in turn 5 and 11. First, by mobilizing the idea of an “ethical attitude” (5), he constructs the diverging framing as being firmly rooted in a basic, not easily changeable individual predisposition. Put simply, he tries to change from a mode of argumentation into a mode of talking that allows for different attitudes being merely displayed; that is, a discursive space where attitudes can coexist peacefully next to each other, without the need to convince others or defend own views. This switch would allow Bruno to stay with the techno-optimistic repertoire and to not be “moved” by the presented counter-arguments. In turn 6, Eva enters the demanded display mode because she only talks about her own more negative perception of the chip. But, interestingly, in the next turn Bruno stays within the argumentative mode and tries to persuade Eva to reconsider her perception of the chip.

After Eva has again resisted his attempt of persuasion, Bruno, in turn 11, makes use of an *analogy to smoking*—with this analogy he basically proposes that everyone can choose for herself whether they want to use the lab-on-a-chip, just like everyone may choose whether to smoke or not. Underlying this move is the same strategy as in turn 5. Accepting that the assessment and choice of the chip is located on a personal rather than societal level would dissolve the controversial character of discourse here, as the need for deliberation and argumentation may be considered to arise only when there is a perceived necessity to reach consensus. However, Eva remains in the argumentative mode by appropriating Bruno’s smoking analogy for her own persuasive purpose, using smoking as *analogical evidence* for her claim that individual decision-making on one’s own health is increasingly constrained, either by laws (against smoking) or technologies such as the lab-on-a-chip. In the interpretative repertoire she mobilizes, technologies are not considered any different than laws in that both are not neutral but have normative assumptions inscribed into them.

Turns 11 and 12 nicely demonstrate how an analogical resource introduced by one discussant can be reframed into an analogical counter-argument by another discussant. While Bruno used the smoking analogy to close the argumentative debate in order to maintain his optimistic vision of the lab-on-a-chip, Eva employed the analogy to highlight the ways in which political goals can be enforced via technologies or laws—just as she did when mobilizing the Nazi analogy in excerpt 1. Almost immediately after this interchange, Franz further challenges Bruno’s vision with the help of another analogy.

#### **Excerpt 4**

- 1 Franz: But what I wanted to say to Bruno in addition, about his visions [...] What happens if it turns out that this chip is more akin to the ticket machines of the Federal Railway?  
(Loud collective laughter)
- 2 Bruno: That’s true. (Cross talk and laughter) No, no, I’m assuming an ideal, of course, yes. Well, I’m now an optimist and believe (laughs) that such a thing should be errorless
- 3 Mod: [So, the Austrian horror version is the Federal Railway ticket machine.  
(Collective laughter)
- 4 Franz: As a Kraut<sup>40</sup> I’m allowed to say that (others laugh) as someone who has been here in Vienna for 25 years now, that’s more than half of my life. The German machine is of course not any better. (Others laugh) But what I wanted to say with this actually is that, of course there exist possibilities and everything sounds good when you read it in, I don’t know, Scientific American or Science Magazine or whatever it’s called. But the implementation is then maybe like we already know it, like we have experienced it already 100 times. It’s simply not perfect. (Med, 899-922)

Franz here questions the usability of the lab-on-a-chip by suggesting that it could turn out like an existing, far from perfect technology: the ticket machine of the Austrian Federal Railway (1). The ticket machine is used here as metonym for a non-user-friendly or error-prone technology. The following loud collective laughter demonstrates that this metonym resonates in the group, as most participants seem familiar with this ticket machine and its flaws from their everyday life. The analogical scenario works effectively for it makes Bruno admit that he was optimistically envisioning an ideal “errorless” chip, not considering potential problems with its implementation (2). He acknowledges that Franz is right (“That’s true”) and presents himself now as someone who merely chose to play the role of an optimist at a particular point in time. In turn 2, Bruno thus declares that he may be persuaded to shift into another, less optimistic repertoire and stop performing “the optimist”.

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<sup>40</sup> He uses the colloquial derogative Austrian expression “Piefke” to refer to himself being originally from Germany. I tried to preserve this derogative meaning by using the term “Kraut”.

At this point, even the moderator chimes in and interprets Franz's example (3). Franz, who is originally from Germany, wants to make sure that he is not perceived as a foreigner who criticizes Austrian technology, and thus stresses that technologies in general turn out to be imperfect in practice—even German technology. To underpin this argument and his entitlement to such a claim, he presents himself as someone with long experience with ticket machines in Germany and Austria. Next (4), he changes into a meta-communicative mode, explaining the intention behind his analogy, namely to raise critical awareness for the fact that promises surrounding new technologies, whose origin he traces back to (popular) science magazines,<sup>41</sup> do not deliver in reality and should thus not be blindly believed and repeated. Thereby, Franz underscores that the techno-optimistic repertoire belongs to scientific journals and popular science media but should not be stabilized in the lay discussion group setting, where everyday life experiences should count and be attributed greater credibility. As with the train ticket machine analogy, Franz refers to people's continuous encounters with technologies in their everyday lives, which prove time and time again that technologies in real life turn out to be far from perfect ("like we have experienced it already 100 times. It's simply not perfect."). It is thus determined that the purpose of the group is to provide and develop an alternative techno-realistic repertoire for interpreting and imagining technoscientific developments, which is rooted in past real-life experiences but also culturally mediated knowledge rather than optimistic future visions. Analogies are the central devices that are employed to draw upon these experiences and knowledges, and that hence work to underpin the techno-realistic repertoire.

### **5.3 Questioning (nano)technological fixes with medical metaphors, metonyms, and idioms**

In the next excerpt, which follows immediately after excerpt 4, we witness how Franz's arguments effectively expel the techno-optimistic repertoire from the conversational floor and pave the way for a general critique of nano, and technologies more generally, as ideal means for solving societal problems.

#### **Excerpt 5**

1 Franz: And what before (.) impressed me was what David said, it applies also here in this context [clears his throat] namely this fighting against cause and effect. If it was possible to repair things that are likely caused by environmental influences (.) cell phone radiation, I don't know, pick what you like, smog (.) and there's the possibility

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<sup>41</sup> While *Scientific American* is a popular science magazine, *Science* is a professional journal that is not oriented to a popular readership.

*The role of analogies in countering promises of nanomedicine*

to repair it, couldn't it lead to a certain carelessness with emission protection? That the things that caused it will be taken less seriously because you say: well, you can fix this with ratiopharm.

2 Christa: Right (.)

3 David: Exorcising the devil with the Beelzebub.  
(Bruno laughs)

4 Franz: Well, exactly what we always do or what my red card mentioned with this: ideology of technical feasibility. Like there's a problem, well, we have a solution but we don't tackle the cause of the problem, if it's possible at all, if the technical, well, the tinkering with symptoms is maybe simpler or possibly more profitable for certain lobbies. (Med, 922-42)

At the beginning of his turn, Franz refers appreciatively back to an analogy David put up for debate when he pondered if “you could also ask: is nano like taking antidepressants but not going to psychotherapy? Is nanotechnology just simply fighting symptoms or part of the solution?” (713-5). David came up with this comparison right after the group criticized people who take antidepressants and refuse to simultaneously work on their problems in psychotherapy (678-706), leading the group to carve out a shared critical position towards techno-medical fixes. David thus took this critical stance and transferred the “just treating symptoms” metaphor tentatively to nano in general. In doing so, he challenged the effectiveness of nanotechnological solutions. Franz, in excerpt 5 (1), revives and elaborates the meaning of the analogy by suggesting that nanotechnological solutions might not just fail to get to the heart of problems (only deal with symptoms) but additionally may lead to carelessness and hence even reinforce the very problems they claim to solve. To get this meaning across, he appropriates and slightly modifies a famous advertising slogan for a painkiller: “Ratiopharm helps with this.”<sup>42</sup> This phrase stems from a series of well-known television commercials that have aired on Austrian television programs for decades, always following the same pattern: An evidently sick person complains about having a pain of some sort and a healthy person advises with the above line that for this problem ratiopharm provides a solution. In Franz's account, the reference to ratiopharm works as a metonym for technological solutions in general. He thus appropriates the slogan in a way that challenges its very meaning, namely that taking up an advertised techno-medical solution might not always be the best approach to tackling a complex problem.

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<sup>42</sup> I translated this phrase from the original German: “Dafür gibt's doch ratiopharm.” The company website provides the following information (my translation): “Ratiopharm helps with this” is a recommendation that has managed to become a well-known phrase.” (<http://www.ratiopharm.de>, accessed 10 February 2013). This description is, of course, in itself interesting for how it presents the advertising slogan as a medical recommendation.

As the next turns indicate, Christa (2) and David (3) share this way of interpreting technological fix solutions as problematic. If we accept that the advertising slogan occupies a similar cultural status as an idiom or a commonplace (Myers 2007), we can argue that David continues the use of idioms as a rhetorical strategy in turn 3. I translated the idiom literally as “exorcising the devil with the Beelzebub”, but its meaning corresponds best to the English idiom “to cast out the demons by the ruler of the demons”. The two idioms incorporate the same admonition, namely that the (technical) solution of a problem can lead to further problems. The fact that this warning can be encapsulated in commonplaces suggests in an implicit way that such arguments have a cultural history and might thus be convincing. The idioms hence work to plausibilize the warning. After the three discussants have interactively established—and accepted—this as shared knowledge, Franz gets more explicit in turn 4. He claims that there is a dominant cultural practice of applying technological fixes (“what we always do”), and underpins this argument by referring back to a line from the story card he chose. His account can be read like an accusation of a belief in technological fix solutions or at least a demand to engage with problems in ways that go beyond mere symptom control. Finally, he holds economic interests partly accountable for this situation. What has become apparent at this point is that the debate has shifted away from the techno-optimistic repertoire.

Let me briefly summarize how the debate further unfolded. Interestingly, despite this shift away from the techno-optimistic repertoire, Bruno keeps up his hope for the lab-on-a-chip to induce positive changes, by mentioning another scenario, in which the lab-on-a-chip was imagined to be affordable for all societal groups for health prevention purposes and would thus be a technology that could reduce social inequalities. Again, Christa and Franz claim that this vision is implausible by referring to the existing two-tier health care system in Austria. Based on their shared knowledge of the present situation, Franz considers it much more realistic that different chip versions will be available: “the simple one, which can do almost nothing [others laugh], for this one health insurance will pay, yes, for the masses, and then the really expensive high-tech chip that will really benefit its privileged user.” (961-3) Franz anticipates that the current health care system will be stabilized rather than altered by the technology. Bruno, then, no longer disagrees but tries to come to terms with why his optimistic visions are so easily refuted: “I’m assuming an ideal (laughs) it’s true, it’s true, of course.” (967). After having had to admit that the other arguments speak against the techno-optimistic repertoire, Bruno finds himself in a face-threatening situation. At the beginning of the next excerpt, Christa displays her solidarity by discursively forming a ‘coalition of idealists’ with Bruno.

**Excerpt 6**

- 1 Christa: We'll be waking up together then, from our dreams when we leave here (others laugh).  
2 Bruno: Well (1)  
3 Christa: One is allowed to philosophize.  
4 Bruno: That's right.  
5 Anna: And I also somehow don't believe in your ideal of the objective chip. Because someone has to produce it.  
6 Eva: Probably it says then: Take the drug from pharmaceutical company X!  
(Christa and Anna laugh)  
7 Christa: And only that! (2) (Med, 969-84)

By metaphorically comparing leaving the discussion group setting with the process of waking up, Christa highlights that reality with its restrictions is waiting outside and that they can legitimately envision ideal futures in the context of the discussion group. Nonetheless, her account classifies Bruno and herself as dreamers and thus consolidates the impression that Bruno does not envision the future from a realist perspective. Bruno thus understandably reacts skeptically to her assessment (2). In turn 3, then, Christa tries to repair this negative connotation by rescuing their imagining of ideal futures (now called “philosophizing”) as an acceptable stance in the debate. Although the word “philosophizing” can be used in a derogatory fashion in the Austrian context, Bruno’s response in turn 4, which is a strong validation, tells us that it is here interpreted as a revaluation of their idealistic imagination in the group context. Being compared to a philosopher is more acceptable to Bruno than being called a dreamer. If the debate about his visions were to stop here, this would signal that it is acceptable to voice techno-optimistic visions—an ideal ending of this passage for Bruno. But the discursive reality has one more blow in store for Bruno, when Anna questions the objectivity of Bruno’s imagined lab-on-a-chip (5)—an argument that had not been mobilized against his vision so far. Then Eva chimes in by playing ironically with the ratiopharm phrase, leading to amusement at Bruno’s expense (6). Finally, even Christa gets on board the female alliance making fun of Bruno’s ideal chip vision. The participants here perform that voicing optimistic visions in the group risks being refuted or ridiculed. As often is the case in group discussions, laughter and jokes indicate the end of a thematic passage. This is also the case here, because excerpt 6 closes the debate about the lab-on-a-chip technology, after the techno-optimistic repertoire was successfully expelled from the conversational floor, mainly due to a variety of analogical moves.



## 5.4 Concluding discussion

The analysis presented in this chapter tried to accomplish a twofold task. First, it examined the role of analogies and other comparative devices such as metaphors or idioms in the debate about nanomedical visions in which nanotechnology assists in repairing DNA and enabling the design of a lab-on-a-chip tool for personalized diagnostics. Second, the analysis also explored how these analogical devices were employed to establish specific framings or ways of imagining the implications of such technological developments. I used the concept of interpretative repertoire to characterize these framings: the techno-optimistic and the techno-realistic repertoire (cp. for similar repertoires in the debate about climate change see Ereaud and Segnit 2006). As should have become clear from the empirical analysis, it tried to assure that the names of these repertoires remain close to participants' own wording (e.g. Bruno who voiced the techno-optimistic repertoire referred to himself at one point as an "optimist"), in the spirit of *in vivo coding*. Let me briefly sketch the main elements and orientations of these two repertoires. The techno-optimistic repertoire is rooted in scientific and political narratives of technological progress and of nanotechnology as a field of great expectations and revolutionary developments. The "breakthrough" metaphor was at the core of this repertoire. While the techno-optimistic repertoire envisions a world in which nanotechnology fixes a variety of (medical) problems, the techno-realistic repertoire provides a less optimistic and more cautionary outlook. It emphasizes potential (undesirable) ethical and socio-political aspects of new technologies and potential problems with their implementation. Analogies and other comparative devices were the central means that were used to underpin techno-realistic arguments, because they allowed pointing to shared past experiences. In doing so, the techno-realistic repertoire works to thwart techno-optimistic conceptualizations of technology-as-neutral and of socio-technical change as predictable.

Although the two repertoires are in tension with each other and constitute the future of nanomedical applications as well as the relationship of technoscience and society in diverging ways, they are not necessarily dichotomous or fundamentally opposed in the sense that a participant can be expected to fully commit to the one or the other. We should rather conceive the two repertoires as forming a duality of currently co-existing interpretations of technoscientific promises. The notion of interpretative repertoires (as discussed in detail in section 3.3) is helpful in such a conception because it emphasizes the flexible, fluid, and variable character of repertoires in talk: "there is no attempt in discourse analysis to find consensus in the use of repertoires in the sense that some people are found to *always* use a certain repertoire [...] analysts do not assume that on other occasions these people would necessarily produce the same repertoires" (Potter and Wetherell 1987, 156,

original emphasis). Following this principle of variability, we may neither expect that other discussants did not draw on this repertoire in other phases of the discussion, nor should we typecast Bruno as articulating this repertoire all the time—which is particularly unlikely after its contestation. Nevertheless, the intriguing question remains, why did Bruno advocate the techno-optimistic repertoire?<sup>43</sup>

The analysis traced in detail how Bruno continuously had to defend the techno-optimistic repertoire and ward off others' attempts to establish the techno-realistic repertoire. Considering these repertoires in the wider socio-cultural context may allow us to gain a better understanding as to why most participants preferred to imagine nanomedical visions from a techno-realistic standpoint. Without much doubt, the techno-optimistic repertoire tends to be the dominant, taken for granted discourse about technologies in contemporary Western societies (Mulkay 1993), or at least in certain influential societal arenas such as politics, science, and the media (see also Franz's reference to science magazines as a source of this repertoire). My intention here, however, is not to impose my understanding of what is dominant or marginal in a culture—a critique often brought forward against critical discourse studies—, but to acknowledge that the status of what is taken to be dominant is determined by participants themselves. Indeed, participants displayed several times that they do—and should—oppose the dominant techno-optimistic repertoire (this was also evident at the beginning of this discussion group, which is covered in Chapter 8). The gradual marginalization of the techno-optimistic repertoire over the course of discussion thus demonstrates that (most) participants defined their role in the group setting as being about mobilizing a counter-repertoire, thereby resisting a mere continuation of the optimistic and promissory discourses that surround emerging technologies in their cultural sphere. Counter-repertoires can only be thought in relation to the dominant repertoire that they are countering. But what is dominant in one context can become marginal in another, and these placements may even shift in the context of a group discussion. In terms of

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<sup>43</sup> Although answering this notoriously difficult question is not my analytical goal, I think the best explanation might be found in his personal affectedness. Bruno disclosed at a later point of the debate that he “has already made acquaintance with nanotechnology” (1731), because he had a nano-coated stent inserted into his coronary blood vessel. This experience of having personally benefited from nanomedicine may thus have affected his choice of repertoire. Drawing on the techno-optimistic repertoire allowed him to speak—often more implicitly than explicitly—from a patient identity characterized by hope for medical breakthroughs. Similarly, Bruno's strong hope for the lab-on-a-chip to be a neutral, errorless technology might be fueled by his personal experience: As he also recounted at a later point, his physician overlooked a contraindication of the nano-stent and his medication, which he himself discovered by searching the Internet.

dominance, we clearly witnessed that the tables were turned in the “mini-public” of the discussion group.

As I hope to have shown in this chapter, exploring the use, variety, and interplay of different rhetorical resources is central to understanding their function in corroborating or undermining the repertoires that frame how the future of technology and society is imagined. A main finding of the analysis is that analogical devices played a central role in the discursive battle of the two repertoires, since they were employed as rhetorical tools to argue for one and counter the other repertoire. Analogical moves directed against the techno-optimistic repertoire were accomplished by drawing on previous experiences with technologies, but likewise by medical metaphors or well-known idioms from the wider cultural context. All of these analogical resources, be they analogies to real-world ticket machines or idioms alluding to the devil, furnish nanomedical visions with a history and draw attention to the sociocultural aspects of technologies. Although analogical devices were used on either side of the argumentative exchange, they were conjured up more frequently in participants’ attempts to undermine the techno-optimistic repertoire. Analogies to past experiences with technologies, which foregrounded disappointed expectations and undesirable socio-political implications, proved to be particularly powerful here. The ticket machine analogy, for instance, brought participants’ imagination back into a present of everyday encounters with imperfect rather than ideal technologies. Recalling these shared personal experiences with flawed technologies worked most persuasively in countering the techno-optimistic repertoire—and they hence made analogous scenarios for nanomedical applications appear plausible, presumably precisely because they are—like idioms—rooted in people’s everyday life experiences. In their work on counter-narratives, Bamberg and Andrews (2004) note that when people’s own experiences do not match with the master narratives of their culture, they come to scrutinize these dominant stories. I think that this what we see at work in the discussion group. When invoking their past knowledge of how techno-medical promises often do not match up with reality, people come to question the techno-optimistic repertoire and its attendant success story of technology as the ultimate problem solver.

Thus, analogies from the techno-realistic repertoire can also be conceptualized as *alerting analogies*: They warn that optimistic technoscientific visions and promises, which are by definition not grounded in real-life experiences, should be viewed with skepticism. The analogies offered a way to ground the debate in a place with a specific history, and allowed the constraints that might hinder the realization of ideal visions to be highlighted. Like in a public debate about embryo research in Great Britain (Mulkey 1993, 738), participants in the nanomedicine group were thus able to “prove” that the techno-

optimistic repertoire—or the rhetoric of hope, as Mulkey calls it—“was implausible and unreal” and that the realistic repertoire “remained true to the scientific and historical facts”. Certainly, the techno-optimistic repertoire could have also been corroborated by references to examples of successful technologies in the past. But since this was not the case, we could only speculate on how this would have changed the discourse dynamic. The overall impression that remains after the analysis in this chapter is that even nanomedicine—this generally more positively perceived nanotechnological application field—turns out to be a more complicated and also contested case. Provided that people are given the space and time to reflect on nanomedical promises in detail, they bring up issues and perspectives missing in other spheres such as the media or policy contexts. Similar to lay members in scientific advisory committees in the UK (Jones and Irwin 2010), most participants in our groups appeared to see it as their civic duty to challenge dominant ways of framing new technologies and to foreground neglected ethical, social, and political issues.

## 6 Enhancement will be like... The role of analogies in imagining and averting human enhancement scenarios

I have an analogy for this, and the reason it's an analogy is that by the nature of the case it's hard for us to imagine what these new forms of interaction will be, and how rewarding they might be, but here's the analogy. Consider two card games: one is the child's game of "go fish" and the other is contract bridge. Now it might turn out that in the future if huge numbers of people are cognitively enhanced, they will look back at the kinds of activities that people in our world perform and say "that was like children playing go fish." Think about the kinds of interactions that we now have, and the kinds of enjoyments and productivity we can have because of the Internet. If you try and ramp that up, if you magnify it by many orders of magnitude, you might begin to get an idea of how human life could be if many hundreds of millions of people were cognitively enhanced. — *Allen Buchanan, bioethicist, in an article on cognitive enhancement*<sup>44</sup>

Indeed, it is a difficult task to imagine the consequences of new technological means for enhancing the current limitations of our bodily existence. For instance, how would the world we live in change if some people received nano-enabled brain chip implants to boost their mental processes or to strengthen their stamina? Imagining plausible future scenarios is central in debates about human enhancement because how we envision the social and ethical implications of enhancement technologies determines our positions on the issue. But the reverse is equally true: Our present positions on human enhancement shape the ways in which we imagine enhancement futures. One important lesson from the sociology of expectations literature is precisely that the futures we construct and present to be plausible are inextricably interwoven with our present interests and goals. That is, by presenting particular futures as more plausible than others, people try to achieve some effect, be it to mobilize towards a specific future becoming reality or preventing others from materializing.

As I argued in Chapter 2, the same holds for analogies, because analogies are central devices that assist our imagination, but—as I capture by referring to their double-sided character—their imaginative side cannot be disentangled from the interests that influence how we construct likenesses between objects or phenomena. Whether we intend it or not,

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<sup>44</sup> <http://www.theatlantic.com/technology/archive/2012/02/why-cognitive-enhancement-is-in-your-future-and-your-past/252566/> (accessed 10 July 2013)

the analogies we bring to life incorporate a framing effect. The epigraph above is an example of how analogies are employed and presented as imaginative devices by bioethicists in debates about human enhancement. What is, however, not mentioned in Buchanan's account is that the analogies bioethicists come up with (and Buchanan is not exempted here) are often normatively infused by their own personal standpoint on the issue. The same applies to the analogies that 'lay'<sup>45</sup> people such as the participants of our discussion groups generate in debates about human enhancement. And there are many analogies to encounter in these debates, as this chapter will show. Among the various instances of analogical discourse in the discussion group material I explore, the debates about futuristic applications for human enhancement stand out: Here, analogies do not just pop up occasionally but the discourse is truly permeated with (dis)analogies and their collective negotiation.

But how do human enhancement and nanotechnology actually go together? In fact, nanotechnology is just one among other new technological advancements that are assumed to provide the means by which humans might be able to build new tools for "enhancing human performance". This phrase stems from the title of the seminal publication *Converging Technologies for Improving Human Performance* (Bainbridge and Roco 2002), a report commissioned by the U.S. National Science Foundation and Department of Commerce. This report not only played a major role in paving the way to founding the US National Nanotechnology Initiative but was also central in fostering the vision of a convergence of nanotechnology, biotechnology, information technology, and cognitive science (NBIC), which is expected to "enhance" humanity in various technologically-induced ways (e.g. life extension; physical, mood, or cognitive enhancement). In such contexts the notion of human enhancement is generally restricted to activities, especially the use of technologies, by which human beings try to improve their bodies, minds, or abilities.

Such enhancement visions have initiated a broad scholarly debate and lead to a large amount of academic literature on their potential ethical, social, and political implications (see e.g. Hays et al. 2013; Savulescu, ter Meulen, and Kahane 2011; Buchanan 2011; Lin and Allhoff 2008; Zonneveld, Dijstelbloem, and Ringoir 2008; Harris 2007; Fuller 2011). My approach differs from these mostly theoretical and philosophical treatments of human enhancement in the sense that I approach the issue in an empirical, bottom-up manner. That is to say, I explore how citizens in discussion groups discuss human enhancement and employed analogies in that process (for similar approaches see Macnaghten and Davies

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<sup>45</sup> I use 'lay' here to refer to people who are neither involved in the development of these technologies nor in scholarly reflection about their implications such as ethicists or social scientists.

2010; Felt et al. 2009; Strassnig 2008; Banks, Scully, and Shakespeare 2006). The *research interest* of this chapter is thus to examine (1) the role of analogies in citizens' talk about human enhancement, in terms of their imaginative, argumentative/framing, and interactional effects; and (2) what central concerns or dilemmas drive and are expressed in participants' analogical discourse about human enhancement. Regarding this second interest, the aim is thus to gain more general insights that may inform the broader academic debate on human enhancement.

The issue of human enhancement was introduced in two of the four discussion groups, *the medicine and ICT group*, by an application card depicting visions of a nano brain-chip implant for medical and neuro enhancement purposes (see Figure 3).

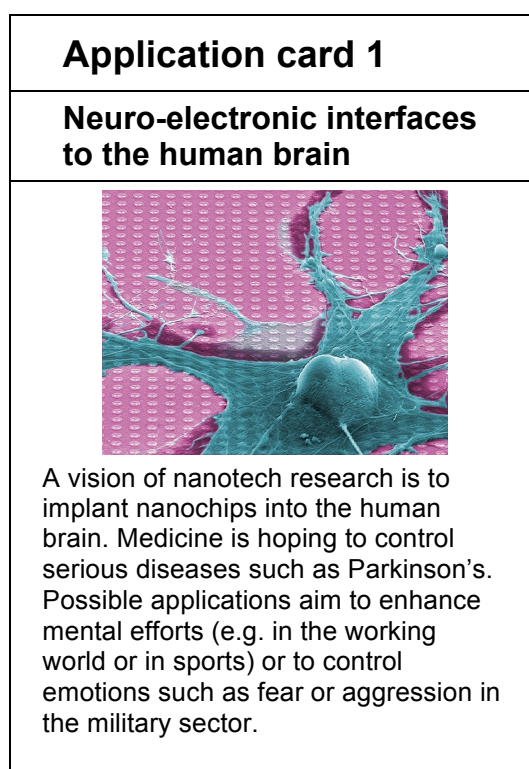


Figure 3

In the following section I will thus explore how participants in these two groups responded to this card, in particular the enhancement visions. While in both groups the medical application of the nano chip was welcomed, the vision to use brain chips to enhance cognitive processes and regulate human emotions triggered a lively and controversial debate, during which the groups also came up with different chip versions, ranging from chips to manipulate emotions, provide its user with knowledge, or improve mental

performance.<sup>46</sup> The enhancement visions from the card elicited strong negative reactions from the beginning, evident in the wording participants used to characterize the enhancement scenarios: “strange”, “scary” (Christine, ICT, 529f.), “the other side of the coin” (Agnes, ICT, 629), “horror vision” (Benjamin, ICT 577), “horror scenario”, “I couldn’t approve of this anymore” (Christa, med, 1181ff.), “the ugly side of technology” (Eva, med, 1263) or “absurd” and “frightening thought” (David, med, 1229ff.). These immediate responses are reminiscent of what has been called “instinct or gut feelings” (Banks, Scully, and Shakespeare 2006). Banks et al. argue that these reactions, which were expressed when lay people were confronted with moral scenarios, are based on socio-culturally rooted “cognitive-moral schemes of interpretation” (ibid., 299). Although I do not share this cognitivist perspective, it is nevertheless relevant to consider that with these responses participants indicated that the human enhancement scenario does not fit in with and hence disturbs their current world(view). Thus, I argue that we have to take these reactions into account when analyzing the analogies and future scenarios in this chapter, because they tell us that participants might have a personal stake in building analogies and future scenarios that entail a rejection of enhancement technologies. Hence, their analogies and future scenarios may be involved with stake inoculation (Potter 1996b), a term that refers to the discursive means people use to downplay or hide that they have a personal interest or motive in establishing specific (dis)analogies as ontologically given or presenting certain future scenarios as plausible or implausible.

This chapter is structured in the following way. In the first section, I present empirical material that illustrates how participants use analogies with science fiction and other rhetorical devices such as a *nano is not like nano*<sup>47</sup> move to suggest the undesirability as well as implausibility of enhancement scenarios. Then, from the second section onwards, the analysis concentrates on how a chip that promises to make its user more efficient and productive was discussed, and the analogies that were constructed in that processes. First, we explore how the chip was compared to drinking coffee and academic doping, a comparative process leading to a distinction that predicts broader (negative) socio-cultural change induced by the chip. The function of this discourse is thus to prevent the enhancement future from materializing. This is followed by a mobile phone analogy that makes the acceptance of the chip seem plausible, and which thus works as a counter-scenario to the preceding section. As we will see, the same effect is achieved by making the

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<sup>46</sup> It is interesting to observe here how in contrast the last chapter, the optimistic medical vision remains shielded from critique because the enhancement vision appears much more problematic in comparison. (Thanks to Ulrike Felt for pointing this out)

<sup>47</sup> In the “Making futures present” project, we used to refer to the diversity within the nanofield with the phrase “Nano is not like nano”. I use this phrase here to describe how—and to which effect—participants drew distinctions between different nanotechnological fields and applications.



enhancement chip resemble clothing and pacemakers. Hereafter, a controversial analogy with vaccination will lead on to analogical discourse about sport doping. And finally, we encounter the use of analogies with the movements against GMOs and vaccination to again plausibilize the collective rejection of enhancement in the future. The chapter ends with a reflection on the uses and usefulness of these analogies as well as a broader discussion of the dilemma of compulsory enhancement that characterizes the debate about performance enhancement.

## 6.1 Constructing undesirable and implausible enhancement futures

### Excerpt 7

- 1 David: To come back to the card, why I chose the card. I've always been a huge fan of Data. And this simply sounds so absurd that I really can't imagine that this will ever become reality someday. And if it does- then it's actually quite a frightening thought, if you read that, controlling aggression, the soldiers, and is all high speed (laughs) and then you push the button or- and then the nanobots come quickly and reassemble him.
- 2 Franz: Fan of what?
- 3 David: Well, when the soldier then, there it says you can control fear and aggression.
- 4 Franz: Card three? Or what?
- 5 Christa: Fan of Teta? Did you just say that?
- 6 David: Of Data from Star Trek.
- 7 Christa: Oh, I see, okay. (Med, 1228-49)

This section explores how enhancement futures were constructed as undesirable and implausible with the help of various analogical resources such as science fiction in the group discussing nanomedicine. At the beginning of excerpt 7 above, David explains his choice of application card #3 with his fascination for Data (1), a human-like robot (android) with a brain chip enabling him to experience human emotions from the popular science fiction series *Star Trek* (6). With this *analogical reference* to a character from science fiction, David underlines his argument that the enhancement vision is implausible (“can’t imagine that this will ever become reality”, “absurd”), which is also entangled with a negative appraisal of the enhancement chip (“frightening”). Thus, by depicting the enhancement vision as implausible, he rhetorically averts this undesired future. In the second part of turn 1, David then elaborates the idea from the card by imagining a scenario in which soldiers are controlled, both on the level of emotions and performance (“full speed”). The way he narrates the scenario brings a person playing an ego-shooter computer game to mind<sup>48</sup>. The word “button” metaphorically conveys the aspect of controlling

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<sup>48</sup> Note that there also exist computer games featuring nano-enhanced soldiers (Milburn 2010)

another person, but it literally could also stand for the button(s) necessary to play computer games. David's scenario ends with an interesting twist that is likewise reminiscent of computer games, in which players may be able to repair or heal their avatars with technologies. David thus constructs the implausibility of the enhancement scenario by likening the enhancement vision to science fiction and by narrating it like playing a computer game.

We also see in the following turns, especially in 2 and 5, that the science fiction repertoire David invoked with his Data reference is not immediately understood, and hence not shared, by other participants. Despite the fact that science fiction is used as a key repertoire in citizens' talk about nano (Davies 2011), drawing on science fiction can thus be problematic in a heterogenous group context<sup>49</sup> in which not all participants are familiar with such rather specialized science fiction repertoire, in contrast to analogical references to cases taken from a national technopolitical history. As is evident in excerpt 7, the Data analogy does not lend itself for the construction of what I termed *cultural analogies*; that is, analogies that are corroborated by the fact that they evoke a shared cultural knowledge base.

A similar entanglement of undesirable and implausible futures emerged a little later in the same group, when another vision of human enhancement was debated: the idea to extend life via the application of nano or other technologies. Here, participants collectively carved out that the quality of life should be more important than its length, thereby deconstructing the assumption that attaining "eternal life" is worthwhile.

### **Excerpt 8**

1 Franz: Also to extend life into eternity.

2 Christa: Yes, what for actually?

3 Franz: We have to go more into the qualitative areas.

4 Christa: More about what kind of life.

(... ...)

5 David: Well, if someone has found the cup of everlasting life, he wouldn't let go out of it all too quickly, I think, and he wouldn't make it available to somebody else.

(... ...)

6 Franz: If there is the possibility of everlasting life, then there will also be means to say, I'm going to switch off the button, that's it, I don't like it. This would also be possible for people (...) then people would say: switch off the machine. (Med, 1309-41)

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<sup>49</sup> If we were to integrate contextual knowledge, we might find it relevant that there is an age difference between David and Franz/Christa, with David being considerably younger than the other two discussants.

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In excerpt 8, Franz and Christa reframe the vision of living longer as not desirable per se. As a consequence, a future in which people would not have access to technologies to extend their lifespan becomes less problematic, but on the other hand, a scenario of compulsory life extension—that is, if people were forced to live longer—would constitute a problem. It is this problematic future that has to be dealt with, and which leads David (5) and Franz (6) to make *implausibilization moves*: Both accounts are attempts to depict compulsory enhancement as undesirable as well as implausible in the future. David does so by arguing that knowing how to prolong life is valuable and thus will not be easily shared—a prediction corroborated by current knowledge of the monetary interests coupled with medical technologies. Franz, by contrast, displays himself as convinced that there will always be a possibility to make a decision about the end of one's life. By presenting the scenario of compulsory life extension as improbable, both participants suggest that the group should not worry about a compulsory enhancement scenario becoming reality. Note that they do not challenge the technical feasibility here, and turn to imagine social factors that prevent the compulsory enhancement scenario. The way in which they construct their predictions of the future thus clearly gives notice that they do not want the future to turn out like a compulsory enhancement scenario. Although lacking an explicit analogical device, the intended effect is similar to the one in excerpt 7, because the discourse also achieves to present undesirable scenarios as implausible based on an assumed shared knowledge of how technological innovations emerge and the social aspects that curtail their societal uptake. In general, participants in both groups mobilized various arguments to render enhancement scenarios implausible or undesirable. Among those were, for instance, arguments that the chip would engender negative socio-cultural changes (such as homogenization of knowledge and thus culture), threaten people's identities and autonomy (if it were to merge with the brain), or would not be feasible because the body acts as a natural boundary to the chip's application (for more see Felt, Schumann, and Schwarz 2013).

Much of the talk about enhancement scenarios, particularly with respect to manipulating emotions, is talk about how to prevent them from materializing. Analogies are not only central devices used to make the realization of enhancement futures appear implausible but also to present other, more desirable scenarios as plausible. An example of such an attempt can be found in a later phase of the medicine discussion, where the debate came back to the enhancement visions. In the following excerpt, Franz first distinguishes different nanotechnological applications fields and then draws an *analogy with lobotomy*.

### **Excerpt 9**

Franz: There could be other things that might be morally much more problematic than coatings. Like this tinkering with behavior or the stimulation of nerves, or suppressing aggressive behavior. Then we'd enter the same debate like with lobotomy in the Sixties or whenever that was. And then there'd be a debate. But the point is that it's not just about miniaturization or scaling down. That just enables things from which we've kept our hands because of bad experiences thirty years ago. But about which we think differently now. (Med, 3052-60)

First, at the beginning of this account Franz distinguishes nano-coatings from nano-enabled enhancement, which allows him to evaluate these applications differently—I call this a *nano is not like nano* move. Differentiating between nanotechnological application fields is a rhetorical move we encounter frequently in the group discussions about nano, typically followed by a critique of a specific application or field. It works as a strategy to pre-empt allegations that one is against innovation or nanotechnology as such when voicing critique of a specific nanotechnological application. In excerpt 9, enhancement is distinguished from existing nano applications, but we also find instances where various forms of enhancement are assessed on different grounds (we may then speak of an *enhancement is not like enhancement* move), as the following utterance that was voiced right after excerpt 7 shows: “And haven't all of us dreamt, when the next day there was going to be a test at school, that you could simply plug in the chip? (Two lines omitted) But this is, this is bad though.” (David, Med, 1257-9) Here, David imagines what could be called a lexicon chip that gives its user an immediate knowledge gain, and he contrasts this enhancement vision, portrayed as desirable, to the negatively-evaluated emotion control scenario from the application card, thereby signaling that he is not generally against enhancement but just rejects certain kinds of enhancement.

Coming back to excerpt 9, after Franz splits nano into different fields, he compares the enhancement chip to *lobotomy*, a neurosurgical procedure for psychiatric conditions that ended up being widely rejected by society because it affected patients' personalities and autonomy. The analogy thus predicts a future scenario in which the enhancement chip (more specifically, a chip to control emotions) might follow a similar trajectory and be widely rejected after a public debate. By mobilizing this *historical analogy* and explicitly referring to “bad experiences” back then, the established negative moral judgment of lobotomy is transferred onto the enhancement chip, and it is thus made to appear equally morally questionable. The analogy tries to make certain societal responses towards the emotion control chip more plausible than others, and by anticipating a public debate it also indirectly calls for such a debate to start if the chip application would become feasible. Unfortunately, the moderator shifted the debate onto a different subject after Franz'

account, thus we cannot discern whether the analogy had any effect on the enhancement discussion.

## **6.2 Rejection analogies: Imagining a performance enhancement chip to be (un)like coffee, academic enhancement, and drugs**

While the preceding section revolved mainly around enhancement chips used to either manipulate human emotions or to provide its user with a knowledge gain, a large part of the debates about enhancement in the two groups focused on the issue of performance enhancement via a nano-enabled brain chip implant. In the ICT group, the moderator asked the participants what a chip that could make them faster and increase endurance would change. The moderator's question hence already implied that there would be some kind of change through the enhancement chip in the future. The following excerpt demonstrates the group's response.

### **Excerpt 10**

- 1 Agnes: Well, competition will become stronger.
- 2 Benjamin: I mean this already exists, a stupid example that comes to my mind, concerning endurance enhancement. I mean everyone who drinks coffee in the morning, coffee is everywhere, it's actually nothing other than a kind of minidoping. In the sense of I'm tired now and I have to work in the morning and I better drink a coffee to be more productive.
- 3 Christine: But there are studies that show that your concentration is not improved with every cup of coffee you drink. Excuse me, that's just an objection.
- 4 Daniel: (...) I never drink coffee (...) But I observe it with those who come to work totally exhausted, you aren't allowed to talk to them before they had two cups of coffee. (...) They already assume that they need coffee to be productive.
- 5 Benjamin: Like a placebo.
- 6 Daniel: Yes, like a placebo.
- 7 Benjamin: Well, if it works, it works. Well, they could do the same with the chip. You say you want such a chip (...) and it works like a placebo and you think: wow, I'm really clever now (laughs) and because he thinks that and believes in it, he might really be better. (ICT, 831-859)

In turn 1, Agnes imagines the society-wide use of performance enhancement chips to amplify competition, which implies two things: First, that she already considers competition to be a part of present-day society, and second, that the chip will also be different from current means of performance enhancement, since otherwise competition would stay the same—she thus also 'obeys' (or agrees with) the moderator who proposed that there would be some kind of change. Benjamin, then (2), follows up on Agnes' first

point, and he makes *two analogical moves* that contest Agnes' account. In a first analogy he *likens the chip to drinking coffee* (i.e. the chip is not fundamentally different), which he presents to be a widely practiced and thus accepted means to stimulate productivity. If this analogy were accepted as truthful, it would suggest the societal acceptance of a performance enhancement chip. His second analogical move—calling drinking coffee a “*minidoping*”—consists of simultaneously comparing drinking coffee to but also distinguishing it from doping. That is, drinking coffee is presented as sharing the underlying idea of stimulating performance with doping, however, the prefix “mini” entails that it is also considered less powerful in its effect. This analogical discourse suggests that despite the perceived similarities, the three practices or techniques that are called upon—drinking coffee, doping, the enhancement chip—might also be different in quality, with one being stronger/weaker than the other, which then may allow for their different assessment (e.g. coffee can be accepted and the chip rejected). Benjamin's account thus raises the question of whether the quality of enhancement should be used as *tertium comparationis* (then enhancement can also not be like enhancement) rather than the idea of performance enhancement as such. The fact that Benjamin introduces his coffee-chip analogy by calling it a “stupid example” indicates that he at this point does not intend to build a strong analogical argument but rather opens this issue up for negotiation.

From turn 3 to 7, the group debates whether coffee actually represents an effective means for performance enhancement and is thus living up to its alleged effect. This is relevant because if coffee were agreed to be ineffective it would not offer itself as a comparative case for an effective enhancement chip. By mentioning scientific evidence, Agnes challenges the claim that coffee is effective—and thus also challenges the usefulness of the analogy (3). Then, Daniel first orients to Agnes' account by stating that he does not consume coffee himself, which could be taken to imply that he believes or at least does not contest the scientific evidence she invoked. In a next move, he points out coffee's addictive potential—a negative side-effect—, which he tries to corroborate by claiming to have observed his coffee-drinking colleagues at work (4). This personal anecdotal evidence is thus given the same weight as the formal scientific evidence. Benjamin accepts the truth of David's observation, but he draws another conclusion, namely that coffee—in line with Agnes' claim—does not really work and thus any positive effects people ascribe to coffee may be based on a placebo effect (5). Daniel agrees with Benjamin's placebo theory (6), and in the final turn, Benjamin argues that even if coffee works like a placebo, it still has some relevant effect, which leads him to imagine an analogous scenario for the chip (7). This *analogy-based scenario* could be interpreted as his hope for the chip to have no other than placebo effects, which would make it less problematic. Simultaneously, however, his

scenario entails that the chip is handled like coffee in today's culture and hence is framed in rather unproblematic terms. In any case, excerpt 10 shows that discussing the chip against the background of what is known about the performance enhancing effect of coffee—or its lack thereof—has shaped how Benjamin imagines the chip. Talking about coffee has also focused the debate on the individual implications of enhancing oneself, thus backgrounding wider ethical and socio-cultural issues.

A little later, the moderator explains the promised effects of the performance enhancement chip in more detail, which reminds Christine of a former school colleague who used performance enhancing drugs during her studies.

### **Excerpt 11**

1 Christine: I mean a school colleague who was studying for a double degree has been living with it already back then at the beginning of the Eighties. I don't remember anymore what it's called this drug that strengthens your stamina, extends the waking state so that you can absorb more in preparation for an exam. I don't know. You could get it at the pharmacy without a prescription. She of course applied it only when needed. Because I also assume that it's not particularly healthy when taken regularly.

2 Benjamin: Yes, that is similar to the caffeine thing or Red Bull is also caffeine.

3 Christine: Yes, yes.

4 Benjamin: What I was just thinking, because you asked about my concrete situation. What would happen tomorrow, if I had such an operation today (...) Well, I think I would simply work more. It would mean that people would work more. Now, here, in our society. But that doesn't mean that they would be happier because of it.

5 Christine: Yes. That's why I think I would need a second chip for art and culture, because I always like that as a counterbalance. To take this to the point of absurdity now. (ICT, 1043-67)

In turn 1, Christine draws an analogy with the use of neurocognitive enhancers, more specifically prescription free drugs, in academic contexts. In doing so, the idea of enhancement via a chip is again not presented as fundamentally new or problematic. She also stresses that her colleague used these enhancers selectively, because she assumes that permanent use might not be healthy. This makes Benjamin recognize a similarity between neurocognitive enhancement drugs with drinks containing caffeine such as coffee and Red Bull (2), to which Christine agrees (3). These existing and culturally accepted forms of enhancement are identified as sharing the normative fact that they should only be used occasionally in order to avoid health risks or potential side effects.

Although it could be argued that the chip differs from these existing means because it is implanted in the body, which could be seen as an unhealthy kind of permanent enhancement, the participants do not explicitly establish this distinction at this point. Note

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that the chip is not mentioned until turn 4. In turn 4, Benjamin then envisions how having a performance enhancement chip implanted would change his own life and society more generally in negative terms (working more but not being happier). He thereby provides a cautionary scenario that portrays the chip in a more negative light. In doing so, he affirms the moderator's assumption that the chip will induce change, since he envisions the chip as enhancing performance more effectively than existing substances—otherwise it would not be able to induce cultural change (making society more work-focused)<sup>50</sup>. Although Benjamin does not explicitly argue for a disanalogy, his account is based on the presumption that the chip differs from existing enhancement means by having more powerful effects. Put differently, Benjamin follows the insight gained by the analogy with academic enhancement that enhancement enables people to work more. In this respect, the chip is similar to existing means of enhancement because many of them are used to achieve this end, but in terms of effectiveness, Benjamin imagines the chip to differ substantially from these existing means—a *tertium comparationis* already implicit in his “minidoping” from excerpt 10. He thus bases his scenario, and his assessment of the chip, on a simultaneous analogical and disanalogical move in which he grants the established dissimilarity more weight. In short, the chip is like coffee (same idea), but it is imagined to differ from coffee in a more important way (effectiveness). The point here is that the chip has to be distinguished from the culturally more or less accepted means of drinking coffee or occasional academic enhancement to construct a scenario that makes a future with the performance enhancement chip appear undesirable.

A negative assessment of the enhancement vision is also manifest in turn 5, where Christine pursues the scenario work. She envisions an absurd scenario in which another chip has to compensate the lack of counterbalance in people's lives induced by the performance enhancement chip. Then, in an interchange I did not include in the above excerpt, Benjamin and Daniel follow Christine's example by ironically predicting that people might get quickly bored due to the chip, and thus another chip would be needed to “switch off boredom” (Benjamin: 1074). With their hyperbolic scenarios of potential negative side effects, the discussants frame the chip as an imperfect technology that will lead to a vicious circle calling for more and more technological fixes. The group has thus managed to playfully (there is a lot of laughter) present the performance enhancement chip in a negative, undesirable light.

Afterwards, the moderator inquires what the group would imagine the chip to do with their personality, which follows the established logic that the chip induces change. In reaction, Christine argues that she would feel “telecommanded”, after which she speaks of

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<sup>50</sup> This also implies that he sees certain values, such as giving work priority in life, inscribed in the chip.



her present reluctance to take medication, which thus works as evidence that she also would not carelessly embrace the chip. Daniel, then, claims to likewise refuse the chip: “I wouldn’t take it, either” (1087); and after the moderator inquires for his reasons, he corroborates his claim mentioning that he has never in his life smoked, drunk alcohol or coffee (see also turn 4 in excerpt 11 above), because he likes to have control over himself (1092f.). The two discussants here invoke their avoidance of these substances as *analogical proof* that they would deal with the enhancement chip similarly. Since they already consider the aforementioned substances to be problematic and thus worth rejecting, they do not need to distinguish but rather to make the chip resemble them, to underpin their argument for the chip’s rejection. The discourse is also designed to predict their strength in being able to resist the alluring promises of the chip. A similar example can be found in the medicine group, where Franz avoided drawing a distinction between the chip for controlling emotions and alcohol or drugs.

#### **Excerpt 12**

Franz:           And this deactivating our fear of the future, we do this by getting drunk. We do this every day, yes. And if there are other things than beer, then some would take that. Some may be left who’ll get stoned or something, what do they call that there, at the Karlsplatz? (Med, 1350-4)

There is no need for a distinction here, since likening the chip to excessive alcohol consumption or drug abuse already achieves the effect of framing the chip negatively. The analogy to drugs is established by Franz’s reference to “Karlsplatz”, an area in Vienna renowned for its drug addicts. Moreover, Franz’s account depicts a qualitative difference of enhancement substances, where drugs clearly rank higher than beer in terms of effectiveness. It is implied that the chip as an even more effective way of enhancement will also find its customers, but since Franz evokes the picture of drug addicts, the future he paints for these customers is a bleak one. Like all the other examples presented in this section, Franz thus envisions an enhancement future that should be avoided. This section shows that both analogies and distinctions are constructed to achieve a negative framing effect that legitimizes their rejection of the chip in the future.

### **6.3 Acceptance analogy I: The chip will turn out like mobile phones**

While I presented a variety of accounts above that were designed to engender rejection scenarios, there also exist instances in the material where acceptance analogies are constructed. The next two sections will present such acceptance analogies. First, we encounter such an example when we enter the debate in the ICT group, right after Daniel

explained why he would reject the chip. As we see in the first turn of the following excerpt, the moderator challenges Christine's and Daniel's claim that they will have a choice to reject the chip by anticipating that social pressure could arise to adopt the chip if it were more widely used.

**Excerpt 13**

- 1 Mod: And if a lot of people in the environment where you work were to get that done and then the performance difference between yourself and your colleagues would become greater.
- 2 Daniel: Okay, let's start from this assumption now, the boss comes and says: somebody has to go or something like that. Well, then it's somewhat unpleasant. But in the end I would go then, I think. The same with: Come on, drink a beer with me! Yes or no? If not, then goodbye. This is just this group thing.
- 3 Agnes: I think he would quickly encounter this compulsion to consume. 15 years ago only a few had mobile phones, then this huge wave came and now everybody has at least one mobile phone (laughs) And that's this pressure to consume. You have to take it then because everyone has it. And if everyone has it, it's hard to resist it, I think. (ICT, 1095-1108)

Although Daniel (2) accepts the moderator's scenario, he tries to re-imagine it in a way that would allow him to resist group pressure ("this group thing"). First, he claims to be willing to lose his job rather than to adopt the enhancement chip. Then, in a second move he compares the scenario with an invitation to join in drinking beer in a work context. Here, the chip is again likened to beer, and since he argued earlier that he would refuse beer, the analogy is used to plausibilize his analogous rejection of the chip. Put differently, he is saying something like "Hey, I can withstand beer, so I can also withstand the chip". His reaction indicates that he takes the moderator's account as a way of expressing doubt about his own willpower. Thus, what he is doing in turn 2 above is to reestablish his identity as someone who is independent and strong-willed. In order to obtain this effect, he uses the beer analogy to envision a scenario in which freedom of choice still exists. Deciding against the chip also entails disadvantages in this scenario, but Daniel presents himself as willing to accept these. In turn 3, then, Agnes counters the plausibility of Daniel's scenario by bringing up an alternative analogy with mobile phones. In this analogy she constructs a scenario in which a "pressure to consume" and hence to accept the enhancement technology appears plausible. By using the metaphor of a wave, she additionally conceptualizes this process as a natural force against which the individual is rather powerless. Agnes thus challenges the idea that individuals might still have a choice to decide over the uptake of the enhancement chip. She thereby follows the moderator's

reasoning and acts as an ‘obedient participant’ who accepts the moderator’s expertise (see also the first turn in excerpt 10, where she performed similarly).

In its entirety, excerpt 13 illustrates that the choice of analogy is crucial because it enacts a different potential for individual resistance towards the chip technology. Additionally, we see that this choice is neither random nor based on pre-existing opinions, but foremost intertwined with participants’ presentation of themselves in the ongoing interaction. Daniel wants to display his strength in resisting the lure of the chip and thus draws analogies that allow for this scenario to appear realistic. The mobile phone analogy, by contrast, suggests a scenario in which such a non-participation becomes unlikely. By imagining a scenario that corresponds with what the moderator claimed before, Agnes takes the ‘safe route’ as it is very unlikely that the moderator would contest her account that is built on the moderator’s own claim.

#### **6.4 Acceptance analogies II: Likening enhancement chips to clothing and pacemakers**

This section continues to explore the role of acceptance analogies. In the following, we will encounter how analogies with clothing and pacemakers were used to destabilize existing distinctions between enhancement and accepted cultural means or medical technologies, and how in turn participants tried to reestablish a distinction that allows a rejection of the enhancement chip. We enter at a later point of the discussion in the ICT group, when Agnes raises a question inspired by the issue card titled “Ethics”,<sup>51</sup> which to her addresses nanotechnology’s potential to “interfere in creation”<sup>52</sup> (1778f.), and then she draws a parallel between gene technology and nanotechnology, as we see in turn 1 of the next excerpt.

##### **Excerpt 14**

1 Agnes: Nanotechnology as well as gene technology, I think they’re almost the same. Well, to what extent are we allowed or can we improve ourselves as human beings? Or are we as human beings ourselves transformation? Yes.

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<sup>51</sup> The text on the card was: “Ethics is concerned with finding answers to questions about values and norms. Should ethics play a bigger role in the debate about nano respectively information and surveillance technologies? What could ethics contribute to this discussion?”

<sup>52</sup> Her wording (“creation”) here could bear a religious meaning, but—as she clarifies later—she uses it to refer to a natural or original state of the body because she wants to discuss whether “human beings are made in a certain way” (2096f.). Generally, religion is hardly ever employed as an argumentative resource against nanotechnological developments, except in a negative way (see Daniel’s argument below).

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2 Benjamin: Here I have a stupid question. (.) Okay. When I imagine myself in the Stone Age, the first thing humans did was to dress themselves in a warm fur, so that they wouldn't freeze. (collective laughter) Isn't this also a modification of humans? (collective laughter) And now the nano chip, well, it's 100 times stronger, but it's the same idea actually. (.) this is a provocative question. Sorry. (ICT, 1779-87)

Agnes' analogy indicates that she conceives of nanotechnology and gene technology as having the same potential to change human beings. What she presents for debate is whether "we as human beings" should use these technological means for enhancement or whether human existence should be understood as change par excellence. Answering the second question with a 'yes' would have far-reaching consequences for the evaluation of human enhancement: if enhancing ourselves is understood to be a fundamental part of who we are, and we have always enhanced ourselves, why stop now with the enhancement chip? Benjamin follows up on her questions with another question (2). By introducing this question as "stupid" he counteracts potential critique in advance. He then presents a thought experiment in which he travels imaginatively back into the Stone Age, thus setting the scene for a temporal comparison. Next, he narrates from a detached observer perspective that "the first thing"—implying that it suggested itself—humans did was to use fur as clothing to protect themselves from the cold. The question he poses is whether this could or should already be seen as "a modification of humans", and thus might resemble the enhancement chip. The collective laughter before and after his question indicates that Benjamin was right in anticipating that his question might appear odd. He continues his argument with a *(dis)analogical move*: first, he acknowledges a difference in effect (a concessive move), namely the nano chip is "stronger" than fur (consistent with his claim in turn 4 in excerpt 11), but then he proposes an analogy based on a different tertium comparationis ("same idea")<sup>53</sup> to be more relevant. This analogical argument suggests that one should give up the distinction and accept the analogy that *human enhancement is like clothing*. Benjamin's apology at the end of his turn shows his awareness of the controversial character of this analogy—he in a way signals to the group that he is playing the devil's advocate<sup>54</sup> and that this should not be taken as his personal opinion on the issue.

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<sup>53</sup> When comparing this with his coffee-as-a-minidoping analogy before, we encounter some similarities in the construction of the argument. But we also saw earlier that Benjamin constructed the argument in the exact opposite way when he proposed that the chip's better effectiveness matters more than having the same underlying idea.

<sup>54</sup> In later moments in group discussions, more vocal participants sometimes tend to play devil's advocate, which means that they on purpose present provocative positions differing from all the others in order to stimulate debate (Myers 2004: 129)

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But what is it that the analogy enacts that makes it so “provocative”? The answer is, I propose, that if the chip is understood like clothing, refusing the chip would come close to rejecting cultural progress and civilization as a whole: Who would refuse clothing, something that is virtually accepted all over the world? The culturally accepted status of clothing is thus transferred onto the enhancement chip, suggesting its acceptability. Distinguishing human enhancement from materials or technologies that are applied outside the human body has been suggested in academic discussions to make debates more productive. Hence, definitions of human enhancement generally do not include “the mere use of tools; that would render the concept impotent, turning nearly everything we do into cases of human enhancement. But if and when these tools are integrated into our bodies, rather than employed externally, then we consider them to be instances of human enhancement.” (Lin and Allhoff 2008, 253) Benjamin’s analogy thus challenges the very definition of human enhancement, and this is indeed a provocative move. Immediately after Benjamin’s turn, Agnes admits to being still unsure about how to answer this question, but she also begins to tentatively establish the distinction that is at the core of the enhancement definition.

**Excerpt 15**

- 1 Agnes: Well, I haven’t thought about that yet (laughs) I have to ponder, if- if I put something on my body or if I put something in my body, that is maybe-
- 2 Christine: [Right.  
(Cross talk)
- 3 Daniel: (... ..) Well, I think every new invention gets into ethics. Then they always say, they don’t want that.
- 4 Mod: There was a question that is maybe relevant. It was the question whether it matters if it’s inside or outside my body.
- 5 Christine: Well, for me it’s a huge difference.
- 6 Daniel: Very well, then we come back to religion. The Jehovah’s Witnesses, well, they don’t take blood and all sorts of things. This is also resistance against technology.
- 7 Mod: Yes, but religion is just- is certainly an aspect here. But I think, what you said: it makes a big difference, if I understood you correctly?
- 8 Christine: Well, yes. Because I think, like Benjamin said, fur has a protective function, as a heat accumulator, but it’s not like a chip, which might provoke a counter reaction in the body or (...) For me it’s an- an intervention. Everything applied subcutaneously is simply a- a- a kind of modification. (ICT, 1789-1822)

In turn 1, Agnes states that Benjamin’s analogy makes her start to reflect whether there might be a relevant difference between putting something on the body or inside the body. By posing the question in this way, she already challenges the analogy and constructs a potential distinction. Christine (2) validates Agnes’s proposition, followed by cross talk—a

sign that a significant issue is being discussed. Daniel (3) manages to take the floor and utters a longer statement of which I cut out several lines in the above transcript. In these lines, he basically argues that older and younger people assess innovations differently, and that the new is always encountering resistance by the older generation, who, he claims, raise ethical arguments against innovations.<sup>55</sup> Then, the moderator attempts to steer the debate back to the question about the outside/inside difference (4), to which Christine reacts immediately, stating that to her—thereby presenting her account as a personal opinion and not a general or factual statement—it makes a “huge difference” (5). Christine thus explicitly rejects the fur analogy and reestablished the distinction necessary for defining human enhancement in the aforementioned terms.

With his next turn (6), Daniel challenges Christine by implying that her argument resembles those of extreme religious groups that reject certain medical interventions such as the Jehovah’s Witnesses. He here not only conflates religion and ethics but also presents religiousness to be synonymous with anti-technology positions. In doing so, he also ascribes resistance towards technological innovations to Christine. In contrast to Christine, who displayed her personal opinion (“to me”), Daniel—by not accepting her opinion—enters into an argumentative mode of debate. There is also an implicit analogy in his account when he speaks of medical interventions, thereby silencing the potential difference between enhancement and medical applications.

Again, the moderator directs the debate away from Daniel by asking Christine to elaborate (7). Christine, as requested, takes the next turn, in which she mobilizes a health argument by mentioning her concern over potential negative counter reactions the chip might cause in the body—she thus enters the argumentative mode of talking and accepts the medical framing that Daniel has established (8). By emphasizing that she cares about health risks Christine also manages to refute Daniel’s imputation that her opinion resembles that of Jehovah’s Witnesses, whom he portrayed as caring more for their religious views than their own health. In contrast to the implanted chip, Christine considers fur that is applied outside the human body not as problematic but rather positive (“protective”). It then seems as if Christine wants to bring up further arguments against the chip, yet she simply finishes presenting once again her personal opinion that the chip is an “intervention” in contrast to clothing because it is implanted. Rather than continuing in the argumentative mode, she thereby signals that she just wants to display her opinion

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<sup>55</sup> We already encountered another argument that mobilized “ethics” in a different way in the previous chapter, when Bruno claimed that everybody has different ethics to argue for a peaceful coexistence of different opinions.

without having to further corroborate or defend it.<sup>56</sup> Yet, she is unsuccessful in this attempt, because Benjamin continues to play devil's advocate and stays within the argumentative mode, as we see in the next excerpt.

### **Excerpt 16**

1 Benjamin: And what is a pacemaker?

2 Christine: Oh, yes. Okay (laughs)

3 Benjamin: Well, for me, I changed that also a little bit during the discussion, it's something good that helps me.

4 Christine: Here in the extreme case, yes, yes, okay, yes.

5 Daniel: Or vaccination. Totally normal.

6 Benjamin: Or vaccination.

7 Christine: Yes, in the extreme case, if I cannot do anything else, well I mean the question swine flu or not, well it's not really a question for me, it's a clear no. But in cases, where it can prolong life and make things easier, simpler or more livable, it's MORE a yes. In the case of an emergency. But not unconditional support from the outset.

8 Benjamin: Well, where you can really say later, measurably, I have had a benefit, for instance lived longer.

9 Christine: Yes, yes.

10 Benjamin: Whereas a chip that, I don't know, that is used for nothing other than advertising or something similar, is nonsense simply.

11 Christine: Yes. (ICT, 1824-51)

Benjamin (1) challenges Christine by mentioning a medical technology that is applied subcutaneously like the enhancement chip but widely accepted in the Austrian context: a pacemaker. Given that Christine invoked the inside/outside distinction as a relevant *tertium comparationis*, the enhancement chip indeed is similar to a pacemaker in this respect since both are implanted in the body. Following this reasoning, Christine would also have to accept the brain enhancement chip. Her argument is thus exposed as logically fallacious—and Christine herself realizes that her argument does not hold in this argumentative framework (2). The interchange so far demonstrates that the rejection of the enhancement chip cannot be successfully argued in a logical manner merely by a reference to its status as an implant, because this can always be countered with the fact that medical implants such as pacemakers are broadly accepted. As I indicated in the introduction to this chapter, this acceptance of medical implants was also performed in the group when the application card #3 was discussed for the first time. Considering Daniel's account from the preceding excerpt, Christine would again run the risk of appearing like a Jehovah's Witness were she to argue against implants of any kind, which by the way would also not be in line

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<sup>56</sup> Cp. Bruno's similar move in the chapter on nanomedicine.

with her claim to care for her health. The inside/outside distinction thus does not work well as an argumentative resource against the enhancement chip without distinguishing the enhancement chip simultaneously from medical implants.

Christine now finds herself in a face-threatening situation because her argument has been exposed to have logical flaws—her laughter also indicates that she has to cope with this situation. In reaction, Benjamin (3) seems to make a concessive move by entering into Christine's preferred opinion-display mode. But at the same time, he reinforces the argumentative framing with his claim to having changed his opinion during debate. He presents himself as someone who was moved by convincing arguments and he thereby urges Christine to do the same and give in to the logical argument he presented her with. Christine (4), however, is reluctant to comply and tries to distinguish the enhancement chip from the pacemaker by calling the latter an "extreme case", where intervention is legitimized, which implies that there exist other cases (the enhancement chip might be among these) where she would not tolerate an intervention. She thus introduces a new *tertium comparationis* based on the "extreme case" idea, which may allow her to uphold her rejection of the enhancement chip.

In the next turn (5), Daniel enters the new "extreme case" framing, where he demonstrates a readiness to move towards consensus. He mentions vaccination as another example of an "extreme case" where an intervention should not be rejected—a move validated by Benjamin's repetition of "vaccination" (6). The two male discussants apparently assume that Christine would consider "vaccination" also an extreme case. Although Christine seems to agree at first, she then distinguishes between different cases of vaccination, thus arguing that not every kind of vaccination can be categorized as an "extreme case" and is thus warranted from her perspective (7). She illustrates her point by referring to the debate over swine flu vaccination, which was a highly debated issue at the time of debate. While she declares that she rejects swine flu vaccination ("clear no"), she also acknowledges that other vaccinations are more acceptable ("MORE a yes"). And finally, she metaphorically conceptualizes the use of vaccination (or medicine more generally) as a way of surrendering, which should hence be carefully pondered and not instantly embraced. In short, distinguishing between different kinds of vaccination that vary in their acceptability here works as a proxy discussion to legitimize her rejection of the enhancement chip, while accepting other implants. The vaccination case also highlights the personal character of such decisions: Whether to vaccinate or not to vaccinate (at least in certain cases) is a decision that is not prescribed by the state but citizens are supposed to make their own choices. It thus corroborates Christine's preferred opinion-display mode.



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In turn 8, Benjamin appears to paraphrase Christine's argument but he also adds new meaning with "measurable", a resource taken from a scientific repertoire. His use of "benefitting" at first is rather vague—it could refer to medicine as well as enhancement technologies, since both may benefit their 'users' in certain ways—but is then exemplified with interventions that prolong life (an example that at least excluded the performance enhancement chip). Next, Christine agrees (9), and Benjamin follows this up with an example for an intervention (a chip for mere advertising) that he expects Christine to reject (10). Like in turn 5, this is a clear move towards consensus. In turn 11, Christine—as anticipated—validates his assumption. Consensus has thus been established by focusing on a chip application that presumably everyone would reject, a sort of lowest common denominator. The performance enhancement chip is no longer at the centre of debate here, most likely because the group is occupied with reestablishing cohesion after the disruption brought about by Benjamin acting deliberately as devil's advocate.

Let me summarize the important points from the analysis of the discourse about the pacemaker and clothing/fur analogies. Both analogies disintegrate distinctions that are considered central for productive debates about human enhancement: namely that enhancement should be conceived as different from the mere use of tools as well as dissimilar from medical applications, because otherwise it can easily be argued "that all forms of human enhancement are morally permissible" (Lin and Allhoff 2008, 254). Consequently, the two analogies mobilize a pro-enhancement position and challenge those who argue for assessing enhancement on different grounds. Such *acceptance analogies* are powerful in moving the enhancement chip closer to culturally accepted technologies, tools, or means. In that sense, the two analogies also work as *cultural analogies* that are hard to oppose because they invoke culturally shared values and practices. As we saw in the interaction, in order to argue for a difference of human enhancement from these other means two distinctions have to be held simultaneously or new points of comparison such as the distinction between "extreme" and "non-extreme" cases have to be presented as better means of decision-making. Moreover, excerpt 16 indicated that vaccination may work as a convincing comparative case for enhancement for it allows to argue that just like a person may not get every available kind of vaccination, certain implants (e.g. the enhancement chip) could also be refused on personal grounds without amounting to a general rejection of medical implants.

## **6.5 Arguing for collective opposition against enhancement: doping in sports, GM movement, and vaccination analogies**

A dilemma that already was present as a subtext in several excerpts above is whether human enhancement should be assessed and hence governed individually or collectively. Put differently, the question that underlies the debate is whether enhancement should be treated as a matter of personal or cultural choice. Answering this question in one or the other way has consequences for the debate about enhancement in the two groups, because if it was a matter of individual choice, displaying one's opinion, as Christine tried to do in the previous section, would be an acceptable stance, however, if enhancement was framed as a collective choice, arguments and deliberation would need to come into play to reach consensus. This section shows that there was a tendency observable in the two groups to argue for a cultural choice concerning enhancement, and that certain analogies were used to underpin claims for collective opposition if enhancement were to become more widely spread in society. In fact, a few turns after excerpt 16 took place, the moderator, apparently having sensed this unresolved issue, explicitly posed the question of whether the issue of enhancement should be a matter of individual or collective decision-making. In response, two discussants argued that in some cases collective decisions would be made but that in others individual choice would still be possible. However, talking in general terms and not about the enhancement chip in particular, they thus avoided giving a clear answer. Since this is where the crux of the matter—the dilemma—is located, it is indeed no wonder that they did not answer this question straightforwardly. At this point, Daniel picks up on the vaccination analogy that Christine introduced in excerpt 16.

### **Excerpt 17**

Daniel: I wanted to say, I think the main thing is the environment. Because when I send my child to kindergarten and I don't vaccinate it against ticks, I say: Certainly not, that's bad, but all others get a tick vaccine, then the other parents will say why doesn't he get it. Then you are almost forced to vaccinate. Peer pressure comes in here. (ICT, 1930-5)

Here, Daniel addresses the tension between individual and collective decision-making, and more particularly he claims that what the majority is doing may affect individual decision-making. The conclusion of his argument is that the individual cannot be seen as decoupled from its socio-cultural context. More implicitly, Daniel suggests that the debate over (indirectly forced or compulsory) vaccination might lend itself as a comparative case for debating human enhancement, since it is similarly controversially debated whether vaccination should be a matter of individual or collective decision-making. We will come

back to the case of vaccination at the end of this section, where it was employed for a specific argumentative purpose.

For now, we turn to another analogy that also revolves around the dilemma of individual or collective choice, and which came up in the medicine as well as the ICT group: *sport doping*. In the medicine group, an analogy with doping in sports emerged after the group agreed that nanomedicine should be available for all people rather than just a wealthy few.

### **Excerpt 18**

- 1 Franz: To me, all these examples are about, yes, then we will all want it. (...) What I see, the other thing that was also on one card. Couldn't it be (...) that a pressure would arise to also perform better? That there might be people who cannot keep up and who feel put under pressure. I think that would be a case where people would defend themselves, a kind of compulsory doping.
- 2 Christa: But that's exactly- I just wanted to say that it's nothing other than doping. Why is doping not allowed for everyone? Then the conditions would be the same again for all athletes. No, it's banned and a few, or even many still do it, because they cannot perform on the same level otherwise. That would be exactly the same.
- 3 Franz: Yes, but if it wasn't banned and if there wasn't an expert commission, if it were allowed, then there would be a social movement saying we don't want to join in that. Because anorexia isn't banned. It's harmful, it's like doping, to me it's almost the same topic. It's about keeping up in a specific professional field. And there's a broad movement against it, which is maybe not that efficient, but the attitude is more no, a line has to be drawn here. And I could imagine it here too, even if some people start with it voluntarily. To get something implanted, because it's small, because it works. There are two possibilities, like with doping: It's done openly or it's not done openly, but first there is a rumor that it exists, that some take it, that not everyone has access. That could play a role in how the public deals with it and groups may be formed that say we make a sort of Attac against nano, or something like that.
- 4 Eva: I think that sooner or later there will be scandals of some kind. Something of these developments will be incompatible with something in the body or sooner or later a complication will appear, maybe even in the long term. And (.) since it's also something where you cannot really estimate the risks. And then there could be a counter-movement, if it's out in the open or if it's like with genetically modified food, which the public perceived to have really big, big risks, that it's obvious and that we have to oppose it. (Med, 3379-3420)

In this excerpt, the group discusses a scenario of compulsory doping, in which non-enhanced people are expected to feel the urge to enhance themselves due to the indirect social pressure coming from enhanced people. Almost all accounts in the excerpt construct scenarios in which this future could be averted by collective opposition. In this case the

*analogy with sport doping* triggered the scenario work, because it already presents the group with an area where doping is perceived as compulsory. What is considered to be problematic is thus not that people are denied a technology—like with medicine (as Franz mentions at the beginning of turn 1)—but are indirectly forced to use it in order to keep up with performance-enhanced people. Franz, in particular, argues that a social movement against enhancement is inevitable in such a sport-doping-like enhancement scenario. Christa (2) also proposes an analogy with sport doping, but she still thinks along the lines of the claim for equal access that emerged in the debate over certain nanomedical applications, and she consequently inquires why doping is not allowed for all because then equal opportunities (fairness) would be restored again. In fact, Franz's first turn already implied a potential answer to her question, namely that such a scenario would not work if some refused to dope and enhance their performance via such means.

Franz then, in turn 3, highlights the inevitability of a social movement, i.e. a broad public opposition, against doping in order to avoid the compulsory doping scenario that threatens to materialize if some people were to start with enhancement. Examined in detail, we can trace *three analogical moves* in his turn. Besides pointing out the similarities between doping and enhancement, he also argues that doping is like anorexia since in both cases improvement, albeit in different ways, is presented as a guiding principle. Alluding to “harmfulness” here likewise establishes a health risk framing. Franz's main point is that in all of these cases people resist these developments (“draw a line”) for good reasons—and, concluding by analogy, he conjures a similar scenario for the case of enhancement. When doping is like enhancement, it appears reasonable to expect collective opposition against enhancement, as there exists no broad societal acceptance of sport doping practices. Franz then presents two scenarios as equally plausible: one in which the chip will be used openly, and one in which it is applied secretly like in sport doping today. Both scenarios are equivalent in the sense that no matter which of them materializes, collective opposition against enhancement is imagined as inevitable. By envisioning the second scenario in more detail, Franz predicts that the issue would become public one day and lead to the formation of a social movement resembling the contemporary Attac movement (“Attac against nano”, third analogy). In terms of the use of analogies, Franz's statement is a rare example of how several analogies are mobilized and combined in an attempt to construct a plausible scenario of a social movement against enhancement. The movement is invoked as a way to guarantee individual rejection of enhancement without facing disadvantages in everyday life, but simultaneously the movement and the implied ban of enhancement would also foreclose individual choice for enhancement.

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In her ensuing turn (4), Eva elaborates on Franz's vision of how such an anti-enhancement movement could develop, and she does so by imagining a scenario in which scandals make public the health risks of enhancement. She thus takes on the health risk framing that Franz suggested when invoking anorexia as an analogical case. Scandals are here and at other points (see Chapter 7) imagined as an effective means of closing controversial debates about new technologies by steering public opinion. Hence, scandals, particularly those involving health risks, are understood—and in a certain sense even invoked—as central agents stimulating the formation of counter-movements, policy debates, and governance responses. Eva then envisions a second plausible scenario without a scandal inspired by the GM food case. GM food is presented as a case where risks had not yet surfaced but were anticipated, and then initiated public opposition (“we have to oppose it”). The GMO protest movement is here employed as another analogical template that assists to plausibilize a future anti-enhancement movement. In short, Eva argues that both materialized or anticipated health risks should be reason enough to convince the public that enhancement has to be opposed. Yet, as the next excerpt shows, Bruno calls into question the assumed influence of public opposition implicit in the scenarios proposed by the two previous speakers.

**Excerpt 19**

- 1 Bruno: But may I pose the question now, I mean that's all okay. May I pose the question what is really being done against this food thing? If we're talking about it so much. What's really being done against it? What initiatives, what economic, political development? Where?
- 2 Eva: What do you mean by being done? It's at least a-
- 3 Bruno: [Well, I mean, I know what you mean. And that it's also on the agenda here and there. But what's really going on?
- 4 Agnes: Maybe, the selection of organic food.
- 5 Daniel: Yes.
- 6 Franz: Yes.
- 7 Agnes: But you can choose.
- 8 Bruno: Yes, okay, now we are back to: I can choose.
- 9 Franz: Yes, I mean, I can only repeat myself. Your own behavior, that you first of all don't buy it, and beyond that- because maybe nobody notices it or it's only later understood via market research, also say something and say keep that stuff to yourself, I deliberately won't buy it (.)
- 10 Bruno: That would be the same then with the chip. For example, I get it implanted or not. That's not a movement. That's a reaction.
- 11 Franz: No no, a movement can develop, when you say I've decided against it deliberately, like there are people who say, vaccination is a sham (.) or risky. That was the case with this combination vaccine, I think measles, mumps, smallpox. Then there were changes. It

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wasn't the big thing in the media, but then alternatives were offered, not this combination vaccines anymore. It was said then that it's right, that certain risk groups aren't forced to get it. In Britain it was with cervical cancer vaccination. (Med, 3422-55)

Bruno here (1) plays the devil's advocate by questioning the success of the anti-GMO movement, which Eva used as a positive analogical template for a future anti-enhancement movement. Bruno, however, does not contest the established inevitability of an anti-enhancement movement but merely its effectiveness ("what is really being done?"). In this way, he still shows himself to be on Eva's side with regard to the negative assessment of enhancement ("that's all okay"). While Eva is about to inquire exactly what point Bruno is trying to make and to defend her argument (2), Bruno interrupts and anticipates that she wants to highlight the effectiveness of the anti-GM movement in terms of its visibility in political agendas. His question "But what is really going on?" assumes that there is some layer beneath this easily observable reality where the success of the anti-GM movement might be not so clearly expressed. Agnes, then (4, 6), proposes that the GM movement has enabled people to choose organic food; that is, she highlights that the movement was successful in avoiding a compulsory GM food scenario, since the aim of the debate about enhancement is exactly to come up with convincing ways of how to avert a compulsory enhancement scenario. Two male participants agree with her (5, 6). But Bruno is not persuaded by her argument, as he maintains that this is again an argument for individual choice (8). Bruno's account is central in this excerpt because it captures that the argument for individual choice would not solve the dilemma of compulsory enhancement, which the discussion has been revolving around. But at this point Bruno and Franz start to talk at cross-purposes—presumably because Franz interprets Bruno's moves as attempts to undermine the future vision of individual and collective opposition against enhancement.

In turn 9, Franz thus begins to defend his argument that individual opposition is necessary and effective when people actively refrain from buying certain consumer products or raise their voice. In other words, Franz's account is designed to call people to action. Franz here still seems to talk about the GM case and its entangled logic of individual consumer choice, but Bruno (10) transfers Franz's scenario onto the enhancement chip ("implanting or not implanting"). Bruno's claim that this is not a "movement" indicates that he perceives Franz's scenario not as an example of collective (i.e. "movement") but of individual decision-making. The GM food case differs from the sport doping case, because there exists no complete ban of GM food in supermarkets. Rather consumers may decide individually whether or not to buy GM or organic products. While Bruno obviously tries to make sense of why the GM case does not map neatly onto

enhancement, which may help to solve the dilemma the group is attending to, Franz continues to defend his argument that “movements” can have an effect and that people should therefore voice opposition and actively resist certain technologies. Franz tries to further support this claim by mentioning the resistance against compulsory vaccination as *analogical evidence* for the power of citizens’ counter-movements—his account is designed to show that opposition has been effective in the past (10). But, inevitably, the vaccination case also brings with it a certain framing. In the cases Franz presents, vaccination as such was not questioned (by contrast the group resists enhancement as such), but the fact that one way of giving vaccination was standardized for all people, not taking into account certain risk groups. Similarly to the GMO case, then, the movement is presented as having mobilized around health concerns and the analogy entails such a health risk frame. It is thus implied that health risks may best stimulate public opposition.

In sum, both excerpts analyzed in this section illustrate participants’ hope for a movement against enhancement if the enhancement chip vision were to become reality one day. The movement stands for a collective rejection of the chip, a rejection that is conceived to be essential to avoid an obligatory enhancement scenario. Several analogies were mobilized in participants’ attempts to argue for the development and plausible success of such an anti-enhancement movement, among them only the GM movement analogy was openly challenged. This was the case because the result of the anti-GM movement—individual consumer choice—is at the heart of the obligatory enhancement dilemma the group anticipates: The dilemma emerges for those who refuse the enhancement chip, if others choose to apply the chip. Arguing for individual choice may work in the case of GM food because the consumption of GM foods by a part of the population does not generate the same kind of social pressure that chip-enhanced people would. Even though a GM analogy may thus seem of limited value for the debate about enhancement, we have to take into account that from an action-oriented perspective it was introduced as a positive template for a successful movement (excerpt 18, turn 4). This makes it a good case in point for analogical agency, namely that it steered and influenced the debate later in ways that clearly exceeded its originally intended function, leading to misunderstandings between the discussants.

## **6.6 Mobilizing health risks against doping and enhancement**

The previous section has already hinted at the fact that health risks emerged as an important argument against enhancement in the group discussing nanomedicine. Drawing on material from the ICT group, this section expands on the issue by showing that the discussants here similarly envisioned that health risks can be mobilized effectively to

stimulate public opposition. In the ICT group, the moderator acted as the devil's advocate and brought up several provocative arguments at a later point of the enhancement debate. One of these arguments resembled the compulsory enhancement scenario that we just encountered in the medicine group. Note that this scenario was already present in Agnes's mobile phone analogy in excerpt 13, which—as was shown in the analysis—was also based on the moderator's framing. It was part of the moderator's agenda to deliberately pose these controversial arguments stemming from the medicine group to stimulate debate in the ICT group, which was made possible because the ICT group took place after the nanomedicine discussion group.

### **Excerpt 20**

- 1 Mod: Should we then say as a society, well, should we say NO to this segment? You said something very interesting before, concerning the discrimination card you said that it's important to you that there is access for everyone. And now I'll pose the heretical question: why don't we say doping for everyone in cycling? Everyone is allowed to dope whatever he wants and then we'll see who wins.
- 2 Agnes: Because it's harmful to your health. (...) Well, I would say that when a thing only produces benefits, I'd have no problem with it, if my performance is assisted and that's it.
- 3 Christine: For me, only in the case when I'd know for sure that there wouldn't be any side effects.
- 4 Agnes: Yes, right. If it doesn't have any side effects, I'm okay with everything. But we don't know that (laughs)
- 5 Benjamin: Well, my answer would be that the Olympic Committee as a private association has said: only athletes who don't dope are allowed to participate. (...) That's now, so to speak. And for all I care there could also exist an association that says everyone can do whatever they want here, we'll hold the Doping Olympics. That's one thing. (Collective laughter) So, and then there is the second question, but I'm no expert in doping, but that maybe doesn't matter. I think it's also forbidden by law. That's something else. And that has to do with the health issue I think. (... ..) I wouldn't mind if now a new sport association comes along and says we'll all dope and cycle around the world in a week. Then they should do it! (...) And then health comes in again, I think. (ICT, 1941-2019)

In this excerpt the group debates the issue of sport doping that the moderator introduced as a kind of proxy discussion for the debate about enhancement. In the course of the conversation, all three discussants resort to a health risks argument in order to explain why doping is not allowed. Thus, as in the debate in the medicine group, the body is imagined or called upon to regulate the uptake of a technology (such as doping). Decision-making is thereby delegated to the body, which should indicate whether a technology should be accepted or rejected by society. Concurrently, Agnes (2, 3) performs that in such an



argumentative framework, one would then have to accept doping if it did not pose any serious health risks. Even Christine, who before (excerpt 15 and 16) explicitly argued against the use of the performance enhancement chip, here claims to accept doping given that the possibility of any negative side effects could be ruled out. But as Agnes suggests in turn 4, the fact that it can never be (scientifically) known with absolute certainty whether something is safe and without any side-effects allows her to convincingly uphold the commitment to rejection under this premise. Agnes's laughter at the end of her account indicates that she is well aware that this is a very clever argumentative construct, since it always allows for the individual rejection of doping/enhancement by recourse to potential but not yet known risks.

In turn 5, Benjamin gives another explanation for why doping might be banned in sports, namely that the Olympic Committee or other sport associations have simply decided against it. Prohibition of doping here is imagined to be just one rule among others. Against this backdrop, Benjamin argues that nothing would speak against the formation of other associations with different rules (e.g. accepting doping), which could then make the "Doping for everyone" scenario invoked by the moderator become reality.<sup>57</sup> In fact, with this parallel scenario, Benjamin sidesteps the dilemma of compulsory enhancement/doping, because those who dope are simply separated from those who refuse to dope; we end up with two (or more) groups playing under different rules, so to speak. While Benjamin poses this as a feasible scenario to deal with sport doping, we have to note that he at no point argues for allowing doping (or enhancement) in society as a whole. It comes as no surprise that this scenario is not conferred to the enhancement case, as such a transfer would imply that chip-enhanced people would be separate from the rest of society (in work life), inducing the formation of a stratified society along the difference enhanced/non-enhanced. In the second part of his account, Benjamin then also draws on the health risk argument. He here ignores a point the moderator made in the omitted lines, namely that not all doping (e.g. blood doping) is harmful to health. Thus, notably, the moderator's argument is passed over as it seemingly disturbs the health risk scenario the group tries to construct as a plausible way to reach societal consensus on the collective rejection of doping/enhancement.

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<sup>57</sup> The argument that if doping were allowed and if all participants doped fairness would be re-established can also be found in debates about sport doping. It is argued that then simply the definition of performance would have to be adapted, including the appreciation of the invention and use of the best doping techniques (Birnbacher 2006, 120). This then would imply that all participants agree to doping—and this is the main difference to the performance enhancement scenarios the groups debate where not all if any want to enhance themselves.

But the debate about doping is not yet finished in the ICT group, the moderator then goes on to mention another argument against performance enhancement, namely “that the body knows why it cannot accomplish more” (2029f.). Benjamin immediately refutes this argument by stating that this is exactly the aspect which will be deactivated by the chip technology: “the body is changed in such a way that it gets stronger. This ‘it knows’ will be switched off” (2033f.). In contrast to Benjamin, Daniel agrees with the moderator’s argument: “Yes, the body signals that we should calm down and don’t do too much. So we don’t overdo it.” (2036f.). Having thus found affirmation by at least one discussant, the moderator elaborates this argument further, as we see in the following excerpt.

### **Excerpt 21**

- 1 Mod: And that the body doesn’t have a built in blood exchange as a normal function. With oxygen transfer. But it has (laughs) it doesn’t have this as a basic function, which you can simply turn on. Well, the question is what do we take in addition, well, to what extent do we say, that’s wonderful, we’ll rebuild now the body with these new possibilities? And from where on is it going to be a problem?
- 2 Agnes: Okay, when you say it like that, then I would say, if the body isn’t built for it, that it gets fresh blood (...) then you shouldn’t do it, because it’s not healthy. (ICT, 2041-51)

The moderator here uses metaphorical language that compares the body to a machine in order to illustrate the underlying conception of the body in the human enhancement discourse. But, at the same time, by phrasing this as a question, she also opens up an alternative perspective that suggests a disanalogy, namely that *the human body is not designed like a machine but from a different building plan*. She thus invites the group to question the body-machine analogy. The moderator also inquires whether rebuilding the body should be permitted by society and where a boundary should be drawn. In response, Agnes states that in this light, blood doping should be rejected, and she again mobilizes the health risk argument—again ignoring that the moderator claimed earlier that blood doping is not unhealthy. The group clearly has collectively determined and identified that health risks work as a commonly accepted argument, based on which the rejection of doping or enhancement can be convincingly argued in the given cultural context.

## **6.7 Concluding discussion**

This final section of the chapter starts out by recounting and reflecting on the (dis)analogies that were invoked while discussing human enhancement, including their framing and interactional effects. This will then lead to more a general conclusion

concerning the role of the analogies—particularly those tied to health risks arguments—in talk about enhancement.

As mentioned in the introduction, participants' first negative reactions towards the enhancement chip visions should be taken as a clear indication of their personal interest in imagining such enhancement scenarios as implausible and worth preventing. This was already evident in the first empirical section, where we encountered several devices that were mobilized to achieve these effects, such as analogies with science fiction—which were, however, not shared among the participants. Yet the debate about life extension in one group has shown that *implausibilization moves* are not always based on analogical devices: participants also use other rhetorical means to make certain futures appear fantastic and implausible. Moreover, participants tried to corroborate a negative framing of the enhancement chip by deploying *nano/enhancement is not like nano/enhancement moves* and by constructing analogies with technologies that have been collectively rejected by society (e.g. *lobotomy*).

Discussants' tendency to construct *rejection (dis)analogies* continued in the second section, where we explored how participants in the ICT group compared the chip's anticipated effect with caffeine and academic doping. Although they did not explicitly distinguish the chip from these existing stimulants, it became clear that they imagined the chip to induce socio-cultural changes, and hence to be more effective than (i.e. also different from) existing forms of enhancement. While the group here carved out that the occasional application of the existing forms of enhancement is rather unproblematic, permanent use—and the permanent chip implant—in turn was imagined to induce health risks.

This result corresponds with what has been discovered in a Canadian focus group study (Forlini and Racine 2012) that examined analogies for and evaluations of academic cognitive enhancement among different stakeholders such as students, parents, and healthcare providers. The study reports that efficiency and frequency of substance use turned out to be central points of comparisons that people drew upon in discussion; that is, for instance, continually-used performance-enhancing steroids were clearly distinguished from the occasional use of prescription medication in academic environments. Analogical discourse comparing the enhancement chip to coffee and academic performance enhancement thus assisted the discussants in the two groups in establishing this difference as a relevant one, which could in turn be used as an argument to support a negative assessment or rejection of the chip, as was the case in excerpt 11. Here, the group envisioned absurd, hyperbolic scenarios of never-ending negative—not just health-related—side effects of the chip. The section ended with further examples demonstrating

how discussants constructed analogies with existing substances (e.g. alcohol, drugs) to transfer the negative assessment and rejection of these substances onto the chip. At the same time, we saw how comparing the chip with beer, for instance, served a particular function for one participant in terms of self-presentation.

All these examples and analogies clearly frame the enhancement chip in a negative light, and thus suggest its rejection as a plausible future scenario (*rejection analogies*). The converse effect—enacting acceptance and foreshadowing social pressure to take up the chip—was achieved in the following two sections by various analogical moves (*acceptance analogies*). For instance, by modeling a future scenario after the societal adoption of mobile phones, one discussant adopted the moderator's cue to imagine a scenario in which chip-enhanced people would exert social pressure on the non-enhanced. I called this the *dilemma of (indirect) compulsory enhancement*—a scenario envisioned to emerge for the non-enhanced if enhancement is not generally banned. The source of the dilemma is this: If some people enhance themselves, the compulsory enhancement scenario appears on the horizon of plausible futures; that is, maintaining the value of individual choice in the context of human enhancement leads to the dilemma. Thus, no matter whether human enhancement is allowed or banned, the value of individual *freedom of choice*<sup>58</sup> is threatened or violated either by urging people who embrace enhancement or those who reject it to subordinate their individual preference to a collective decision. Arguments to preserve individual choice can be mobilized by those arguing on both sides, but they contribute to and never solve the dilemma, which can only be bypassed by regulating enhancement on the collective level. Thus, my broader argument (as well as suggestion) is that in order to generate productive debates about enhancement—meaning a debate that does not go round in circles—, these have to move from a rigid persistence on and appeal to the logic of individual choice (cp. Mol 2008) to a process in which the collective negotiates its shared culture and values. The fact that many participants see the enhancement chip as a carrier of values that they regard rather critically already indicates the probable direction of such a debate at present.

Coming back to the mobilized acceptance analogies, the section in which the enhancement chip was portrayed to share relevant similarities with *clothing and pacemakers* is particularly informative, not least due to its controversial character. These analogies were central in undermining participants' attempts to construct convincing arguments for their individual rejection of the performance enhancement chip. Like the

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<sup>58</sup> Cf. the analysis in the chapter on nano labeling that illustrates the use of “freedom of choice” arguments to back up claims for a nano label, which also illustrates the power that is ascribed to such arguments in the given cultural context (if they were not thought to work, they would not be used).

mobile phone analogy, presenting the chip as not fundamentally different from clothing or pacemakers transfers the broad socio-cultural acceptance of these objects onto the chip. The interaction here demonstrated how participants thus struggled to refute the 'logical' consequence of these analogies: acceptance of the enhancement chip.

As mentioned above, underlying much of the talk about enhancement was the threat of the compulsory enhancement scenario to become real. This issue was also tackled by using *sport doping* as an analogical template in the two discussion groups. Imagining an enhancement future with the chip as similar to sport doping was fruitful because it foregrounded that in such a scenario the unenhanced may encounter "a relative disadvantage" (Lin and Allhoff 2008, 259). But, as follows from the two-sided character of analogies, each foregrounding also achieves particular effects: in our case it was used to argue for the inevitability of and need for a social movement against enhancement, and consequently implied the collective rejection and regulation of enhancement technologies. Most notably, the case of sport doping was therefore used to enact the compulsory enhancement scenario, which in turn allowed discussants to justify and predict the inevitable emergence of an anti-enhancement movement.

Enabling the individual rejection of the enhancement chip is a crucial driving force in the debate about the performance enhancement chip, which is equally evident in the last two analogies explored in this chapter: analogies with the movements against *GM food* and *vaccination*. Both analogies incorporate important functions, as they were used as analogical evidence for the effectiveness of such collective movements in opposing technology-driven developments, and thus express participants' hope for collective opposition to rise and avert enhancement technologies in the future. Likewise, the two analogies address the tension between individual choice and forced uptake—albeit in different ways. In the Austrian context, the consumption of GM food is framed as an issue of individual choice, a situation many participants seem content with. Framing the enhancement debate in terms of individual choice, however, does not work to avoid an indirect compulsory enhancement scenario, as outlined above, because the choice argument can also be mobilized for a pro-enhancement position, which again leads to the dilemma. Only when enhancement is regulated on a collective level—and thus stops being a question of individual choice—can such a scenario be plausibly avoided. Considering this, the analogy with vaccination might represent a better comparative case than GM food, for it brings into view that individual decisions are not made in a social vacuum since infectious diseases threaten not just the individual but also its social environment. Similarly, performance enhancement threatens those who do not want to be enhanced with

personal disadvantages. The debate thus shows that vaccination could prove a stimulating comparative case in debates about enhancement.

What was particularly striking concerning the implications of many analogies was that they enacted scenarios in which *health risks* are imagined to regulate the societal uptake of the enhancement technology. If we were to interpret this as a way of delegating decision making to the body, we would impute that participants rely on the body to tell them what is good or bad. By contrast, a discursive psychological perspective invites us to explore what is done with this argument in talk. Here, the analysis showed that ‘health risks’ are used as a rhetorical resource to legitimately argue for the personal rejection of the enhancement chip. Since most participants displayed a clear first negative reaction towards the enhancement chip, the ensuing debate may best be understood as an interactional process in which they try out different arguments as to how to best justify and corroborate this assessment on socio-culturally acceptable grounds. What makes the health risks argument so powerful—and thus explains why participants resort to use it even after being told that some kinds of doping are not harmful—is precisely the fact that caring for one’s health represents a culturally shared, uncontested value, over which only ‘extreme’ religious views are expected to take precedence (see Daniel’s Jehovah’s Witnesses argument in excerpt 15). In that sense, arguments invoking health risks are rhetorically self-sufficient in the sense that they can be expected to be agreed upon (Potter 1996b). This also suggests a broader conclusion, namely that the use of analogies that plausibilize health risks might assist in mobilizing anti-enhancement positions. As suggested in excerpt 20, turn 4, the health risks argument also proves useful because it is generally assumed that potential health risks can never be ruled out completely—negative health effects may surface only after decades. Indirectly, participants thus highlight that the health risks argument lends itself to being used in debates against new technologies more generally. Hence, this finding also reflects back on previous debates, such as the controversy over GM food, in which health risks rank first in a long line of arguments against the application of such emerging technologies. To sum up, the findings suggests that health risks may de facto be used as proxy arguments for other, perhaps more vague, concerns due to their broad socio-cultural acceptability.

Overall, the empirical analysis in this chapter has shown that analogies play a central role in futuristic debates about enhancement technologies because they are employed to (im)plausibilize future scenarios. Concerning the interplay of acceptance and rejection analogies, acceptance analogies, rather than appearing discretely, were mainly constructed to challenge rejection scenarios in which specific discussants envisioned themselves resisting the lure of enhancement chips. Individual participants predicting their chip

*Enhancement will be like...*

rejection were thus forced to warrant their claims by drawing on socio-culturally accepted arguments, analogies and examples. Similarly, they had to respond to accusations of technophobia (see Daniel turn 6, excerpt 16). Moreover, the broad variety of analogies that emerged during the enhancement debates indicates that these debates are characterized by various analogy-distinction cycles or phases of analogical discourse, which, depending on the employed comparative case and its existing framing, are used for the construction of similarity or contrast. Considered as a whole, the invocation of these multiple analogies and disanalogies clearly worked to stimulate debate about specific socio-cultural implications of enhancement technologies. Looking thus beyond the argumentative role of analogies, we can come to acknowledge the imaginative and deliberative value of analogical discourse. Quite in contrast to academic debates among bioethicists, which tend to focus on the detailed argument of one analogy (Hofmann, Solbakk, and Holm 2006a, 2006b; Smith 2002), the emergence and disappearance of analogies in lay talk can provide diverse and varied insights on the contested issue of human enhancement since discussants seek to carve out and assess the implications of human enhancement on their individual lives and culture more generally. Exploring lay talk on human or cognitive enhancement is thus a way of leveling the playing field between professional and lay ethics by enhancing the status of lay cultural knowledge and removing ethicists from their privileged epistemic position. The argumentative dynamic at work in lay discussion groups here assures that arguments are voiced in accordance with dominant values and relevant experiences in a given cultural context. Whether an analogy holds becomes thus a matter of collective negotiation rather than individual logical reasoning.





## 7 Nano labeling: Analogies oscillating between regulation and marketing

Despite being characterized by many far-reaching application visions—some of which we came across in the preceding two chapters—, nanotechnology is currently already being applied in a variety of consumer products that can be found on the shelves of supermarkets. This chapter revolves around such existing nano-enabled consumer products, which are either sold with a nano marketing label promising consumer benefits such as the “lotus effect” of nano-coatings, or nano is not mentioned and labeled on these products at all, as is the case for example with many sunscreens that include transparent nanoparticles to avoid the white film otherwise left on skin after application. The reason for this lies in the fact that at the time the four discussion groups were held, regulation and mandatory nano labeling was not yet in place, making nano thus a matter of voluntary labeling of producers. Only recently, the EU committed to compulsory testing and comprehensive labeling of nanoparticles in consumer products, coming into effect no later than 2014.

Against the background of an ongoing debate about whether the use of nanoparticles in cosmetics could induce negative health effects, media coverage illustrates the hope that is put into such regulatory labeling measures to empower consumers: “Then responsible consumers can decide for themselves how much “nano” they’ll permit on their skin in the future.”<sup>59</sup>—this closing sentence of an article on these regulatory developments, published on the widely read website of the Austrian Broadcasting Corporation, is a good case in point here. Such discourse of consumer empowerment is consistent with current approaches to nano governance that call upon responsible consumer-citizens to fulfill their civic duty in participating in the risk management of nano products<sup>60</sup> with their buying decisions. The debate about nano labeling hence cannot be disentangled from the broader question as to which governance and risk management approaches should be adopted with nanotechnology.

The nano labeling approach here can be considered a successor to GM labeling, which has become a visible and identity-creating part of Austrian (food) culture. In Austria—as well as in many other EU countries—certain food products carry the label “without GM” or a similar front-side label conveying that the respective foodstuff is strictly controlled to neither contain GMOs nor to have come in contact with genetic engineering in the

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<sup>59</sup> <http://www.orf.at/stories/2181758/2180611/> (date of publication and access 17 June 2013)

<sup>60</sup> cp. also [http://epub.oeaw.ac.at/0xc1aa500d\\_0x002c9d9a.pdf](http://epub.oeaw.ac.at/0xc1aa500d_0x002c9d9a.pdf) (accessed 23 June 2013)

production process (from field to packaging).<sup>61</sup> In contrast to the US or Canada, where voluntary labeling prevails, GM foods in Europe are thus regulated by mandatory labeling in reaction to broad and heated public controversies during which a variety of concerns were articulated, ranging from health or environmental risks, to ethical, and social issues (Jasanoff 2005a; Mehta 2004).

While the European GM governance approach is characterized by differentiating GM foods from non-GM products, rendering them a biolegal novelty that calls for new regulations, US regulators followed the assumption that GM foods were basically the same (“substantial equivalent”) as existing products on the market, thereby avoiding modifications of existing standards (Lezaun and Schneider 2012). Different regulatory approaches are hence outcomes of debates over whether crucial similarities to other entities allow to order a new material into existing categories, or whether it is to be seen as radically different and thus in need of new regulation. This illustrates how the establishment of similarities and differences is culturally variable and has far-reaching regulatory consequences. In the Austrian context, GM foods for instance were rendered essentially different from non-GM foodstuffs during the debate of the 1990ies; in this case difference became a stigma, which is also evident in the GM label that is designed to allow consumers to recognize and avoid GM food products (for more on these issues see Felt 2014). Consequently, a nano label modeled after the “without GM” label might not represent a neutral way of making nano visible but could also transfer GM’s blemish onto nano—in other words, taint it by analogy. Therefore, we need to pay close attention to the role and the agency of analogies in debates about nano labeling, which is the central aim of this chapter.

Here, a recent Australian controversy over voluntary nano labeling of sunscreens advises that more aspects need to be considered to grasp the complex character of nano labeling. The sunscreen debate arose in 2011, when a sunscreen manufacturing company labeled its product “nano-free” in the absence of a mandatory nano labeling regulation. Australia’s national sunscreen regulator deplored this practice for implying that nano-enabled sunscreens were unsafe, thus potentially scaring consumers.<sup>62</sup> Friends of the Earth, on the other hand, criticized that without a nano label consumers were denied their right to informed choice, and the NGO also accused the regulatory agency of failing to provide

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<sup>61</sup> However, there exist exemption clauses for substances that are not available in non-GM form. Source: <http://www.bewusstkaufen.at/labels/194/kontrolliert-gentechnik-frei.html> (accessed 12 June 2013)

<sup>62</sup> <http://nano.foe.org.au/australian-regulator-tries-quash-not-nano-labelling>, <http://www.nanofreesunscreen.com.au/>; <http://nano.foe.org.au/sites/default/files/Background%20information%20on%20TGA%20attack%20on%20nano%20labelling%20July%202011.pdf> (accessed 12 June 2013)

safety testing.<sup>63</sup> By the end of 2012, then, Friends of the Earth in turn charged several sunscreen producers for falsely marketing their products as “nano-free”<sup>64</sup>. This short outline of the controversy brings out several aspects that are of concern in this chapter. First, it highlights the complex and ongoing struggle over nano labeling, involving a variety of actors, such as state regulators, producers, NGOs, and consumer-citizens. Second, labels are obviously considered powerful agents in constructing the public image of nano-enabled consumer products, since regulators and NGOs suspiciously overlook their use.<sup>65</sup> Hence, modeling a new label after an existing one could be conceived as a way in which visual analogy unfolds its power. And, third, the controversy also indicates how regulatory and marketing dynamics interplay and complicate the debate about the labeling of nano consumer products—a tension that will run throughout this chapter.

The chapter explores in detail how participants in the discussion groups debated the complex issue of nano labeling and used analogical devices in that process. More concretely, the aim of the following analysis is twofold: First, it tries to cater to the central research interest of the dissertation and thus seeks to better understand what role(s) analogies play in the discourse about nano labeling. Second, the analysis also aspires to carve out underlying problems and dilemmas with the issue of nano labeling and how participants try to solve these with their analogical moves. Among the empirical chapters of this dissertation, this chapter turned out to be on the longer end because labeling was not merely a central topic in three of the four groups, but talking about labels meant for the most part analogical discourse, as participants came up with a broad variety of analogies. This accumulation of analogies may be largely due to the fact that there exists no mandatory (front) nano label, forcing participants to use their analogical imagination in order to envision how a nano label based on their experiences with existing labels from their everyday lives could and should turn out.

Before moving to the empirical analysis, let me briefly explain how I conceptualize a label for my analytical purpose here. In contrast to a structural linguistics perspective (Saussure 1916/1983) that would define a label as a sign conveying a more or less clear meaning, I conceptualize a label as an object that acquires its meaning through negotiation processes—a view in line with a critical public understanding of science perspective. That is, instead of adhering to the structural linguistics model of communication that leaves

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<sup>63</sup> <http://nano.foe.org.au/australian-regulator-tries-quash-not-nano-labelling> (accessed 12 June 2013)

<sup>64</sup> <http://www.abc.net.au/news/2013-03-04/company27s-about-face-on-nano-free-sunscreen-claims/4551820> (accessed 12 June 2013)

<sup>65</sup> An experimental study (Siegrist and Keller 2011) also ascribes this framing power to labels. It has shown that test persons who received nano-labeled sunscreens and additional information perceived these sunscreens as more risky, which suggests that nano-labeling may indeed affect public opinion.

relatively little room for different interpretations, I follow an interactional model in which the readers of a label participate in the construction or meaning-making of a label (cp. Eden 2011)—a perspective also assisted by the applied group discussion methodology. Since the project team refrained from providing any existing or ready-made nano labels to the groups, which would represent the usual approach in studies on labeling (see e.g. Siegrist and Keller 2011; Eden 2011), participants were required to develop their own visions for nano labels ad hoc. Put differently, the discussants thus had to act like designers who were supposed to imagine and reflect critically on potential labeling approaches—an approach that reflects the “shift in the conceptualization of users from passive recipients to active participants” (Oudshoorn and Pinch 2003, 5).

The analysis in the following sections draws on data from three discussion groups: the food, consumer product (conpro), and ICT group. The medicine group is not part of this analysis because the issue of labeling consumer products remained a marginal topic there. In terms of order, the analysis moves from group to group, starting with the group discussing nano in ICTs. Afterwards, material from the food group is focused on, and finally the group on consumer products provides us with exceptionally rich analytical material.

## **7.1 GM-nano labeling analogy: enabling governance via consumption**

In the ICT group, the issue of labeling emerged as a topic in the context of a larger argument for more democratic modes of governing new technologies. One participant, Benjamin, tentatively proposed a referendum as a democratic instrument by which “the people” could vote whether they wanted to allow or prohibit a new technology such as nano in Austria. In response, Daniel suggested an alternative *governance via consumption* scenario in which people’s purchase decisions would gradually determine the fate of technological innovations. Next, Benjamin challenged the feasibility of Daniel’s governance model by arguing that consumers are generally not aware whether a product includes nano—an argument that implies the absence of a nano label. This interaction created a delicate conversational situation because Benjamin forced Daniel to warrant and provide evidence for the feasibility of his model. At this point, Agnes mentions GM labeling as a case from which a lesson might be drawn as to how Daniel’s model might work for nano in the future, as we see in the first turn of excerpt 22.

### **Excerpt 22**

1 Agnes: Yes, that’s interesting. So, this genetic engineering prohibition, or- or- say quasi quality label “without GM”, how- how did it develop? I think it also developed because

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of the people. Well, this pressure that you don't, that you abstain from GM-products actually came from the people.

2 Daniel: Yes, the people demanded it, that's why it came.

3 Benjamin: And because somewhere organic farmers started with it, with "no GM". The issue didn't come from nothing. And it's also interesting that we're now talking about nanotechnology. Because that's also the message that something already exists where a discussion is starting.

4 Agnes: Like, without nanotechnology (laughs). (ICT, 2440-53)

In turn 1, Agnes recalls the GM food case as an example where "the people" are seen to have initiated the development of a "without GM" label to make genetically modified ingredients visible on food products, thereby making or allowing an unspecified "you" to decide against them.<sup>66</sup> By bringing up the issue of labeling, her account rehabilitates Daniel's governance via consumption model, which is also expressed in Daniel's affirmative response to her argument (2). Benjamin, in turn 3, evidently no longer takes up an oppositional stance but simply adds in a cooperative manner that organic farmers likewise contributed to the development of the "without GM" label by first using it voluntarily. He concludes that "the issue" has to be generated by someone and, by analogy, he takes the fact that the discussion group revolves around nano as an indicator that a similar public debate on nano is already forming. This claim concurrently assigns the role of "the people" who partake in generating "the issue"—and a potential nano label—to the workshop participants. In turn 4, Agnes then makes the GM-nano labeling analogy, which was more implicit in the previous turns, explicit. Put differently, she finishes the analogical move that is accomplished over the course of the four turns of excerpt 22 by envisioning a *GM-analogous "without nanotechnology" label*. Her closing laughter is further indication that she presents herself not so much advocating such a label but that she is rather displaying her analogical imagination and active participation in the collaborative development of this analogical scenario. Pertaining to the whole excerpt, we observe how collectively remembering the GM labeling approach enabled the appearance of a "without nano" label on the horizon. But there is no discursive evidence that the group is fully committed to or actively advocating this labeling solution at this point. More importantly, the excerpt demonstrates that the emergence of the GM-nano labeling analogy coincided with the group starting to imagine itself as representative of "the people". As we see in the next excerpt, once fully actualized, this analogy unfolded agency by influencing the development of the following discourse.

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<sup>66</sup> The fact that Agnes struggles with how to best characterize the GM food situation suggests that it may lend itself to different framings: she talks about it as being both subject to legal prohibition and voluntary abstinence.

**Excerpt 23**

- 1 Daniel: Well, (...) labeling, I think it was in Germany, no, in England it was, I think, there more and more German products came and I think it was during the Second World War, or it was before, they always came to England and they were bought. And that was enough for the English, they wanted their- their import thing to start, that's why they pushed through the label German labor. And then there was the problem that exactly the opposite happened. Now all people just bought German labor (laughs) (.) The English wanted to prevent them from buying it, and now they have: ah, this is German labor, okay, then I take it. Then it's just (.) I guess then automatically the experience, the people decide if it's accepted or not accepted.
- 2 Mod: But was the point you wanted to make with the GM comparison that it should be labeled? That labeling- that labels should be made, that it says: includes nano components this product, electronic product.  
(Several lines omitted, in which the moderator makes a joke and Agnes laughs)
- 3 Benjamin: Yes. In the break I was looking at this apple juice and there it says stupidly, it includes sugar or it doesn't include sugar. I mean that's really something trivial actually, if you think about it and it's mentioned nevertheless. And now we're talking about genetic engineering and nanotechnology. Why shouldn't it be labeled? To put it simply: does anything speak against it? (.) creating transparency is certainly nothing bad.
- 4 Daniel: Well, they've already started this- this nano there, like the iPod nano. So, everyone buys that now, because it's labeled nano, because it's a small iPod. (ICT, 2455-88)

In the first turn, Daniel gives an account of a historical case from another national context, in which “the people” resisted state-prescribed meanings of labels. The subtext of his story is that a label is open to different interpretations, and that labeling hence is bound to fail as a means of steering public opinion if (a majority of) the public attributes a different—here positive—meaning to a specific label such as “German labor”. Daniel’s narrative provides historical evidence for the collective argument that emerged in the preceding excerpt, namely that a socially robust label needs to develop in a bottom-up fashion from “the people”, if one does not want the scenario evoked in the story to repeat itself with nano. In the second turn, the moderator ignores Daniel by addressing Agnes directly. The moderator’s question presumes that Agnes tried to make an argument for labeling or a specific labeling approach. Such an interpretation cannot be upheld by a close analysis, as shown above, because it reveals that the way the interaction developed produced the GM-nano analogy, with Agnes neither being its initiator nor making a strong argumentative case for labeling. We should however bear in mind that this is not an indication of “bad” moderation but rather the misunderstanding owes itself to the double-sided character of

analogies; that is, that interlocutors can always interpret analogies as either imaginative or argumentative<sup>67</sup>.

In the omitted lines, the moderator and Agnes manage this difficult interactional moment by switching into a playful mode of joking, which allows Agnes to escape from having to give a clear answer to the moderator's question. This playfulness continues until Benjamin moves back into work mode by formulating a well-argued, earnest response to the moderator's question (3). First, he uses the apple juice package right in front of him as a *comparative case*. By stressing that its nutritional label includes detailed descriptions of sugar amounts, he argues that one could thus also expect that GM or nano—which he both distinguishes from the “trivial” sugar as more important—should be indicated on products. Referring to a fact right in front of everyone—any participant could check his claim immediately just by reading the label on the juice package—assists in presenting labeling as a well-entrenched practice in the given cultural context. Second, Benjamin uses the phrase “creating transparency” to further corroborate his claim. “Transparency” here works in a double-sense. Understood metaphorically, it reflects nano's intransparent state since mandatory nano labeling on products does not exist yet, which would be necessary to know whether products contain nano. In a more literal and culturally informed reading, the wide usage of “transparency” in political rhetoric has contributed to making it a largely undisputed value in Western democratic cultures (Brown and Michael 2010; Irwin 2006). As a skilled user of political language, Benjamin thus appropriates “transparency” for his particular purpose: By equating labeling with the practice of establishing transparency, labeling is likewise framed as a culturally indisputable value. With these two comparative moves, Benjamin has built a convincing argument as to why nano labeling appears to be a logical thing to do in the given cultural context.

The persuasiveness of this account is also revealed in the next turn (4), where Daniel mentions that nano labeling has already begun because certain small electronic products are called “nano”. Quite in contrast to the GM-nano analogy, which pointed towards the resistance of technology-enhanced products, the nano labeled iPod becomes rather more, instead of less, attractive for buyers. This is an interesting moment. Although Daniel and Benjamin both talk about labeling and build their accounts on each other, they also talk at cross purposes here: This is because Benjamin refers to labeling in the form of regulation (of food products), while Daniel talks about a nano label used for marketing purposes (on information and communication technologies). These two different interpretations of a

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<sup>67</sup> Note that I am not claiming that the discourse was not argumentative as there is surely some kind of argumentative level involved, but just that we simply cannot trace a strong argument for a specific GM-nano analogous label.

label also point to the diverging public assessment of nano in different application fields: In food, nano is to be avoided, but in ICTs the nano label works as a buying incentive. And this, in turn, indicates that the varying assessment of nanotechnological application fields may complicate debates about nano labeling. We will encounter this complexity in more detail in the following sections. What has become clear in this section is that the ICT group has plausibly carved out collectively that a GM-analogous bottom-up emerging nano label would be in line with a culturally well-established governance via consumption model.

## **7.2 (De)constructing GM-analogous nano labeling scenarios**

In contrast to the ICT group, where GM emerged as a comparative case primarily to solve a difficult interactional moment and to allow for the implementation of a governance via consumption model, GM was used much more explicitly as a resource to support calls for nano labeling in the food group. In the following excerpt, which stems from the beginning of the discussion in the food group, participants react to a remark of the moderator, who mentioned that nanoparticles are already part of certain food products such as salt or ketchup.

### **Excerpt 24**

- 1 Emil: Does it have to be labeled?  
2 Claus: No, it doesn't have to be labeled, no, but consumer advocates want it to be labeled.  
3 Doris: Yes, that would be desirable.  
4 Emil: Well, to me it would be an absolute prerequisite.  
5 Claus: The economy, that is, the industry, refuses it.  
6 Emil: But now we are back to the first card, right, what- what kind of confidence is there in consumers, do you say: you don't get what it means anyway. Like it says there, why should it be labeled, you will just be incited by someone. Or do you say, okay, let's have freedom of choice, we live in a democracy, everyone can choose what he wants, what she doesn't want, everyone has the possibility to gather information, some of which you understand, some of which you don't so much. But when you start with not declaring it, well then the roof is on fire for me. This starts with genetic engineering, there you can be of this or that opinion, but if it is not labeled anymore and consumers were just told: yes take it, it's good for you, that would be crossing a line. (Food, 383-403)

After Emil (1) inquires whether nanoproducts can be identified via a mandatory label, Claus reports the status quo of nano labeling, which he characterizes as an ongoing struggle between consumer interest groups fighting for mandatory labeling (2) and a reluctant industry (5). In between, Doris (3) and Emil (4) state their preference for nano labeling. After Claus has finished his status report, Emil formulates a long argument in which he



mobilizes various resources to underline why the present situation of non-labeling is unacceptable (6). First, by referring back to the story card with a scientist position that he chose and criticized for its “scientific arrogance” right at the beginning of the discussion group, Emil uses the card to build a counter-position (“do you say...like it says there”) against which he makes a stand. More particularly, he argues against experts who paternalistically deny consumer-citizens their right to make own choices (if there is no labeling). “Freedom of choice” and “democracy” here are mobilized as cultural resources—similar to Benjamin’s call for “transparency” in the previous section—to strengthen the argument for individual choice and to counter a deficit model of the public (“you don’t get what it means anyway”). Not labeling nano-products is thus equated with an expert-lay relation in which experts frame consumers either as ignorant or susceptible. Benjamin constructs the figure of a consumer-citizen by interweaving discourses of consumerism and democracy. Integrating consumerism into a democratic framework (or vice versa) serves a particular function in his argument. It allows sidestepping epistemic questions as to whether people possess the adequate knowledge base on which to decide about nanofood, since citizens are entitled to partake in democratic decision-making regardless of their understanding of information (“some of which you understand, some of which you don’t so much”).<sup>68</sup> A label here is conceptualized as a conveyor of important information; consequently unlabeled nanoproducts imply a lack of information that deprives consumers of their right to choose (“freedom of choice”). This represents an unacceptable situation to Emil, stressed by the idiom of “the roof is on fire” which he uses to communicate that something must urgently be done to change this situation.

Next, Emil links the debate about nanofood with GMOs, presenting *GMOs as a predecessor to and potential role model for nano*. In his account, GM labeling represents a means that enables diverging opinions to peacefully co-exist in society next to each other—again labeling is thus understood as a democratic tool, because it allows for a diversity of opinions (“there you can be of this or that opinion”). In a last move, Emil then imagines a counter-factual scenario of non-labeled GMOs modeled after the current state of nanofood, which would affect him in the same way as the non-labeling of nano does now. In this interesting construct not GM but nano is used as a source for constructing a (negative) future scenario for GM food. In effect, this move does the same argumentative work as the presentation of the GM labeling approach as a role model for nano. In short, Emil employs the GM case as an analogical resource here in different ways to persuade that

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<sup>68</sup> Consider also this other quote, which conveys the very same meaning: “And the consumer might not have full knowledge like the scientists, but these are the rules of the game in a democracy, it’s no different in any election, we agreed on that in the system in which we’re in right now and then you also have to go through with it in this case” (Emil, food, 1807-11).

a desirable future scenario for nano is one that avoids societal conflict—a scenario in which labeling plays a key role. By threatening to protest, he even rhetorically performs the conflict predicted to arise without labeling.<sup>69</sup> However, we also see that the GM-nano analogy represents just one resource among others (e.g. paternalistic experts, democracy) that is mobilized to construct a convincing argument for labeling nano in food products.

To Emil, GM-like labeling clearly represents a positive horizon for nano because it would counterbalance a scenario in which nano invisibly—i.e. without label, unnoticed—“creeps into” society (Emil, food, 992) and consumer-citizens are hence deprived of decision-making. At this early point in the debate, the GM-nano analogy was generally not contested, presumably because the group was not yet familiar with the many consumer benefits nanofood promises, which were not introduced until the application card stage (see next section). At this point, Emil could still argue convincingly that nano—like GM—brings consumers no significant benefits: “genetic engineering only benefits certain enterprises, that you know, and it simply causes damage, but we won’t talk about genetic engineering now, but with nanotechnology it’s similar (...) because to say that for the ketchup to flow better and faster out of the bottle, for this we should take these risks?” (Emil, food, 495-502). Later in the debate, it was not just the broader amount of promised benefits of nanofood that made the group doubt the appropriateness of a GM-nano analogy. The GM labeling success story also began to erode over the course of the food discussion and consequently lost its attractiveness as a template for nano labeling. This was mainly due to the fact that the GM labeling approach was exposed to have flaws, notably because it was argued that specific food products are allowed to contain a certain amount of genetically modified ingredients without having being labeled as such, as is illustrated in the following excerpt.

### **Excerpt 25**

- 1 Doris: But labeling also has a loophole, because if it’s like with GMOs then we won’t have a chance. (...) there are areas, I don’t know, to a certain degree it doesn’t have to be labeled and only a certain point onward it will be labeled. But if I don’t want any of it, then I’m in a bind.
- 2 Mod: With processed food for instance, there’s a percent limit under which it doesn’t need to be labeled. It’s actually not that low.
- 3 Doris: Right. (... ..) Well, now in my training, there was a lecturer that made us understand that we shouldn’t be under the mistaken belief that we don’t have genetically modified corn in Austria. (... ..) it isn’t always declared. And if it will be the same with nanotechnology then even the best labeling is useless.

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<sup>69</sup> He also makes a similar move later when he threatens to “protest if nano were dropped in people’s laps” (1686f).

4 Emil: Well, the problem here is actually that the legislature and industry are in the same boat... (Food, 2224-76)

In the above, the fact that GMOs in processed foods do not have to be labeled when falling under a certain threshold is collectively established with the help of the moderator.<sup>70</sup> This fact, Doris argues, deprives people of their “chance” to make a decision, thereby undermining the desirability of a GM-analogous labeling scenario for nanofood. Emil’s reaction (4) can best be read as an attempt to rescue the GM-nano labeling analogy by locating fault in the biased and hence untrustworthy legislators, who do not comply with their ascribed role, and not the labeling approach as such; this allows him to continue to have high hopes for a nano labeling approach modeled after GM food<sup>71</sup>.

### **7.3 Acceptance analogies: Marketing nanofood like light products and probiotics**

As already alluded to above, constructing a direct GM-nano analogy in the food domain, is not only complicated by GM labeling “bolt-holes” but also because nanofood appears to be distinct from GM foods due to the consumer benefits it promises, such as making foods lighter while retaining the original taste, or enriching foods with vitamins and healthy oils. Several application cards (see Figure 4) introduced promises that portrayed existing or envisioned nano-enhanced foods. As the following excerpt demonstrates, participants associated nanofood applications that were advertised with health claims on the cards with existing functional food products<sup>72</sup> rather than with GM foods.

#### **Excerpt 26**

Doris: I mean, a point I wanted to make and I didn’t get around to, it’s similar to, for instance like, I’m still with functional food, there’s this advertisement, these small bottles against cholesterol. My hair stands on end every time because I think that can’t work and people buy it, because it’s advertised and it definitely doesn’t work. That maybe

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<sup>70</sup> See also Lezaun and Schneider (2012: 10) on the problematic legal status of GM-free labels, as neither the absence of a GM label nor foods with the GM-free label provide full certainty that a product is without GMOs.

<sup>71</sup> The above excerpt is, of course, also interesting for how the myth of Austria being “GM free” is deconstructed. The fact that similar moves were also accomplished when debating nuclear power in other groups (medicine and consumer products) demonstrates that the broader imaginary of keeping certain technologies completely out of Austria’s national territory is challenged (see also Felt 2014).

<sup>72</sup> Lezaun and Schneider (2012) argue that defining functional foods has proven notoriously difficult for regulators, thus they recommend Marion Nestle’s definition referring to “products created just so that they can be marketed using health claims” (Nestle 2002, 316).

also belongs in this category of the added vitamins, probiotics and such things. (Food, 568-74)

Here, Doris draws an *analogy* between future visions of vitamin-enriched nanofood products (see Application card 1 in Figure 4) and present *functional foods* such as probiotic drinks. Since she presents functional foods as delivering empty promises (“doesn’t work”), the promises of nanofood are also called into question by analogical implication. Doris uses an idiom (“hair stands on end”) to emphasize the physical terror she experiences when hearing such false promises—her body is described as reacting immediately. Although Doris thus opposes functional food health claims strongly, she also acknowledges that other people buy these products. Here, this issue is not elaborated but Doris is able to continue her critique later when another application vision was discussed (see application card 2 in Figure 4), which inspired the emergence of a “nano light” marketing label in the group, as we see in excerpt 27.

Application card 1	Application card 2
<p><b>Nanocapsules as transporters for healthy nutrients</b></p>	<p><b>Reducing calories with nanoparticles</b></p>
<div> </div> <p>Nutritional supplements such as vitamins or pharmaceuticals can be packed into minuscule capsules and thus added to all kinds of foods.</p> <p>In Australia, certain brands of bread are enriched with fish oil, which is good for your heart. The omega 3 fatty acids are encapsulated, which avoids the unpleasant smell and fishy taste. Once inside the body, these additives unfold their full effects.</p>	<div> </div> <p>In conventional mayonnaise small oil drops create its distinctive taste and creamy texture. Nano-mayo, however, replaces oil drops with water drops, encased by a thin oil slick. This mayo promises less fat with full taste. In a similar way, low calorie milk shakes use nano-sized silicon crystals coated with chocolate. Silicon has no calories, which reduces the amount of calories in the shake.</p>

Figure 4

**Excerpt 27**

1 Doris: Well, card 2, I didn’t choose it but I just wanted to remark, there it says that the innovation promises less fat but with full flavor. I mean, today, really many people are

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overweight because they lack fat. And the body needs fat to lose weight and if I look at the card, that instead of fat then this nano comes and and there's even less fat than now, which is already not enough, well, somehow I think, people won't get more healthy.

- 2 Franziska: These are mere marketing strategies, it seems to me, so, everywhere less fat, that's [just
- 3 Armin: [Light, nano light.  
(... ...)
- 4 Bertha: It sounds great, but it doesn't taste great. (...) that whole low-fat stuff, I don't like the taste of it.
- 5 Mod: Yes, but the promise is that nanotechnology will solve the problem that it doesn't taste good  
(... ...)
- 6 Doris: Well, people will certainly buy that just as they were buying the other stuff (.)
- 7 Emil: If it's advertised accordingly, then yes, you only have to look at Actimel. And when three more balls stay in then.  
(Collective laughter)
- 8 Doris: I have never tried Actimel.
- 9 Emil: Me neither, but it's crazy how the people- well, you see how the shelves are full with it, the commercial was just ingenious and very intense. (Food, 897-942)

In turn 1, Doris challenges the scientific assumptions about the role of fat in dieting that are inscribed in low-fat products.<sup>73</sup> Even more clearly than in the preceding excerpt, Doris here speaks from the subject position of a diet consultant (her professional identity, which she articulated right at the beginning of the discussion group) who is entitled to “remark” on a misconception on the card and question the underlying scientific theory behind the nanofood vision (for more on category entitlement in the construction of facts, see (Potter 1996b); and for more on subject positions see (Davies and Harré 1990)). Doris's expertise and assessment is accepted, since Franziska agrees with her that the promise of fat-reduction is a mere selling strategy—she thus follows Doris in denying that it actually works (2). Armin, then (3), uses his analogical imagination and *transfers the marketing of light products onto nano* by coming up with the idea of a “*nano light*” label. This analogical move is reminiscent of Agnes' “like without nano” in the ICT group, because with “nano light” Armin actualizes the implicit analogy that already underlay participants' previous turns.

In stark contrast to Doris and Franziska, Bertha, in turn 4, does not question the epistemic grounds on which light products are marketed; she merely claims to be put off by their taste. This prompts the moderator to clarify that applying nano in such products

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<sup>73</sup> This exemplifies nicely how people assess scientific claims when they engage with consumer items, particularly in the area of food (cp. Eden 2011).

precisely promises to rectify this gustatory shortcoming (5). A few lines later in the transcript, Doris predicts (6) that “people” will again succumb to these promises with nanofood, whereby nanofood buyers are depicted as ignorant or easily susceptible (note how this is opposed to the image of the public that Emil painted in excerpt 24). Interestingly, Emil agrees with Doris and supports his assessment that food marketing works to persuade consumers with evidence of the huge amount of probiotic products (here epitomized by the brand Actimel) in supermarkets (7). The implicit *analogy with Actimel* implies that nano-enhanced functional food products can be expected to sell too, since similar marketing strategies are used. This analogy thus makes the acceptance<sup>74</sup> of functional nanofood appear likely in the future and it hence works conversely to the GMO labeling analogy that plausibilizes rejection scenarios. In short, nano’s similarities with functional and light foods are foregrounded by focusing the debate on the marketing strategies with which nanofood is promoted. More precisely, the group here talks about labeling in the form of marketing rather than legal regulation. In contrast to Daniel from the ICT group (see excerpt 23, turn 4), the food group however does not talk explicitly about nano marketing as a kind of labeling here.

#### **7.4 Countering acceptance scenarios with a GMO analogy, strangeness and nature arguments**

Although certain nanofood product visions were thus imagined to be analogous to existing functional food products, others such as “interactive food” (see Figure 5) were not readily attached to existing food products. For instance, the idea of food changing its taste or color merely by changing the wattage on the microwave thanks to nanotechnology appeared “strange”<sup>75</sup> to some participants. By definition, if something is strange or uncanny, it is not completely familiar but familiar enough to irritate. According to Sigmund Freud, the uncanny is precisely frightening because it reminds of the familiar in a distorted way.<sup>76</sup> Interestingly, Freud also famously noted that “[a]nalogies, it is true, decide nothing, but they can make one feel more at home” (Freud 1964, 72), thereby hinting at the fact that analogies can be strategies that protect people against the potentially frightening new or uncanny (Rohy 2009). In the case of interactive food, both pizza and microwaves are familiar objects in the given cultural context, but its combination with the word

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<sup>74</sup> I use “acceptance” here in the sense that functional nanofood products will manage to enter the food market in Austria without gaining a negative stigma and will also be bought.

<sup>75</sup> The wording in the original German was “befremdet mich das” (Armin, 961; Franziska, 984).

<sup>76</sup> Freud explored the uncanny in his famous essay “The uncanny” (1919). An English version of his essay can be found here: <http://www-rohan.sdsu.edu/~amtower/uncanny.html> (accessed 17 June 2013)

“interactive” and the attendant functional visions point to an unfamiliar—and thus strange—usage of these elements. Hence, the discursive resource “strangeness” is employed to denote an object that resists easy classification or analogizing and is therefore caught in a state between distinction (lack of familiarity) and similarity (familiarity). Moreover, participants use references to “strangeness” to justify why the interactive food vision meets with their refusal, which also implies the assumption that “strangeness” is an acceptable argument for the individual rejection of a new technology. In the following excerpt, the moderator inquires whether participants would anticipate interactive foods to become widely rejected in society. In the two discussants’ reactions we can discern various argumentative resources (besides “strangeness”) that are drawn upon to make a rejection scenario appear plausible.


<b>Application card 3</b>
<b>Interactive food due to nanocapsules</b>

<p>In the future, food whose taste and colour can be shaped individually could become reality. Tiny nanoparticles in drinks or foodstuffs will enclose certain substances and, depending on the wattage of the microwave, give off different favours, colours, or nutrients.</p> <p>Pizza diavolo or pizza quattro formaggi: Consumers can decide individually and spontaneously how they want their product to taste and what to look like.</p>

Figure 5

### Excerpt 28

- 1 Mod: Don't you think that people wouldn't buy such a thing?
- 2 Franziska: Honestly, I can't imagine that it will be a total boom, don't know, because I think, I'm a bit skeptical of- I don't think that people are that stupid. Okay, I mean low-fat sounds good but I think that in the meantime people have realized that these whole light and low-fat products are not the real deal (...) now we have a countermovement

and when I hear about things like that, then I'm disconcerted, and I'm actually very generous towards new technologies, and if people think about it even a little bit, I can't imagine that it will really be a raving success, at least not in the next few years, maybe in a few decades, if then if the world has developed completely differently.

(2 lines omitted)

3 Emil: If it were labeled as it is now with genetic engineering, well, genetic engineering doesn't get accepted, looking at it from our perspective here in Austria at the moment, it isn't accepted because the consumers simply don't want it and it has to be labeled, and the supermarkets brag about it, that they don't have GM products in their product line. And if it had to be declared, I think then that the atmosphere would turn to- that people would say: no, I think, that's too uncanny for me, I don't really need it, that's too technical (...) and I think everyone has some kind of a desire for the most natural, it doesn't matter whether they do it or not, but essentially everybody wants to eat as naturally as possible and is suffering that he's not, because of no time, no money, or whatever. (Food, 975-1002)

In turn 2, Franziska constructs a plausible non-acceptance scenario in accord with her own, previously expressed skeptical reaction to interactive nanofood. In her scenario, "people" realize over time that the promises of light products do not deliver. Imagining "people" as knowledgeable and actively resisting ("countermovement") marketing here allows Franziska to envision a non-acceptance future, that is, at least a future where interactive nanofood is not fully embraced by society as a whole. In effect, the previous conversation between Doris and Emil (excerpt 27) works as evidence for this anticipated development, as both (per)formed such a countermovement in the context of the discussion group. Like in the ICT group, the group participants are thus here also taken to represent "the people". In her micro-political uptake of the mini-public (Goodin and Dryzek 2006), Franziska takes the group dynamic as an indicator for wider societal movements and she also uses this collectively shared experience of an in situ emerging movement as a resource to underpin her rejection scenario. After speaking of the countermovement, Franziska leads to the interactive food vision that alienates her ("I'm disconcerted"). By highlighting that she is otherwise generally very positively inclined towards new technologies, she makes a concessive move (Potter 1996) to strengthen her claim, and by again ascribing "thinking" to the people, she anticipates that interactive nanofood will not become widely accepted under current socio-cultural conditions.

In turn 3, Emil joins forces with Franziska in constructing a non-acceptance scenario for nanofood, in which he again makes use of the *GM-nano labeling analogy*. If nano were labeled like GM food, Emil predicts, it could turn out like GM foods (i.e. get rejected). Furthermore, he claims that supermarkets make use of non-GM labels for marketing purposes, which could be read as a suggestion to supermarkets that voluntary abstaining



from nanofood might work as a better marketing slogan. Then, Emil shifts from labeling conceptualized as marketing to labeling as regulation and he makes an analogical move by predicting a GM-like future for nanofood. Labeling as regulation (“if it had to be declared”) is established as a means to negatively affect nano’s public image (“the atmosphere would turn”). In this way, he ascribes power to labeling in framing the debate about nanofood. An obvious side effect of Emil’s focus on the GM case is that the promises of nanofood are masked in his account.

Rather what we see further is that Emil follows up the GM analogy with several other arguments that advice and/or predict the societal rejection of nanofood products. First, the word “uncanny” works in the same way as the “strangeness” argument. The second argument, then, is one of having either no use for such products or of voluntary abstinence (“I don’t really need it”). It is here where the advertised consumer benefits of nanofood are silenced most explicitly. And in a third move, Emil mobilizes the dichotomy of technologized versus natural foods,<sup>77</sup> on which he elaborates in more detail by attributing to everybody a “desire” for superior “natural” food. All these arguments seem familiar from the debate over GM foods, which Emil here transposes onto nanofood to make its societal rejection appear plausible in the future. This can best be understood as an attempt to counter the acceptance scenarios based on analogies with functional and light foods that were talked into being right before by the very same interlocutors. The following excerpt indicates how the GM-case was further explored as a potential template for nano a little later in the same group.

### **Excerpt 29**

- 1 Emil: When nano then arrives as something new, then it will be about the image, the marketing. Well, genetic engineering, they didn’t manage in time, it was toppled, that’s my impression, yes, in the general public it simply- in Austria certainly 80 percent of the general public doesn’t want it in their food (...) With nano it’s still undetermined (...) if nano develops like GMOs, that it’s yucky, then it will have lost. If it becomes fashionable- it’s probably a question if the marketing strategists for nano-
- 2 Franziska: [Yes, but isn’t it that nano is exactly- that GMOs are bad precisely because somehow, I don’t know, it’s like something alien, because it’s something unnatural and nanotechnology insofar, it seems to me, is actually the same in that respect (...) I can’t imagine that it’ll become chic, if it didn’t become chic with GMOs, well. The same skepticism will be there too.

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<sup>77</sup> Given that the distinction between natural and artificial/technological is culturally contingent, the analytical interest here lies in how the resource “natural” is mobilized to achieve an effect in discourse (for a more detailed analysis on the role of „nature“ and „natural“ as resources in the discussion groups see Felt, Schumann, et al. 2013; Schumann and Schwarz 2014).

3 Emil: No, this can- for me yes, but I think for the big impact externally a lot of marketing is also required. Well, there are other things that are also not much better, but that have become chic, because things took a different course, but (.) I don't know. (Food, 1076-99)

In turn 1, Emil anticipates two diverging futures for nanofood, acceptance or rejection, depending on its image. He recounts the public perception of GM foods as a story of belated marketing that has failed to counteract GMOs emerging negative image in the food sector. By emphasizing that a huge majority (underpinned with a percentage number) of the Austrian population rejects GM foods, Emil envisions that if nano were to develop like GM foods it would be similarly viewed in a negative light (“yucky”) by the majority. Note how Emil does not predict such a future as more plausible than the other, but also imagines the possibility of a different scenario in which nano becomes “fashionable” due to the effective work of marketing strategists. Constructing such a bifurcated future works as a call for action here. Conceptualizing public perceptions as malleable allows him to highlight the work needed to create a negative image of nanofood to oppose otherwise effective marketing strategies. This is underlined by Emil’s refusal to predict that nano will turn out like GM food anyway, which would undermine his emphasis on the work needed to bring this future underway. Constructing a convincing *GM-nano analogy* is one step towards achieving this goal. The overall communicative message of Emil’s turn is that those opposing nanofood still have a chance to influence its public perception—and thus should act.

By presenting strangeness (her “alien” stems from the same semantic domain as “strange” and “uncanny”) and unnaturalness as inherent to both food technologies, Franziska (2), in contrast to Emil, constructs the GM-nano analogy as a given fact based on a pre-existing ontology. This ontological similarity serves as a proof that nanofood likewise will not manage to become “chic” in the future: It creates certainty. Emil claims to share this ontological perspective (3), thereby admitting his personal interest in making nano turn out like GM food along the way, but he also repeats his theory (and the call for action it entails) that marketing is powerful in shaping nano’s image. As I argued above, this is necessary because otherwise the futures appears as predetermined and not open to be shaped by different actors. After the above excerpt, which focused on potential futures, the debate moved into the present, as Franziska and Doris diagnosed a lack of critical media attention and “voices of dissent” (Doris, 1127) with regard to nano, both of which they claim to consider necessary to oppose marketing strategies. Most importantly, this shows that Emil’s rhetorical move was successful; for it has persuaded other participants that

something should be done against nano marketing. However, they neither ascribe this responsibility to the general public nor to themselves but to the media.

In summary, the analyses in this and the preceding section have shown how acceptance and rejection analogies brought different future scenarios for nano onto the horizon. The acceptance analogies emerged from the application cards and their promises of functional and light nanofood, bringing into view that nano at present is not a straightforward candidate for a second GM food scenario<sup>78</sup>, because nanofood also seems to resemble existing light or enriched food products that have managed to become an accepted part of Austrian food culture. This, in turn, raised awareness among participants who reject nanofood most vehemently that (argumentative) work is needed to counter marketing efforts and thus prevent an acceptance scenario from becoming reality. Drawing GM-nano analogies—based on the shared “strangeness” and “unnaturalness” of GM and nano food products—is a crucial element in participants’ arguments for a future in which the public will reject nanofood. In this light, “strangeness” and “unnaturalness” constitute the *tertium comparationis* on which the GM-nano analogy is build. Although not being explicitly at the center of debate here, labeling appears in participants’ talk as a central agent determining nanofood’s future. While voluntary labeling in the form of positive product marketing (e.g. “nano light”) is considered powerful in getting people to buy nanofood (see excerpt 27), labeling in the form of mandatory regulation (like a “without GM” label, see excerpt 28) is expected to affect nanofood’s public imagine negatively. The debate about nanofood thus also illustrates the tension between these two meanings of labeling and the different power that is attributed to them in framing the future of nanofood in society.

### **7.5 Enacting the nano labeling dilemma: A “with nano” or “nano-free” label?**

In the following sections, we move on to how labeling was debated in the group exploring nanotechnology in consumer products; the discussed products ranging from nano in textiles, energy applications, cleaning agents, cosmetics, sports equipment, to nano-coated surfaces, and antibacterial nanosilver in refrigerators. Thus, nanofood was excluded from being an explicit issue in this group, but as we will see it nevertheless emerged. The group discussing consumer products enacted most strongly what I refer to as the nano labeling dilemma. As we will see hereafter, this group also came up with several analogy-based solutions to the dilemma. The following excerpt introduces the nano labeling dilemma.

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<sup>78</sup> This, in a way, demonstrates the power of promises in shaping the future discourse about nano, even though participants generally tend to downplay their effect on them.

**Excerpt 30**

- 1 Albert: Well, I've got the solution for you (... ..) there should simply be a sticker, like "nanotechnology-free", right? [Denise: Yes, that's] If that existed, I mean, if somebody starts it, a "nano-free" sunscreen, then everyone will think: oops, that's nano-free, the others are with nano, well, then I better not take these, right? They won't use that sunscreen probably.
- 2 Barbara: Yes, but then I'd need to know whether nano is good or bad. That's something we don't know yet for the most part.
- 3 Albert: Well, when it says "free" that automatically implies that whenever it's not "free" it's bad.
- 4 Barbara: Well, why? There will be people who'll say: okay, I'll buy only that one with nano, because I think that it's so great.
- 5 Albert: I think like that too when it comes to medicine or technologies for instance, but I don't want to apply it on my body, I don't want it in my food. Yes, well, if it was labeled "nano-free" then I'd buy it. (Conpro, 1707-34)

In this excerpt, Albert (particularly in turn 1 and 3) proposes a "nano-free" front label as a "solution", because he imagines it to indicate that products without this label (i.e. nano-enhanced products) are worse than those with the label (i.e. nano-free products). Similar to Emil from the food group and the Australian regulatory agency we encountered in the introduction, a nano-free label is conceptualized as an agent that would affect nano's image negatively. Albert anticipates that consumers would avoid nanoproducts if other products were labeled nano-free, which in turn would in the long run provoke sunscreen producers to voluntarily abstain from using nano in their products. Barbara, however, reacts skeptically to this scenario and contests its plausibility. She argues that nano's moral status—that is, whether it is perceived as good or bad—is still undetermined at present (2). Then (4), she challenges Albert's assumption that nano-free always implies that a product is better, arguing that some consumers might consider nano to be beneficial in consumer products. In turn 5, Albert then makes a *nano is not like nano* move, which allows him to argue that nano should be welcomed in certain application areas (medicine, technical products) but avoided in others (cosmetics, food). The application area is thus here presented as the criteria used to categorize nano as desirable or non-desirable.<sup>79</sup> But for Barbara the time for a nano label has not come yet, because it would signal certainty when nano's riskiness is still contested, Albert is already committed to a normative judgement as to whether to reject or accept nano, which is based on a distinction of application fields. Albert's argument is similar to Emil's in the way he also proposes a GM-analogous labeling approach, even though Albert does not mention GM explicitly as a template. Barbara's

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<sup>79</sup> But as we saw above, this may not always work out because nano also promises consumer benefits in areas people generally consider more problematic, such as food or cosmetics.

turns, by contrast are fueled by the nano labeling dilemma; that is, to her it is not settled whether nano is good or bad and thus decoding a potential nano label becomes an impossible or at best random task. As we see here, the labeling dilemma emerges with a conception of a label that conveys clear, prescribed information just waiting to be decoded by consumer-citizens accordingly. Albert's solution to the dilemma is, by contrast, to conceptualize the meaning-making of labels not as a unidirectional but interactive process where his personal assessment plays the leading role.

A little later, the moderator inquires whether the participants would prefer a label indicating that a product contains nano (e.g. "with nano")—an idea the moderator introduces herself here—or is made without nano (e.g. "nano-free"), which conforms to the labeling approach Albert proposed (for more on how "free-from" labels are tied to national identity in Austria see Felt 2014). From a logical point of view both modes of labeling would convey the same information, but as the following excerpt indicates these two modes are expected to already entail a specific assessment of the labeled product.

### **Excerpt 31**

- 1 Mod: Do we want a label that says: without nanotechnology? That would be one mode of labeling, another mode of labeling is: contains nanotechnology.
- 2 Denise: Well, I would prefer it if it said: contains nano.
- 3 Carl: Yes.
- 4 Denise: So I would know it and then I would know as well if there's no label, then it doesn't contain it, in reverse.
- 5 Carl: The question is always whether you consider it good or bad, the thing, isn't it?
- 6 Barbara: Right.
- 7 Denise: I would read it as a warning sign first.
- 8 Carl: If it's something bad, like fat, yes, fat, then it's without fat, right?
- 9 Albert: Yes, but in principle fat isn't bad, is it? Too much fat is the problem.
- 10 Carl: It's marketed like that.
- 11 Barbara: And which kind of fat (laughs) (Conpro,1982-2007)

In reaction to the moderator's question, Denise articulates a preference for a label indicating that a product contains nano (2, 4). Although Carl agrees at first (3), he then argues that the applied labeling mode might depend on the general normative judgment of the labeled product (5). Next, Denise discloses her own normative judgment by declaring that she would read a "with nano" label as a warning—this indicates that she considers nano a potential threat and hence wants to integrate it into a regulatory framework. Her turn also implies that she imagines such a "with nano" label analogous to existing warning

signs, which are generally used to make people aware of dangerous substances.<sup>80</sup> Carl, in turn 8, however, brings up a counterexample to her proposed reasoning: the case of fat in food products, which entails a shift of frame from labeling as regulation to marketing. We already encountered fat in foodstuffs as an analogical resource in the food group, and here it is similarly used to point out that the absence of “bad” ingredients is generally advertised with “free from” labels in food products. But like in the food group, the conpro group also challenges the marketing claim that fat in general is “bad” by arguing that the quantity (9) and quality of fat (11) also should make a difference to how fat is assessed. The discourse about fat-free (or fat-reduced) products here demonstrates the group’s attempt to explore how nano should be labeled by drawing on an example from the food area, although food is not the explicit topic of debate in this group. The discourse in excerpt 31 is still ambiguous because the fat case does not exemplify Denise’s preference for a label as a warning sign (regulation) but foregrounds the use of labeling as a marketing instrument. After this interchange, the discussion further revolves around the marketing of certain nano-enabled consumer products, but by switching to the application field of textiles. In the course of this debate, Albert argues that nano-socks will be more expensive than others, thereby attributing to nano a special quality for which consumers would be willing to pay more—although, he claims that he would not buy them himself. The next excerpt displays how the discussion evolved afterwards.

### **Excerpt 32**

- 1 Albert: If I know that it doesn’t contain nano, then I’m on the safe side. [Carl: Well] Then I don’t have to deal with whether it’s good or bad, I simply don’t have it. And that’s that! (Several lines omitted in which Albert, Carl, and Barbara agree that a substance that was once marketed as having great effects might be considered a health risk after some decades.) But as I already said, I’m of the opinion that if one producer starts assessing it with nano-free, which automatically implies, if it’s not “free” it’s bad.  
(... ...)
- 2 Mod: How are other foodstuffs labeled? Have you thought about that?
- 3 Albert: GM-free.
- 4 Barbara: Yes, it always says free there. That somebody uses genetic engineering, that I’ve never read, right?
- 5 Albert: Or organic.

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<sup>80</sup> The idea of inventing a nano warning sign has also been propagated by the Canadian anti-nanotechnology oriented ETC Group, who called for designs of “nano hazard symbols” in 2006. The selected signs were clearly evocative of existing warning signs—thus representing a case of visual analogy. The signs, then, were not merely means to “raise public awareness”, as the ETC Group itself has stated, rather they aimed to fix nano’s still ambivalent meaning by associating it with danger and riskiness. You can find these signs here: <http://www.washingtonpost.com/wp-dyn/content/article/2007/01/20/AR2007012001565.html> (accessed 17 June 2013)

*Nano labeling: Analogies oscillating between regulation and marketing*

- 6 Denise: CFC-free was also used frequently for a time.  
7 Barbara: Yes.  
8 Albert: Yes, the law prescribed that everything had to be CFC-free, I think, didn't it?  
9 Carl: Well, if it's regulated then it's always something bad, a bad material is being kept out.  
10 Barbara: Right.  
11 Carl: Well that- that defines, OK, this is a bad substance, it's dangerous for some reason, it is staying out. Here, the authorities provide security to consumers, if it's labeled, you are assured that it's not in it. (Conpro, 2032-87)

In this excerpt, the group continues to struggle to find a suitable labeling approach for nano. Albert (1) again suggests a nano-free label and offers two reasons for this approach. First, this would allow him to be on the “safe side” by simply avoiding nano, which implies again that he considers nano to be potentially risky. In the omitted lines, several participants highlight that nano's riskiness cannot be known at present and any assessment could also be subject to change, since they see the possibility that nanoparticles might turn out “carcinogenic”, as one discussant put it. Thereby they stress that it can never be claimed with absolute certainty that a new type of material will always be categorized as “good”. Albert, then, repeats his solution of a voluntary nano-free label (marketing) as the best alternative, because it would affect nano's reputation negatively and thus lead to its general non-use. Next, the moderator (2) animates the participants to use their analogical imagination and to think of labeling practices known from the food area. This can be interpreted as an attempt to help the participants by means of focusing the debate on one nanotechnological application field, since—as traced above—the group switched continuously from food to textile applications, each of which entail different assessments of nano.

In the following turns, the participants come up with several examples, and they do so in a collaborative manner by building on rather than challenging each other (see the many affirmatives such as “yes” and “right”). The fact that Albert responds first and brings up the GM food example suggests that he might have relied on the GM case as a kind of hidden analogical template for his imagined “nano-free” label all along. But in any case, we now realize more clearly the parallels of his argument to the use of the GM-nano analogy in the food group. Based on their examples of “GM-free” and “CFC-free” labeling,<sup>81</sup> the

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<sup>81</sup> Since the CFC-case is a non-food example, the group does not completely adhere to the moderator's suggestion. CFC (in German: FCKW) is the abbreviation for Chlorofluorocarbon, a compound of chlorine, fluorine, and carbon, that demonstrably reduces the ozone layer, and which has thus also been connected with an increase of skin cancer. CFC had been widely used in consumer products such as refrigerators or sprays, but it has been heavily regulated since the 1970s. At present, sprays may still display “CFC-free” labels, but in fact also sprays without such a label may not contain CFC as it has been practically replaced with other

discussants agree that the usual (regulatory) labeling practice is the “free from” approach. In order to reach this conclusion, they however have to elide the example of “bio”<sup>82</sup>, mentioned in turn 5, for which this reasoning does not apply. In turn 9 and 11, Carl draws a further conclusion from their collective use of their analogical imagination—we could also refer to what the group is engaging here as brainstorming—, namely that labeling as regulation has the function to “keep the bad out” and to protect consumers.<sup>83</sup> Although this might seem to echo Albert’s “free-from” suggestion, the debate is not back at the beginning because the “free-from” labeling approach is now discussed as a regulatory rather than a marketing tool.

To summarize, the analyzed excerpts in this section demonstrate how participants in the group discussing consumer products tried to find a labeling rationale that guarantees the safety of consumer products. But strikingly, apart from Albert, no other participant established a clear analogy based on the potential analogical labeling templates that were mentioned. As clearly stated by Carl, the regulatory labeling approach presupposes a negative assessment of nano, but the majority of the participants (Albert being the exception) are still caught in the nano labeling dilemma—that is, nano could be positive or negative, but a label might contribute to stabilize one or the other meaning—and thus reluctant to commit to such an assessment.

## **7.6 Imagining ways of solving the nano labeling dilemma: Seals of quality and clear-cut futures**

Since participants in the conpro group are hesitant to commit to a clear normative assessment of nano, which is co-determined by the broad application spectrum discussed in this group, they come to imagine an alternative labeling approach as a solution to the labeling dilemma. The approach is based on their knowledge of seals of quality in the food area. This solution was already implicit in the previous excerpt in the reference to “bio”<sup>84</sup>. Carl elaborates on it by thinking about a different seal of quality right after his last turn from the previous excerpt.

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less problematic propellants in consumer products. (cp. <http://www.snappygreen.com/what-does-the-no-cfcs-label-mean/>, accessed 17 June 2013)

<sup>82</sup> I use here the Austrian term, in English more often the term “organic” is used for such foodstuff.

<sup>83</sup> Banning CFC, of course, was not mainly about consumer safety concerns but about the environment. The fact that this is ignored by the participants demonstrates that what they are mostly worried about here is their health.

<sup>84</sup> Note that in the ICT group, Agnes also referred to the “without GM” label as a “quasi quality label” (excerpt 22, turn 1).



**Excerpt 33**

- 1 Carl: Or just controlled, there are a variety of seals. With meat there's the AMA seal of quality and the like. This you trust, there's a regulatory authority that inspects it regularly and right, when they've inspected it, then it's OK.  
(... ...)
- 2 Barbara: Well, nano can also be very positive. It doesn't mean automatically that it's bad, right? (Simultaneous talk and laughter) But, how shall I decide then, even if it's labeled as free or not free? (laughs)
- 3 Carl: If a harmless (.) symbol, well, certificate would be here. Then it would be certified.
- 4 Barbara: Yes, but this requires that it's inspected. And at the moment that's not the case.
- 5 Carl: Yes, that's the point. Yes, it's not done now, yes. So, that would assure me, OK, that is certified, it's harmless. And and then it wouldn't matter what's in it or not. (Conpro, 2087-120)

Carl puts forward the idea of a seal of quality, here exemplified by the AMA seal,<sup>85</sup> as an alternative solution to a nano-specific label (1). The seal is called upon as a positive model for how food products should ideally be inspected and controlled in order to provide consumer safety. Carl also stresses that this quality seal approach is based on trust in the work of regulatory authorities (“This you trust”)—compare excerpt 25 where a lack of trust is mentioned to destabilize the labeling approach. Thus, Carl here talks the seal into being as a regulatory instrument, backgrounding the fact that it could likewise be seen as a marketing instrument of the *Agrarmarkt Austria Marketing [sic!] GesmbH.*<sup>86</sup> Since Carl's solution remains more implicit at first, Barbara reiterates the dilemma (2). This prompts Carl to further explain how the seal solves the dilemma by sidestepping the issue of nano labeling as such in order to focus solely on the harmlessness of (food) products (4). The debate now has shifted away from nano to the issue of quality or product safety as the more general concern underlying participants' talk about nano labeling. As Carl points out in turn 5, this reframing avoids the dilemma of having to categorize nano as either good or bad, because with seals of quality it no longer matters to consumers whether nano is in a product or not. In such a preferable labeling scenario nano becomes invisible and a non-issue to consumers. In excerpt 33, the area of food therefore provides an alternative

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<sup>85</sup> The AMA website states that the seal “guarantees that the meat has been produced in Austria, is top quality and has been strictly monitored at all marketing stages, i.e. from the farm to the outlet where it is finally sold. <http://www.ama-marketing.at/orientierungshilfen/ama-guetesiegel/> (accessed 17 June 2013)

<sup>86</sup> This raises the interesting question how certain seals manage to pass as regulation, concealing their marketing character, which adds to their credibility and positive image, since people tend to be generally more suspicious of marketing (as we also see in the discussion groups).

perspective and positive template for how nano-enabled products more generally could (or should) be controlled and labeled, and the nano labeling dilemma is avoided.<sup>87</sup>

In fact, the quality label solution already came up earlier when Carl demanded that for consumer products in general “there should be a certification authority. Like with organic farming, there is a certification (...) that is able to assess consequences and makes tests before it is licensed” (Conpro, 1282-6). As exemplified here, organic food labels were the second template based on which an alternative labeling approach was imagined for nano, and this was particularly the case in the food group, where organic or bio labeling served the same function as the AMA seal above. Doris and Emil—both open advocates of organic food—here presented “bio” as a safe alternative to the uncertainty nano creates.<sup>88</sup> For instance, Doris claims to be on the safe side if she continues to consume primarily organic food products: “if I stay on the track on which I’m on now, then nothing can ever happen to me” (Food, 2931f.). Organic food labels were hence also considered as seals that help avoid the flaws of GM labeling (see above).<sup>89</sup> What is more, participants in the food and conpro groups tended to express their shattered trust in labels and their apprehension that seals of quality are becoming less strict and misused for marketing purposes.<sup>90</sup> Thus, participants stressed the need to protect seals of quality from industry attempts of using or changing them for their benefit and of clear information on labels in order to not be misguided by industry labels that feign regulation.

To sum up the analysis in this section so far, the debate about alternative labeling via seals of quality in the conpro group shows that a nano-specific labeling approach would enable consumer sovereignty in risk management, but would involve the difficult task of having to categorize nano as either good or bad—in other words, this would mean individual managing of the labeling dilemma whereby the responsibility for judging the

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<sup>87</sup> In other parts of the transcripts, which were not included in the material for analysis, the medical field and its strict drug trails are also drawn upon as positive templates for the regulation of nano-enabled cosmetics.

<sup>88</sup> Note however that it would be misleading to reduce the meaning participants ascribe to organic or bio food labels to health risks avoidance. For Emil they signify for instance sustainable production processes in the first place: “When I buy bio products it’s not so much the fear that the other stuff is poisoning me, but I know what is behind it in terms of how the farm land is being used and that’s why I buy mainly bio, because I want to support another kind of agriculture.” (1766-70) At the same time Emil is well aware that the health argument may be more convincing as an argumentative resource in public debates, since it represents a culturally more widely shared value. See also next footnote for more.

<sup>89</sup> Consumers may decode “bio” certificates and labels as assurance of harmlessness, but this does not, however, correspond with the meaning producers and regulators ascribe to them: “the label “organic” is given meaning by producers and verifiers because of the consequences of production for the environment and animal welfare, not because of product qualities or consequences for human health. This contrasts with the meanings given to organic by consumers.” (Eden 2011: 186)

<sup>90</sup> For instance, the “organic” label was considered to be a fraud by some participants. Trust in labels was in general a big issue in the group discussing consumer products.

quality of nanoproducts lies with consumer-citizens. By contrast, seals of quality are seen to remove consumer-citizens from the need to perform such an assessment. Participants' preference for seals of quality thus indicates that they are more than ready to hand over responsibility to other trustworthy and capable<sup>91</sup> actors to avoid having to make ambiguous decisions about nano. However, instances in which seals of quality are revealed not to "hold water" (Conpro, 1202) threaten to destabilize the trust-based network of human actors that these labels are supposed to maintain from a consumer-citizen perspective.

Although the seal of quality solution was thus envisioned as potential way out of the nano labeling dilemma, the dilemma was also managed by a second strategy in the group discussing consumer products, namely by imagining clear-cut futures in which nano turns out either as unambiguously "good" or "bad". By analyzing how participants imagined futures for nano, particularly in the future card phase in the following, we thus get a different perspective on the present dilemmatic situation they find themselves in.

#### **Excerpt 34**

1 Flora: Well, for me the near future or present is the lack of transparency (... ..) yes, it will eventually become public, I think, on the one hand there will be scandals, to push it in the media, and on the other hand there will also be a labeling requirement, I think. And then in the distant future, in certain areas there will be abuse (...) in the even more distant future, I think, perhaps there will be a horror scenario, catastrophes, but also maybe revolutionary changes.  
(... ..)

2 Denise: Well, I have the future cards 14 and 15,<sup>92</sup> because I think that the topic will totally pop up one day, yes, then suddenly, everything, wow, nanotechnology, and we all didn't know anything about it and back and forth. Then there will be the labeling period requirement, and then the whole thing will wane, and then things will simply contain nano, right? Then it'll be like preservatives. They are also in our food, there you can decide for or against them. But it's not anything revolutionary anymore because

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<sup>91</sup> In this group a controversy developed about whether this can be considered a way of "shifting responsibility onto the state" (1796). Some participants strongly opposed such a view and argued that it is the function of "public authorities or agencies to free us from these tasks" (Carl, 1701). Interestingly, epistemic hierarchies are drawn upon here to argue for the outsourcing of these tasks to scientists. Participants then present themselves unable to perform what they consider scientific tasks such as measuring or estimating the risks of nano(products): "you cannot assess it yourself" (118f.), "I am no scientist" (1614).

<sup>92</sup> The text on these cards was:

*Future card 14:* Labeling and personal choice. In the future, labeling will make transparent whether a product contains nanoparticles. Thereby every consumer gets the chance to decide if s/he wants to buy nano-products.

*Future card 15:* Getting accustomed to the new. We already live with nano-products today. Without noticing it, they will become more and more part of our everyday lives and we will get accustomed to them. It has always been like that with new things.

you've become used to it. It's nothing where you say, wow, there's nanotechnology in it, but, okay, that's just a t-shirt with nanotechnology. It will become completely normal, I think. (... ..) all jackets will be nano because it's totally normal.

(Two lines omitted)

- 3 Barbara: Well, it will be like with calories or so. It's also written on everything (.) if nothing serious happens. That we don't know. It could also be that there's a total scandal and nano in general gets demonized. (... ..) But it could also be like with preservatives, right? For some time they weren't declared, then products were labeled if they contained them, and now everywhere the labels say: no preservatives (laughs) (Conpro 2916-71)

These three accounts provide basically two different versions of future scenarios for nano in society: on the one hand, scenarios in which nano becomes accepted and normalized, and on the other hand, scenarios in which nano becomes problematic and thus publicly rejected. In turn 1, Flora clearly imagines the second type of scenario, which is motivated by her wish for nano to become publicly visible (transparent)<sup>93</sup> via labeling. In order to make nano into such a public issue ("to push it into the media"), Flora is ready to come up with rather dystopian scenarios, in which nano appears unambiguously in a negative light due to "scandals", "horror scenarios", or "catastrophes". Only after having imagined these dystopian scenarios, she adds a more positive vision that nano might likewise induce "revolutionary changes".

Denise (2) starts out with a similar scenario, in which nano suddenly becomes a public issue entailing mandatory labeling, but she then begins to construct a future belonging to the other scenario type, in which nano undergoes a process of normalization *analogous to preservatives*.<sup>94</sup> While nano may at first be considered revolutionary or special ("wow" usually signals enthusiasm), the analogy with preservatives makes her envision nano entering society and becoming widely applied in clothing. At first this is imagined to permit a choice for or against nano, but she then ends her scenario with a future world in which nano has become "normal", or, put differently, ubiquitous and unavoidable (all jackets are nano). In this scenario, time will tell, in contrast to Flora's vision, that nano can be clearly categorized as "good".

In turn 3, Barbara analogizes that nano could turn out *like calories*. The analogies with preservatives and calories both illustrate a preference for nano labeling. Regardless of nano

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<sup>93</sup> The term "transparency" was used on card 14 (see previous footnote) and was evidently adopted by Flora here and presumably also by Benjamin in excerpt 23 (turn 3).

<sup>94</sup> Preservatives are a subcategory of food additives, thus each preservative is given an E number by the European Union, which has to be indicated on products containing them. Preservatives are only approved in foods if they have been scientifically proven not to involve health risks, to be technologically necessary, and if they do not deceive consumers.

turning out like preservatives or calories, what applies in both cases is that nano is thus no longer a potential threat but has become normalized and regulated. Barbara also envisions a counter-scenario in which a scandal damages nano's image ("demonize"), thereby acknowledging that Flora's vision could also be plausible (and desirable). In a final move, Barbara then integrates Denise's preservatives analogy with Flora's more negative vision of nano, by pointing out that nano could also *turn out like preservatives*. But her story differs from Denise's in that it does not end with preservatives/nano being normalized. In her recollection of the preservatives case, after a phase of non-labeling, regulation prescribed the labeling of preservatives on food products and hence led producers to advertise their absence.<sup>95</sup> Her narrative highlights once more that emerging consumer preferences might be exploited by marketing, or in other words, how regulation and marketing dynamics play out in labeling processes.

Considered in its entirety, excerpt 34 vividly reveals that participants seek to imagine nano to turn out either good or bad, because both scenarios would dissolve the present labeling dilemma. In order to achieve this, nano has to move from its current ambiguous state into a state in which its meaning has become collectively stabilized and a nano label hence conveys a clear, unambiguous message. Participants' analogical imagination plays a central role in this process of imagining such futures because previous trajectories in other areas provide evidence for what could be plausible avenues for nano's development in the future. Since there is no sign of contestation in the talk, the diverging analogy-based scenarios are all considered equally plausible, presumably because they all serve to solve the dilemma. Excerpt 34 also draws attention to the fact that the direction of the future scenarios changes with regard to application field: While Denise envisions an acceptance scenario when thinking about clothes, the analogy-based scenarios deriving from food examples generally suggest more indirect and complex acceptance scenarios (see Barbara's "without preservatives").

## **7.7 Concluding discussion**

To conclude this chapter, I will first contrast and compare how nano was discussed in the three groups by means of analogies, and then draw some more general conclusions concerning the complex issue of nano labeling as such. In terms of similarities, the discussions on nano labeling in all three groups were thematically characterized by the complex interplay of marketing and regulation dynamics around nano labeling. The

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<sup>95</sup> This practice is also called "clean labeling" in the literature.

<http://www.lebensmittelklarheit.de/cps/rde/xchg/lebensmittelklarheit/hs.xsl/1418.htm> (accessed 24 August 2013)

emerging analogies reflected this oscillating character between labeling understood as either regulation or marketing, since discussants switched from discussing nano as a GM-like risky object in need of regulation and mandatory labeling to perceiving nano products as analogous to the marketing of existing products that promise consumer benefits.

In the first two empirical sections, we saw how participants in the ICT and food group responded to being informed that nano is already applied in consumer products without their knowledge. Participants here mobilized various arguments and analogies to point out the unacceptability of this situation, and labeling in particular was presented as a prerequisite enabling them to still have a choice when new technological applications enter the market. Moreover, by collectively remembering the GM debate—thus illustrating the power of collective analogical imagination at work—, the ICT group came to conclude that the public should play a prominent role in the design of a future nano label, because this assures the socio-cultural robustness of a nano label in the sense that its meaning has been stabilized by a preceding public debate. The second empirical section then revealed that the GM case served as a central analogical template in the food group when discussing nano labeling; it was particularly used by nanofood opponents who tried to establish a direct analogical link between GM and nano to foster the emergence of a similar negative public image for nanofood.

However, in both the ICT and food group the complexity of the nano labeling debate crystallized when nano labeling in the form of marketing came into view, as was the case in the food group when discussants became aware of the fact that the promises of nanofood resemble those of existing functional and light foods that have, quite in contrast to GM foods, managed to successfully fill many shopping carts in Austria. This perceived resemblance led to what I called *acceptance analogies*, that is, analogies that plausibly suggest future scenarios in which nanofood might also become accepted (at least partly) in society. But since these analogy-corroborated scenarios disagreed with the futures several participants wished to materialize for nanofood, these participants also engaged in countermoves to undermine the analogy and the promised consumer benefits of nanofood. They did so again with attempts to establish a GM-nano analogy based on the argument that both technologies are characterized by “strangeness” and “unnaturalness” when applied in foods. With this analogical move, the collective rejection of nanofood became again a plausible future, which renders the GM-nano analogy in this context a *rejection analogy*. In order to bring this non-acceptance future underway, the argumentative work (e.g. establishing a convincing GM-nano analogy)<sup>96</sup> necessary to counter nano marketing

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<sup>96</sup> Of course, a GM-nano analogy could also be challenged. For instance, not only is nano’s use in consumer products not restricted to the area of food like it is the case with GM, nanofood is also distinguished from

strategies was also highlighted. The alternation between acceptance and rejection analogies in the discussion groups is here the analogical expression of the general oscillating character of debates about labeling, which are characterized by continuous switching from discussing labeling as marketing to talking about it as regulation.

But it was not until the subsequent sections, which were based on material from the conpro group, that we came to recognize the *nano labeling dilemma* responsible for this oscillating effect clearly. Taking up the concept of ideological dilemma (see section 3.3), which draws attention to the struggles of arguments for specific decisions and actions, allows us to see that some participants indeed found themselves in such a dilemmatic situation as they found it impossible to decide whether they should categorize nano as “good” or “bad” (cp. Eden 2011). From their perspective, nano was still characterized by ambiguity or by what STS scholars have termed interpretative flexibility (Pinch and Bijker 1984). Participants who find themselves in the dilemma stress that any kind of nano label would be ambiguous at present, whereas those participants who have made up their mind as to how to assess nano in specific application fields (e.g. seeing nanofood as “bad” as GM) claim to be able to make use of a nano label and thus act on their assessment.<sup>97</sup>

In this context, labeling thus was frequently treated as a culturally well-established regulatory mechanism that can be employed to close down disputes over the meaning and identity<sup>98</sup> of new technologies and materials (cp. Lezaun and Schneider 2012). Based on their knowledge and recollection of previous labeling approaches from their cultural sphere, the groups also carved out that different modes of labeling have inscribed a specific culturally entrenched normative assessment of the labeled product.<sup>99</sup> For instance, like the Australian sunscreen regulator, they anticipated that a voluntary “without nano” label would imply that nano should rather be avoided and thus negatively affect its public image. Put differently, the cultural connotation of existing labeling approaches, such as “without GM”, was anticipated to coincidentally rub off onto nano then by analogical implication.

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GM foods with regard to the consumer benefits it promises, making it here more akin to functional or light foods, as we have seen. Unlike functional food, GM has not managed to convince consumers of benefits and “functional GM food” such as Golden Rice has as of yet not managed to be successfully introduced.

<sup>97</sup> Additionally, there is the open question whether is it possible for a nano label to be interpreted as a sign of quality on a mp3-player, while being taken as a sign of minor quality or even potential danger on food products. This issue was not debated in the groups.

<sup>98</sup> The issue of coming to agree on a collective meaning of a technology also relates to the question as to how national technopolitical identities are tied to specific labels such as “without GM” or “bio/organic” (Wodak et al. 2009; Felt 2014)—as a state may configure its identity by establishing certain strict regulations via labels—and how these then are in turn interwoven with the individual identities of its citizens.

<sup>99</sup> Of course, socio-culturally stabilized meanings of labels and technologies or modes of labeling can also be opened up again: “At any moment, the stabilized, historical legal fact can reappear, perhaps becoming a matter of concern, debate, challenge or resistance.” (Silbey and Cavicchi 2005, 557f.).

Labels hence were treated as powerful devices moving a technology from a state of interpretative flexibility to stability. Ideally, this process of reaching closure or stability over nano's meaning is imagined as a social process; that is, a label's meaning is conceived as the outcome of a public debate, as it has been the case with GMOs in Austria, where a public debate led to a referendum and subsequent regulation and labeling.<sup>100</sup> In the absence of a similar public debate about nano, however, consumer-citizens are left alone with the labeling dilemma and the need to ascribe meaning to nano individually. In the ICT group, consequently a GM-analogous public debate was imagined to play a central role for the emergence of a "without nano" label.

Two intertwined questions remain with regard to the nano labeling dilemma: (1) why some participants articulate the dilemma more strongly than others, and (2) what solutions were proposed or performed to manage the dilemma. In tackling the first question we have to keep in mind that the nano labeling dilemma was addressed most explicitly in the group discussing consumer products. What was specific for this group is that the focus of debate shifted continuously from one application field to the next, leaving it often unclear what application field participants were actually talking about. In the ICT and food group, by contrast, the debate was already narrowed down to specific application areas, which allowed participants more easily—or even invited them—to apply a *nano is not like nano* strategy. With this shorthand I here refer to how discussants avoided the nano labeling dilemma by distinguishing in their assessment of nano between different application fields. Thus, almost paradoxically, the fact that nano spans a broad range of application areas partakes in (but is not solely responsible for) producing the nano labeling dilemma, while at the same time this divergence also allows participants to distinguish "good nano" (e.g. in ICTs) from "bad nano" (e.g. in food) and thereby circumvent the dilemma. In excerpt 30, turn 5, Albert made this strategy most explicit by explaining to another discussant that normatively distinguishing between different nano product groups allows him to act on a "without nano" labeling approach. This strategy thus represents one way of circumventing the nano labeling dilemma in the present. Based on this interpretation, we may also draw a more general conclusion concerning the use of nano as an umbrella term for a large variety of technological processes that are merely united by the scale in which they operate. The umbrella term 'nano' may have been useful for generating funding and excitement, but once nano comes out of the laboratories and factories and becomes a label on consumer products, the breadth of the term becomes problematic. The analysis thus suggests that the political use of nano as a label in one societal arena may backfire at a later state in the innovation chain by creating dilemmatic situations for consumer-citizens.

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<sup>100</sup> [http://www.parlament.gv.at/PAKT/VHG/XX/I/I\\_00715/index.shtml](http://www.parlament.gv.at/PAKT/VHG/XX/I/I_00715/index.shtml) (accessed 17 June 2013)



Coming back to participants' dilemma management strategies, aside from the *nano is not like nano* strategy the groups also envisioned several future scenarios in which the labeling dilemma disappeared. In the conpro and the food group, *seals of quality* such as the AMA seal or a "bio" label were carved out as alternatives to a nano label allowing consumer-citizens to generally avoid the issue of nano as a whole. Participants took such labels to indicate products' non-riskiness and the existence of safety tests, thus releasing consumers from the need to perform the difficult task of individual risk assessment. Another strategy was to imagine futures in which *nano turns out clearly "good" or "bad"*. Here, analogies (e.g. to preservatives in foods) played a relevant role in fueling participants' imagination of plausible future scenarios that could dissolve the dilemma. As alluded to in the introduction, in the meantime the EU has established mandatory labeling of nano that indeed is similar to the way food packaging informs about preservatives, because the prefix "nano" is added to ingredients listed on the back of consumer products. It remains, however, an open question whether this approach may be able to resolve the dilemma for consumer-citizens at present because people tend to orient mostly to front labels rather than such back labels, as the analysis in this chapter has shown. Moreover, it should be discussed whether this approach continues to assign the task of risk assessment to individuals and represents a convenient way to avoid a controversial public debate about nanotechnology.

To bring this chapter to a close, a more theoretical conclusion emerging from the empirical analysis is that an actor-network theory (ANT) inspired approach could enrich analyses of (emerging) relations around consumer product labels. In the ANT framework, technologies are conceived of incorporating prescribed uses, a feature captured with the idea of a script: "like a film script, technical objects define a framework of action together with the actors and the space in which they are supposed to act" (Akrich 1992, 208). This ANT script approach thus furnished us with conceptual resources such as subscription, de-inscription, and antiprogram that allow to grasp activities ranging from underwriting to renegotiating or rejecting the script (Akrich and Latour 1992).<sup>101</sup> Following this, we may conceive of labels as prescribing a certain script—and in our case, attributing specific meanings to nano—, which, however, can also be contested and countered. Thus, although labels configure consumer-citizens and other actors<sup>102</sup>, label readers can always bring with

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<sup>101</sup> In cultural and media studies a similar perspective on the active role of recipients of media texts has been developed, most prominently by Stuart Hall (1980), who coined three ideal typical decoding positions that fulfill a similar conceptual function as the ANT vocabulary: dominant/hegemonic, negotiated, and oppositional positions (for more on his encoding/decoding model see Schwarz 2004, 27ff.)

<sup>102</sup> We should not forget that consumer-citizens are not the only potential users, but that labeling regulations also address producers of consumer products.

them their antiprograms that work against pre-scribed meanings and uses. However, at the same time, ANT and its emphasis on the relevance of design processes highlights that not every meaning of a label might be equally plausible in a specific cultural context. In short, some meanings simply suggest themselves more directly, for instance if an analogous mode of labeling was employed with other technologies in the past. Hence, not only are labels on consumer products designed for a particular communicative purpose and intended to influence people's actions in certain ways, but experiences with and knowledge of similarly designed labels and their existing cultural connotations likewise confine the range of descriptions (this is where analogical processes do their framing work). Additionally, the ANT framework with its principle of generalized symmetry allows conceptualizing labels as actants that do something, for instance they bind certain actors together in a network of relations.<sup>103</sup> Finally, the fact that participants themselves treat labels as agents powerful enough to influence nano's image and public debate should be taken as an important cue that the agency of labels still warrants more analytical attention.

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<sup>103</sup> The role of labels in assembling actors with their diverging agendas and thus enabling exchange among different social worlds also reminds of the concept of "boundary objects" (Star and Griesemer 1989; Eden 2011), since a boundary object is characterized by different identities and an openness for different interpretations. However, following Star's advice that not every phenomenon lends itself to be conceptualized as a boundary object (Star 2010), I would caution about seeing labels as good examples for boundary objects. The main reason for this is that interpretative flexibility, which is often wrongly equated with boundary objects, holds for any object and represents only one among several dimensions constituting the concept of boundary object.

## 8 Nano should not turn out like... The role of analogies in talk about preventing risky futures

It would be surprising if nanotechnology did not offer upsets similar to thalidomide (the sleeping pill that bred the contergan children, red.), if not enough attention is paid to precaution and humility”, his Royal Majesty Charles, Prince of Wales, warned this summer. Let’s continue with the text: “We should treat nanotechnology maybe like radioactive substances.” No, this second passage does not stem from the crown prince, whom some consider to be an eccentric greenie biding his time until his coronation. It can be found in the matter-of-fact calculation of Swiss Re, one of the biggest reinsurance companies, which has also conducted a risk assessment of nanotechnology this summer. *Die Presse*, 13 November 2004, p. 6, my translation

This excerpt stems from the opening of an Austrian newspaper article on nano published a decade ago. It represents a good example of how references to elite persons are used as a news value but, more importantly from the viewpoint of this dissertation, of how media articles on nano refer back to past negative experiences with new technologies, materials, or drugs to address nano-related risks and tell a cautionary tale.<sup>104</sup> In order to achieve this effect, the article mentions two analogies with risky substances: thalidomide and radioactive material. It starts out quoting the then widely debated analogy with thalidomide that Prince Charles introduced into the debate about nano in an article for *The Independent*. The Prince’s analogical move was interpreted as a clear call for precaution and it entailed a range of actions, for instance it brought the Royal Society to call upon the Government to fund risk research on nano.<sup>105</sup> Although influential British scientists thus approved of the Prince’s concerns, critical comments concerning his thalidomide analogy could likewise be discerned, most prominently from the executive secretary of the Royal Society himself:

The Prince’s article is designed to stimulate public debate about nanotechnology, which we welcome. (...) The Prince cites one piece of evidence that warns of the possible risks that can be associated with new technologies and the need to address public concerns and interests. Although these general points have been made in other evidence to the working group, it

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<sup>104</sup> For a media analysis of Austrian newspaper articles on nanomedicine see Kainrath (2012).

<sup>105</sup> <http://www.independent.co.uk/news/science/the-big-question-what-is-nanotechnology-and-do-we-put-the-world-at-risk-by-adopting-it-1015518.html> (accessed 27 September 2013)

is difficult to make a direct comparison with thalidomide as nanotechnology is not a new drug, but rather a set of tools and methods for working with materials at the scale of millionths of a millimeter.<sup>106</sup>

The executive secretary of the Royal Society here rejects a direct or ontological parallel to thalidomide, while at the same time granting noble intentions to the Prince. His account carries an appeasing tone and is presumably designed to prevent panic among the public. If we look closely at the quote from Prince Charles in the introductory excerpt we realize that Prince Charles in fact never claimed that thalidomide and nano are similar on ontological terms, he merely posed an analogy-based scenario as probable if certain precautionary measures were not taken. In essence, the secretary's account is thus no less rhetorical than the Prince's. But let's get to the heart of the matter. This story illustrates that analogies are at the core of public debates about nano's potential riskiness. *Risk analogies* or scenarios based on comparisons with previous risky cases and technologies are highly contested due to the negative assessment they tend to produce for the emerging technologies summarized as nano. We already know from the theory chapter that analogies matter because they frame the debate about nano by constructing nano in specific ways. Moreover, the story told about the Prince shows that analogies cannot be disentangled from their animators. Both the journalist writing the article on nano as well as the secretary of the Royal Society did not take Prince Charles's thalidomide analogy as sufficient evidence for possible risks. Much more credibility was attributed to the radioactivity comparison attributed to the insurance company, and scientific evidence.

The thalidomide and the radioactivity analogy clearly entail a health risk framing. The public and regulatory debates about the potential health, safety and environmental risks of nanoparticles, however, have from early on been dominated by an analogy between asbestos and nano (Kane and Hurt 2008). Even before Prince Charles's alert, the nano-critical ETC group mobilized for precautionary action by invoking a nano-asbestos analogy based on the similar shape of asbestos fibers and specific nanoparticles: "It turns out that Dr. Wiesner's comparison of carbon nanotubes with asbestos is not merely rhetorical, highlighting the need to assess the dangers of a material before it becomes ubiquitous. Carbon nanotubes resemble asbestos fibers in shape: they are long and needlelike."<sup>107</sup> By mentioning a supposedly neutral scientist as the source of the analogy, the ETC group here aimed to establish its credibility and to diminish the "rhetorical"—that is, designed—character of the comparison.

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<sup>106</sup> <http://www.freerepublic.com/focus/f-news/1169874/posts> (accessed 27 September 2013)

<sup>107</sup> [http://www.etcgroup.org/sites/www.etcgroup.org/files/publication/192/01/comm\\_nanomat\\_july02.pdf](http://www.etcgroup.org/sites/www.etcgroup.org/files/publication/192/01/comm_nanomat_july02.pdf) (accessed 27 September 2013)

This chapter traces how such risk analogies and, more generally, analogical discourse oriented to prevent certain futures from materializing were constructed and negotiated in the discussion groups. It goes beyond focusing merely on health risk analogies because this would fall short of the myriad kinds of risks that were addressed in the groups. Hence, the first two empirical sections of this chapter explore the risks participants identified regarding the governance of innovations on a societal level, and the role of analogies and metaphors played in this process. The chapter thus reflects the fact that public concerns cannot be restricted to safety risks of new technologies but encompass concerns about governance processes and public participation, which is why it is also more appropriate to speak of innovation rather than risk governance (Felt and Wynne 2007).

As we will see, citizens provide and activate many examples of what they interpret as failed governance processes. Remembering past failures here has to be understood as active construction in order learn for the future of nanotechnology governance and to prevent similar outcomes from repeating themselves. This is why the analogical discourse we encounter in this chapter can be understood as *prevention talk*, that is, a kind of discourse designed to show how nano *should not turn out*. Consequently, rather than putting emphasis on positive socio-technical imaginaries, the following analysis reveals the ways in which dystopian futures and *alerting analogies* are employed to mobilize for the emergence of preventive and more inclusive governance processes.

The chapter is based on selected material from the groups discussing nano in medicine, food, and consumer products. Its first and second empirical section draws mainly on material from the introductory discussion in the medicine group where story cards were discussed. I chose this material because it represents a rich passage as regards the occurrence of analogical discourse. The third and final empirical section then assembles examples of risks analogies such as those mentioned in this introduction. While most of these accounts share an alerting character, we will also encounter variety as regards the perceived scope of action to effectively prevent threatening analogy-based futures from materializing. Like in the preceding empirical chapters, we will finish with a concluding discussion that weaves together the detailed insights from the empirical sections and distills more general conclusions.

## **8.1 Alerting analogies and metaphors: Demanding political action to prevent undesirable futures**

In this first section, we explore several excerpts from the start of the medicine group that demonstrate how participants use analogies and metaphors to imagine rather dystopian

scenarios and alert an absent present actor (politics) that something should be done to prevent these scenarios from materializing in the future. The first excerpt begins after David explained why he chose story card 4 (see Figure 6) and demanded that politics should “build a regulatory framework” (182) for nano. Franz, a 50-year-old business economist, elaborates on this issue of regulation in the following.

<b>Story card 4</b>
<b>Maria Cerny (politician)</b>
Time is short. While on the EU level and in other EU countries the chances and risks of nanotechnology are discussed intensively, Austria is still lagging behind. Continuously, new products containing nanoparticles enter the market. We know far too little about the possible risks and effects of these particles, because risk research cannot keep up with market development. That's why transparency and clear state regulations are necessary. Only if that is the case, we can trust the positive applications of this technology. Companies will then be willing to research and invest in the area of nanotechnology responsibly.

Figure 6

### Excerpt 35

Franz: Yes, I think that politics shouldn't from the outset somehow take sides with one side because it's a topic for the future and they always somehow jump on everything that lets them be associated with an agent of the future. I at first (clears his throat) understood this point about the regulatory framework also a bit differently. If I compare this with stem cell research and the like, where it has always been said that the absence of a legal framework would restrain Austria or- it's not just Austria, also other countries complained about that, compared to other countries. And I think that we will see the same issue here, if something isn't allowed or is viewed more critically or will be pushed stronger, it'll be moved somewhere else. (...) And when people get that glint in their eye, then they will lie like a trooper. (Med, 191-203)

From our analytical viewpoint, this excerpt is interesting for its metaphors and for the analogy with the debate about stem cell research. First, Franz uses the *metaphor of “taking sides”* to highlight that he wished for politicians to be neutral in debates about new technologies despite their attributed tendency (“they always somehow”) to adopt (“jump on”) promising issues (“topic for the future”). The figurative expression of “jumping on”

reminds of the idiom “jumping on the bandwagon” that alludes to opportunistic attempts of trying to benefit from an already successful or promising development by becoming part of it. If we interpret the “*jump on*” metaphor in this way, it entails a conception of (nano)technological developments *resembling a running train* and it also draws attention to the *right timing* of investments into new technologies (if you do not jump on the train at the right moment, the chance to get on has passed by). By using these metaphors, Franz prompts political actors to resist the urge to participate in the nano hype merely to present themselves as forward-looking.

Then, Franz explains that the aspect of state regulation mentioned on the story card reminded him of the debate about the regulation of stem cell research. By reproducing specific arguments from these debates, he highlights that certain actors demanded state regulation in order to not fall behind other nation states, invoking a discourse of national competitiveness to mobilize for investment. Next, Franz anticipates by analogy that if nano were not regulated in Austria, research on nano would also be done elsewhere like stem cell research, thus warning about an undesirable future, which threatens to become real from the perspective of the nation state. Finally, Franz predicts that the lure of new technologies will affect the trustworthiness of actors promoting these technologies. The *glint in their eyes* metaphor refers to an excitement aroused by anticipating something (presumably profits) in the future, and this excitement is presented as being the cause of immorality, here in the sense of untruthfulness (“*lie like a trooper*” idiom). The final part of his utterance thus works as a warning to the public and its representatives in the discussion group that the techno-promissory talk of certain actors should not be trusted.

In the next few turns, which I will just summarize, Eva and Franz continue to discuss the role of politics in governing nano. Eva expresses doubt that political actors can influence the development of technologies due to the more powerful position she ascribes to the business sector, in this way challenging the calls for political action that were voiced before. Franz, in response, defends his call for action by arguing that despite the fact that the business sector is a “fast and flexible” (218) actor, politicians are still responsible for creating a legal framework and installing control mechanisms instead of “resigning and behaving passively” (221). Franz here follows up the action-orientation of his previous account, since the utterance is again designed to activate policy makers to counter economic forces by establishing regulations—passivity is presented as a non-acceptable stance. Politics is thus assigned a counter-balancing force against the weight of economic interests. Immediately afterwards, Bruno, a 65-year-old pensioner and former teacher, delivers a long uninterrupted statement including several *analogical moves*. For analytical purposes, I split his long turn into three parts in the following.

**Excerpt 36**

- Bruno 1: What comes to my mind now, a parallel example from recent history. It's not so long ago, when the term globalization was (.) born, let's put it like that, bor-, well, it entered mainstream society. Many have said, what is this? Globalization? And is this now bad for us Austrians? Do we gain anything from it? What harm could it do? What good could it do? And in the meantime, the economic situation has overtaken us, the situation that developed concerning the banks. And suddenly they're saying, was it globalization? Is globalization to blame that it came to this? Now, to me the big question is not the question of blame but how the- the fellow citizen sees it. You- you connect the term globalization with something negative that happened in the meantime.
- 2 And something like that would then also be the issue for me with nano. It could be that if this general framework doesn't exist (...) of course, of course, once again the new technologies, right? We pay for it. So, I think it's necessary to either reject it in time or to educate people in which respect what is associated with it, what consequences are already known.
- 3 And the risks, I'm thinking about vaccination for instance, where people are becoming more and more critical, when risks cannot really be identified. And it will be the same here. For all these new terms that spill into society, the question is, ah, why aren't we told the whole truth? And this seems to be the case with nanotechnology. Now it's still insider knowledge, I would have said, isn't it? I don't know if it's true, but (laughs) the term is rather dark, I think so at least, I don't know. You would have to- I can only talk about my generation now (laughs) this could be wrong. But probably the task would be to inform people early enough, provide material, information material, discussion or examples. To take away the fear. (Med, 223-48)

Right at the beginning of his turn, Bruno prepares his audience for an *analogy* to come (“parallel example”) and then goes on to narrate how he perceived the introduction of the term “globalization” into Austrian society, during which he gives voice to concerns about national well-being as did Franz before. Bruno suggests that the public might have come to blame globalization for the economic crisis due to chronological coincidences. In addition, he presents himself as a detached analyst of the reactions of his “fellow citizens” who is himself disinterested in attributing blame or giving his personal opinion. This move works as a strategy of stake inoculation, that is, he uses it to perform personal disinterestedness (Potter 1996b).

In the second part of his account, Bruno establishes an *analogy* between his narrative about globalization/the financial crisis and nano. This allows him to construct an undesirable future scenario for nano in which the public could blame “new technologies again”. By presenting this assigning of blame as a recurring pattern (“again”) and by performing the anticipated public outrage—citizens complaining that they have to bear the



consequences (“pay”)<sup>108</sup>—Bruno tries to further strengthen this future scenario. The scenario is imagined to come about in the absence of a “general framework”, by which Bruno most likely alludes to state regulation. Bruno thus echoes Franz’s attempt to plausibilize the emergence of the negative consequences brought about by a lack of political action and legal regulation. In contrast to Franz, however, he does not focus on economic investment but on public opinion, thereby introducing another argument for why politicians should act. In this way, Bruno casts himself into the role of a policy advisor who is concerned about the reputation of nano in the public realm. In accordance with this role, Bruno advises how to avoid this future from materializing, namely by “educating” the public at the right time. Thus, *timing* reappears as an issue. He further argues that politicians first need to realize what needs to be done—expressed metaphorically with “*to switch*”—and then should communicate what is already known about nano. His advice is that early communication will prevent the public from attributing blame. Bruno’s account thus corresponds to the growing concerns of government institutions to engage in blame management (Hood 2002).

In the third part of his account, Bruno draws an *analogy with vaccination*, which renders nano and vaccination as cases for which the risks cannot be estimated. Here, public skepticism pertaining to vaccination is used as further *analogical evidence* for the emergence of similar reactions with nano (“it will be the same here”, note that this is the exact same phrase Franz used in excerpt 35, which further underlines that they share a communicative intention here). The analogy is employed to corroborate the credibility of his prediction and to send a warning to policy makers to communicate and thereby establish public trust, since the public is expected to ask otherwise: “why aren’t we told the whole truth?”. With this suggestion, Bruno also reacts to Franz’s proposition that lies will be told. Bruno’s solution to the anticipated problem of public trust is information, which corresponds to the deficit model of the public. His call for information is then further underpinned with the argument that citizens do not yet possess the necessary knowledge about nano (the metaphorical expressions “insider knowledge” and “dark”<sup>109</sup> are part of this). At the same time, such an argument implies that there already exists indisputable knowledge about nano that simply has to be communicated to the general public, which contradicts his preceding claim that risks cannot be anticipated. Finally, the way Bruno

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<sup>108</sup> The word “pay” could be interpreted both literally and metaphorically, because a literal interpretation fits with the aforementioned financial crisis and, as a metaphor it could refer to the negative side effects of promising technoscientific developments.

<sup>109</sup> The metaphor “dark” fits with the image domain of seeing, which can be used to “talk metaphorically about what is known and unknown, apparently realizing a conceptual link KNOWING IS SEEING.” (Cameron and Deignan 2006, 673)

closes his turn is interesting for how he orients towards the other people present, who are all visibly younger than him. By restricting himself to being entitled to speak for his generation, he simultaneously counteracts potential allegations of lacking the necessary knowledge or experience to speak for society at large. He finishes his account with repeating his suggestion to inform the public in order “to take away the fear”, thus reperforming the deficit view of the public.

So far we have traced how analogies with previous technoscientific developments and societal debates were established to warn against nano turning out like these. Analogizing here played an integral part in participants’ attempts to construct plausible future scenarios (*analogical evidence* is provided for these scenarios), which are designed to *alert and activate* politicians to *prevent* these undesired futures from materializing either by regulatory measures or communicative efforts. With their analogy-based scenarios, Bruno and Franz *warn* that lessons should be learned from negative past experiences. Put simply, the rather dystopian analogies are designed to shock policy makers into action. Additionally, they also work as *devices* to present their enunciators as mere animators or neutral advisors without a personal stake in the issue.

While Bruno constructed a scenario in which the public should be educated, Christa, a 50-year-old woman working in the pharmaceutical industry, reacts to Bruno’s account immediately and displays an orientation more interested in stirring public opposition rather than “taking away the fear”.

### **Excerpt 37**

1 Christa: This is why I right away took the “action group against nano” card (laughs). Because I always like being against something (laughs) even before I know what it’s about so this is, this is, late-68-thing probably, the gene in me. Well, I just always think it’s really great, when something that is supported by industry and politicians gets a counter draw, to keep the balance in society, right? And that appealed to me most. Because the one thing will start running on its own anyway, because there’s so much money behind it, and a lot of recognition, and prestige, and I don’t know, divinity, if you want. And then, to me, those who don’t get blinded and who illuminate the other side are really important. That’s why I chose this card.

(... ...)

2 Franz: Yes. Well, the term that I found the most tangible in all of the cards was- was this term “ideology of the technical solution to all problems”. Here I said, I can relate to that, this is something that I’ve thought about from time to time. And in the next sentence, “social and political structures that make people sick are suppressed”. This is, I think, yes, a second aspect, this blinding out at the beginning and then waking up too late. (Med, 250-70)

<b>Story card 5</b>
<b>Action group against nano</b>
At first glance, nanomedicine appears to belong to the unproblematic nano applications, because nanomedical products are at present the only sufficiently tested nanoproducts. However, it is problematic that nanomedicine is built upon the ideology of the technical solution of all problems. Social and political structures that make people sick are blinded out. Nanotechnological developments aim to realize the total surveillance of humans. If nanoparticles cross the blood-brain barrier, we worry that completely new psychotropic drugs will flood the market.

Figure 7

At the beginning of her turn, Christa opposes Bruno's claim for information politics, but she avoids addressing him directly by talking about her card choice (see Figure 7) instead. At the same time, she echoes Bruno by drawing on her generational situatedness to legitimate and avoid being held accountable for her critical stance. Christa constructs herself as someone with a rebellious identity originating from growing up in the late 1960s. By comparing her critical stance to a gene, she highlights the formative and permanent power of her specific generational experience to ward off personal responsibility. In other words, she claims that growing up in that time period formed her identity in ways she cannot overcome because her generational belonging makes her articulate a critical attitude. She then stresses the importance of a "counter draw" coming from people who resist the lure of promising innovations and try to put the spotlight on other aspects of these innovations. In order to convey this meaning, Christa uses two metaphors stemming from the image domain of *light/seeing*: One suggesting that too much light ("light" as a metaphor for the promises of new technologies) prevents certain actors from seeing properly, whereas "illuminating" stresses the additional activity needed to make aspects that would otherwise stay hidden become visible. In the omitted lines of the excerpt, the moderator asked whether anybody else chose this card. In response, Franz declared to have selected the card and he also inquired whether he is expected to "justify" (264) why he took it, to which the moderator replied in the affirmative.

Franz complies and explains that he chose the card because he agrees with several of its phrases that he then also reproduces verbatim (2). We now come to understand that a light/seeing metaphor was already introduced by this card ("blinding out") and was taken

up as a *metaphorical resource* by Franz and Christa. Both discussants, however, did not simply adopt the metaphor but extended its meaning. Franz here connects it with a *metaphor of timing*, which we can trace back to story card 4 (see Figure 6), when he states that the blinding out (negligence) comes first, followed by waking up (realizing) “too late”. The theme that reappears here is that seeing/knowing has to happen *in time*. Taken together, Franz’s and Christa’s metaphors create an *undesirable scenario*: First, the absorption of too much light (getting blinded) symbolically stands for the promises of nanotechnology that are expected to bedazzle politicians. This is connected with disregarding (“blinding out”) certain issues or risks, which does not represent the specified ideal balanced approach. And finally, the sudden delayed realization (“waking up”) comes at a point in time where damage has already been done (“too late”). The employed metaphors neatly fit together and thus assist in co-constructing a future-oriented narrative that—similarly to the use of analogies—serves as a warning to policymakers to also recognize the critical voices raising these issues.

## **8.2 Should nano turn out like Zwentendorf? Collective remembering and a lesson of timing**

We stay with the medicine group. A few turns after excerpt 37 took place, David takes up the issue of societal balance that Christa brought up and explores it by means of retrospection, thinking back to the debate about nuclear power a few decades ago.

### **Excerpt 38**

- 1 David: May I return to this question, we’re talking about balance in society. Going back, I wasn’t there in the sixties, topic nuclear politics, nuclear power plants, the new solution to all problems of mankind and all the rest of it. Let’s look at the situation today. We have no clue where to put these fuel rods, this [shows
- 2 Christa: [But I protested, this I can say. (laughs) A clean conscience (laughs)
- 3 David: I believe you, I believe you. What about the balance in society, I’m asking: where is it? Nuclear power plants are everywhere, [they are standing right in the middle of society.]
- 4 Christa: [But in Austria there are none, thank God! Which is of no help.]
- 5 David: One is there, but it’s not running.
- 6 Christa: Yes, that one isn’t running, right.
- 7 David: The main thing is that a lot of money- a lot of money was spent [Christa: Yes] But that’s the question, I’m asking myself, where is the balance?
- 8 Christa: It’s not in balance anyway.
- 9 David: It’s extremely unbalanced. [It does not even exist.]

10 Christa: [Right. And that's why such organizations and people, who dedicate themselves to such a great topic, where everyone gets such eyes

11 David: [Totally important. But I'm a politician. I don't have an opinion.

12 Christa: (laughs) That's why I took it. It's like a leitmotif in my life. But yes, you can't do more than be critical.

(cross talk) (Med, 293-324)

In turn 1, David makes clear that his account should be understood as a reaction to what has been said about societal balance before, and that he will confront the group with a question. He then prompts the group to recall the public debate about nuclear power, which he presents as having been characterized by huge promises that have not been fulfilled but have instead led to unresolved problems in the present. His final “this shows” indicates that David wants to draw a conclusion, but he does not get around to it, because Christa (2) defends herself by arguing that she “protested” and hence cannot be held accountable for this situation. This shows that she interprets David account as an accusation of the older generation, including herself (his “I wasn't there”, which can be read as “I'm not to blame”), for not preventing what has happened. The debate here still revolves around the underlying question of who is responsible for acting in order to prevent certain futures from materializing. Next, David (3) reassures Christa that he is not holding her accountable (“I believe you”), and he uses her statement to further back up his assessment that the struggle for balance (and past public protest) has not been successful. This statement could be interpreted as a counter-argument to Christa's argument that societal countermovements are necessary to restore “balance” and can achieve a relevant effect. His claim that power plants “stand in the middle of society” may appear puzzling, taking into account that Austria is among the few countries in Europe without nuclear power plants in operation. But it makes sense when we consider that the society David here talks about transgresses national borders—an interpretation supported by Christa's next turn (4). She first starts to correct David by stating that Austria is without nuclear power plants, a situation she is glad about (“thank God”), but she also admits that David is right because this makes no difference (“of no avail”). She thus subscribes to David's understanding of “society” encompassing more than the borders of nation states. The two participants here presumably remember that nuclear power plants can be found quite near to the Austrian border—and in the case of an emergency Austria would thus be equally at risk since radioactivity does not stop at borders.

In their next two turns, the two interlocutors clarify their facts by collectively remembering that there is one nuclear power plant on Austrian soil in Zwentendorf. This nuclear power plant was built in the 1970ies, yet never put into operation (“not running”) after protests and a referendum (for a historical analysis of this case see Felt 2014). David,

then (7), sarcastically notes that building the nuclear power plant was a waste of money with which Christa agrees, and he uses this as a case in point to again phrase his rhetorical question concerning societal balance—the question is rhetorical because it is designed and oriented to as a statement. In turn 8 and 9, David and Christa consolidate in collaboration the diagnosis that society is “out of balance”. David also uses the *metaphor of “overweight”* to accentuate the image of imbalance. Christa (10) repeats her assessment that critical countermovements are therefore necessary to restore the missing balance when it comes to topics that raise great expectations (metaphorically making the eyes bigger; again a *seeing* metaphor). At this point, David (11) ironically slips into the role of a politician, the story card he chose, and speaking from this position he ascribes importance to countermovements and presents himself as a neutral actor (the ideal of not taking sides already established).<sup>110</sup> Put simply, David here performs how the participants would expect politicians to act, while at the same time his ironic performance shows that such a politician’s assurance is taken as nothing more than empty words. Christa (12) is amused and emphasizes that “this” —denoting presumably the rhetoric of politicians—made her choose the “Action group against nano” story card. Then, she calls upon her lifelong critical identity and once more professes to having done all in her power (“being critical”). Most strikingly in these last turns, the two participants made their two story cards speak to each other to discuss problems they identify in broader societal constellations around emerging technologies. The subsequent cross talk indicates that this is a relevant/controversial issue that might not yet be resolved at this stage.

After a brief interlude in which several participants collectively argued that “the public” is hardly aware of nano yet (they thus elaborate and agree with Bruno’s point of nano being “still dark”) and then arrived at the conclusion that being personally affected is often necessary to get people to engage with such topics (326-57)<sup>111</sup>, Bruno led the debate back to the issue of nuclear power (the issue thus indeed was not yet resolved). This generated another rather controversial debate, as the next excerpt shows.

### **Excerpt 39**

1 Bruno: (...) Today, if we blind out the last 20, 30 years, today, we have the standpoint, yeah thank God, Austria did it, we have no nuclear power plants. But I have enough acquaintances who say: Stop this bluff, all around us there are so many nuclear power plants that it doesn’t matter if we had one or not. [Christa: of course] That means (cross talk, laughing) of course. But to transfer this, now I’m getting to our topic,

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<sup>110</sup> We could speculate whether there is a relationship between the constructed ideal of “neutral” political representatives and the participants’ own performances of disinterestedness.

<sup>111</sup> This conclusion might be a result of the overall framing of the discussion group as being about medicine; an area in which personal affectedness plays a greater role.

*Nano should not turn out like...*

applied to it this would mean to me, what you said, as long as it helps me everything is fine. But couldn't it be that there are dangers which I don't know about, then I'll be skeptical, right? And then it comes down to politics, which foundations do we create to inspect this. Or to give people the feeling that it's being inspected, it's inspected and running as it should.

- 2 Christa: The problem is that politicians are also just people with their personal views and ideologies (...) and satisfying everyone is simply not possible.
- 3 Bruno: Well, but then of course comes the industry like he says [David: Right, then comes] and says, wait a minute, if we don't do this in Austria, then the Germans or the Swiss will do it.
- 4 Christa: Yeah yeah
- 5 Bruno: Or I don't know, let's be faster, let's do something (laughs) it's our chance
- 6 Christa: But-
- 7 David: [Do- do we have to jump off the cliff just because everyone's jumping?
- 8 Bruno: Well, yes, yes (.)
- 9 David: The Austrian solution is anyway typically Zwentendorf, now there's a nuclear power plant there, but not in operation.  
(collective laughter)
- 10 Christa: I like that.
- 11 David: I like that too. But it would have been better, if it wasn't standing there.
- 12 Bruno (laughs)
- 13 Christa: Yes, in this case they were stopped too late (laughs)
- 14 David: At least we did get the turn. (Med, 364-405)

At the beginning of the first turn, Bruno takes up the “*blinding out*” *metaphor* to focus the debate on the present, which he presents as characterized by a collectively shared positive assessment of the situation that Austria has no operating nuclear power plants. Although he repeats Christa's “Thank God” phrase in this context, he does not refer to her directly but instead speaks of a collective (“we”) in order to mitigate the accusation that follows. Then, Bruno reports hearing skeptical voices that contest the positive assessment of the present situation by pointing to nuclear power plants near the Austrian border. Christa's interjected validation (“of course”) demonstrates that she agrees with this argument and might also have understood it being indirectly addressed at her. Going back to the previous excerpt, we see that she and David already articulated this argument, and Bruno in fact merely revives it here. By repeating Christa's “of course” Bruno demonstrates consensus. After some cross talk, Bruno manages to continue and he claims to make an *analogical move* by transferring (an insight from) the nuclear power example to the nano case. His following account can best be understood as an implied accusation of politicians who were not successful in reassuring the public of the safety of nuclear power and that this mistake

should not be repeated with nano.<sup>112</sup> The lesson he draws from the nuclear power case is that it presents an example where this communicative process has failed, and thus politicians are addressed to do more to avoid public skepticism. Politics, he advises, needs to check whether any risks (“threats”) are associated with nano and assure the public that something will be done to contain these risks.

Christa challenges Bruno’s account in turn 2, which again indicates that their orientations are difficult to reconcile. She demonstrates that she does not believe in the realization of the ideal of neutral politicians. Bruno then counters her (3, 5) by incorporating the voice of commerce that presents arguments for national investments in new technologies. The business sector is thus portrayed to put pressure on politicians by mobilizing arguments of national competitiveness and timing. In Bruno’s incarnation, commercial interests appeal to Austria (“we”) or its representatives to invest in new technologies in order not to fall behind neighboring countries. Bruno’s attempt to provoke a reaction with this move is successful, because Christa reacts, true to her self-acclaimed critical position, with skepticism (4, 6). But before she can refute Bruno’s argument, David assists her in mobilizing a well-known idiom that works as a counter-argument against entering into a competition between nation states (7). The idiom points out that doing what the majority is doing can be fatally wrong (in a literal sense: dying when jumping from great heights), and it also matches the metaphor of the nano hype as a train on which nation states jump on, which Franz introduced at the beginning (see excerpt 35). The idiom here legitimates Austria’s maverick role in refusing promising yet risky technological innovations such as nuclear power and it allows audiences to interpret the mode of doing it differently as prudent foresight rather than innovation resistance or the like.

The idiom displays rhetorical power because Bruno only validates it and then pauses for a moment (8). This gives David the chance to elaborate, and he again draws on Zwentendorf to account for the ambiguous history of Austria’s nuclear power politics, to respond to the critical voices Bruno mentioned. Zwentendorf, David concedes, illustrates that Austria cannot present itself as having exceptional foresight from the start because a nuclear power plant was built in the first place (clearly a sign that Austrian politicians wanted to jump on the train), although it was later abandoned after a referendum. The fact that he refers to Zwentendorf as the “typical Austrian solution” renders it a case that captures the usual way of handling new technologies in the Austrian context, characterized by first trying to be part of a new development but then backing down (what could be

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<sup>112</sup> We should consider that this discussion took place before the nuclear meltdown in Fukushima, after which Austria’s national anti-nuclear identity as a pioneer in anti-nuclear politics became even more stabilized. Since then other European countries have also begun to opt out of their nuclear energy programs.



called indecisiveness). Additionally, collectively remembering that an expensive nuclear power plant had been built but was then not put into operation seems to evoke ridiculousness, expressed in the participants' laughter. Christa and David confirm that even though they criticize the governance process, they are at least satisfied with the outcome; they are here displaying their personal opinion (rejecting nuclear power) and performing as well as vindicating the "Thank God" assessment (10, 11).<sup>113</sup>

The last two turns of excerpt 39 are notable for how the public is invoked as an actor that was able to stop politicians ("them") and pull the nation's energy politics into a more desirable direction ("get the turn", 14)—even if this turnaround should have taken place earlier ("too late", 13), that is, before having built the nuclear power plant (11). Thus, the issue of *right timing* reappears once more—here referring to the point of time when the public should intervene or be involved in the decision-making over new technologies. Collectively remembering the debate about Zwentendorf thus works to carve out the lesson that timing plays a crucial role for public involvement or countermovements to be effective and prevent undesired futures. Thus, the implicit lesson emerging from excerpt 39 is that nano should not turn out like Zwentendorf in terms of timing.

Moreover, we encounter a metaphorical change of means of transport: While at the beginning of the discussion (excerpt 35), Franz referred to Austria trying to jump on the bandwagon, by which technological innovation or the nano hype was conceptualized analogous to a train moving forward on predefined tracks, the metaphor of "getting the turn" casts Austria into the driver's seat of an individual means of transport. By switching metaphors, Austria is imagined to have gained back its agency regarding technological decisions; it can then go on a different route that might not lead into the anticipated disaster or abyss—if we integrate David's "jump" metaphor. The articulated dissatisfaction with the way the nuclear power trajectory turned out stems only from the fact that Austria should have changed from mass transport (a follower role) to individual transport (resisting the promises of nuclear power) earlier.

What is also notable in excerpt 39 is that only Bruno (1) tried to establish a direct analogy between Zwentendorf and nano. Nevertheless, the conversation about Zwentendorf can be understood as analogical in the sense that it is held to gain insights for the governance of nano—and as we saw the group indeed carved out that timing is of relevance for countermovements to successfully intervene in the governance of emerging

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<sup>113</sup> Note that no participant openly professed to being a proponent of nuclear energy in this group. Such a position was only expressed via proxies (see e.g. Bruno's "acquaintances"). Only in the group discussing nanofood, one participant "outed" herself as an proponent of nuclear energy and thus as "absolutely bad". These were her own—very telling—words, since they perfectly indicate the almost taboo-like status of such a position in the Austrian context (see excerpt 47).

technologies. Although not addressed explicitly in the above excerpt, the debate about Zwentendorf entails that *rejecting nano like nuclear power* appears on the horizon of attainable and perhaps even desirable future options. This interpretation is supported by Franz's comment following David's last turn, which is reminiscent of the quote from the secretary of the Royal Society in the introduction.

#### **Excerpt 40**

Franz: Yes, nonetheless I think it's hard to compare. Nuclear power is used for energy production, that's a really important topic. But nano is much, much broader. It can be used in a variety of areas, medicine is just one aspect. It can make all kinds of things, processes more efficient, material properties and so forth, and that's why it's harder to lump it all together. Probably in ten years' time we will shake our heads that we gathered it all into one category. Then these will be completely separate topics. (Med, 407-14)

Here, Franz reacts to the potential analogous rejection of nano in the previous discourse on nuclear power by proposing a disanalogy between nuclear power and nano. In this way, he cautions the group not to transfer their assessment of nuclear power onto nano. He achieves this distinction by changing *tertium comparationis*: whereas the debate before revolved around the governance process of new technologies, he focuses now on the range of application areas of nuclear power and nano. By stressing that nano differs from nuclear power in this respect and by highlighting its positive effects (e.g. making things more efficient), he argues against a general rejection of nano. This *nano is not like nano* move here not only enables a differentiation between application fields, but it also suggests that one should assess these fields on different terms. Franz's utterance can thus best be read as a *cautionary account* directed to the group to not engage in a generalizing assessment of nano. We will explore the group's reaction in the next section, because it is here where the debate moved to health risk issues.

For now we remain with the comparative case of Zwentendorf that was also mentioned in two other groups. In the group discussing nanofood it was used as an example for a public debate in which physicists claimed to possess superior knowledge about risks among experts, and in the group on consumer products it was referred to as a positive historical example for how public protests against an emerging technology can work out. Since this second use resembles the argumentative pattern we identified above, let us look at this instance in more detail in the following excerpt. This conversation occurred after the moderator brought up the idea of the precautionary principle in a debate about possible risks. This, of course, demonstrates that the analogical resource of nuclear energy co-emerged with the debate about risks.

**Excerpt 41**

- 1 Albert: But will that even work? We can't inhibit it, we can't lock it out, we can't inhibit it, it will come nevertheless.
- 2 Carl: Yes, that is the question if you could prevent it somehow, right? Wait until you know more about it, until you really can say-
- 3 Barbara: [Or you can set an example at least, right? Because that is like with our not activated nuclear power plant. Maybe the others laugh about it. But it's simply a statement, that you say we can do without it. Or, the general public can be against it.
- 4 Xm: But we also import. (laughs) (Conpro, 2699-2707)

As the excerpt shows, the claim that nano cannot be prevented from being applied in Austria (1) and that therefore every protest would be useless, is challenged with a reference to Zwentendorf. It is presented as evidence that the public can successfully make a statement, that is, reject certain technologies and participate in the governance of new technologies (3). Note again the nod to the ridiculousness of the Zwentendorf situation. Turn 4 illustrates how this success story is again challenged, namely with an argument that Austria despite upholding its image of being "nuclear power free" imports electricity from other countries who have nuclear power plants. This fact indeed could be used to argue that it is not possible to supply a nation with enough energy without nuclear power plants. Here, such a counter-argument was, however, sidestepped by interlocutors, who sought to highlight that civic protests in the past were effective in influencing governance processes.

**8.3 Asbestos and other long-term risk analogies: Alternating between calls for action and fatalism**

While we already encountered several references to risks above, this section now focuses exclusively on analogies, such as with asbestos, that emphasize the potential riskiness of nanoparticles pertaining to negative health and environmental effects. First, we return to how the medicine group responded to Franz's proposed distinction of nuclear power and nano in excerpt 40 because it inspired a debate about risks.

**Excerpt 42**

- 1 Bruno: But concerning the danger nothing changes. Less was known back then-
- 2 Franz: Yes, which danger?
- 3 Bruno: Well, the assumed danger. [Yes (laughs)]
- 4 Franz: [Yes, yes, exactly] that's something completely diffuse. That's why this "ideology of the technical solution of all problems" speaks to me. Well, we always talk about of this (.) you just have to believe that everything is possible, what we also accuse the Americans of doing, that we say this is typically THEIR solution, for everything there is a technical solution, right? And the opposite would be, or the counter-position, that you

say every technology that is introduced, at lightning speed, it will also be misused or involves risks for which we aren't prepared.

5 Christa: But you cannot anticipate them, right?

6 Franz: Or which will only become apparent later, back in the day, asbestos, and is asbestos—it's also a nanoparticle I think. You know (.) exactly what the problem is.

7 Eva: Well, I somehow see a parallel with genetically modified food [Franz: Yes] because it was also like that, it opens new possibilities and at the same time we don't know anything about its effects on the environment or on human beings, if you eat such food. (... ..) The research is seen as a positive thing. The main thing is that it's new. But what the consequences will be is considered much too late when it's already here. (Med, 416-49)

In the first turn, Bruno proposes an analogy between nuclear power back then and nano now based on their shared “danger”. From turn 2 to 4, Franz establishes in collaboration with Bruno that nano’s “danger” is unclear (“diffuse”) and not a given fact like with nuclear power. They thus distinguish between “danger” and “assumed danger”, where the former indicates certainty and the latter potential risks.<sup>114</sup> In the remaining part of turn 4, Franz then draws a *cultural distinction*. First, he ascribes a general belief in technical solutions to all problems to the U.S. (“typical U.S. solution”), and thus constructs it as an antipode to the “typical Austrian solution” that David mentioned before (the similar wording is indicative here). Franz claims that “we”—presumably referring to Austrians or Europeans—accuse the U.S. of following this approach, thus ascribing the “counter-position” that takes into account potential misuse and risks to the “we”. By means of cultural distinction, the precautionary Austrian/European approach to new technologies is presented as more thoughtful and foresighted.

Next (5), Christa indirectly undermines the feasibility of the precautionary approach and its cultural supremacy by pointing out that risks are unforeseeable. Franz adds in a cooperative manner that the risks may also become apparent over time—thus calling for an observant attitude. This is backed up with a reference to *asbestos* (6). Then, he classifies asbestos as a nanoparticle, which reestablishes the foreseeability of nano’s risks. Equating nano with asbestos makes Franz argue for nano’s riskiness with relative certainty, whereas in turn 4 he still maintained that its danger is “diffuse”. Regardless whether this was intended or not, we see how establishing such a clear analogical link between asbestos and nano affects whether nano’s riskiness is judged as possible or certain.

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<sup>114</sup> Note that their distinction resembles to some point Luhmann’s demarcation between danger and risks, which is based on a difference marked by the actual or potential occurrence of losses as well as different attributions of agency (Luhmann 1993).

Directly afterwards Eva (7) proposes an *alternative analogy with GMOs* that avoids the certainty of the asbestos analogy—a move to which Franz responds favorably (a sign that he tends to go along with the emerging discourse rather than give a strong opinion of his own). The reestablished uncertainty concerning nano's and GM's health or environmental riskiness is expressed most explicitly in Eva's "we don't know anything". Eva ends her account on a note of accusation, blaming society for its focus on novelty and for introducing technologies without considering possible negative consequences, which are realized "too late" (again *timing*). She thereby espouses a stance that takes into account potential risks and performs what Franz referred to as the precautionary "counterposition" to the American approach (4). Excerpt 42 thus illustrates how cultural comparison or cultural distinction enables the group to elicit their own cultural perspective more clearly.

Franz, in turn 6, established nano's harmfulness by ontologically placing asbestos and nano on the same level. In contrast, mere references to asbestos work differently in discourse because they are used to highlight that a lesson should be learned from the asbestos story rather than a direct analogical link (asbestos=nano). For this other use, see the first turn in the following excerpt stemming from the food group. It emerged after it was established that already about 300 nano-enabled food products exist on the market.

#### **Excerpt 43**

- 1 Claus: (...) well what would actually be the long-term effects, because asbestos back then, I just want to introduce this into the discussion, with asbestos they didn't know too, the long-term effects, they were only realized later and it will be similar with nanotechnology, right? I think so at least. Because for instance, there is an example, I got it via Google, namely in socks there you also already have nanotechnology, and when you wash them, the socks, the nanoparticles migrate into the water, then we have the water in the environment (... ..)
- 2 Franziska: Yes, in how far have the long-term effects actually already been researched?
- 3 Claus: There aren't any yet.
- 4 Doris: They can't yet exist, if they just started with nanotechnology, nobody knows about it.
- 5 Franziska: Then I find it really a bit strange in principle that there's no regulation, that everything is just thrown on the market, that's not right. Well, I mean, usually one is afraid of negative consequences, yes asbestos and nuclear power and such things are regulated extensively, and yes with nanotechnology we don't do it, there we barely have any regulation and it's just thrown on the market, I can't really believe that.
- 6 Emil: Yes, but it has been like that with everything, because in the beginning nobody knows and of course those who produce it have no interest in regulation and those who- who so to speak point to possible fears and dangers, they always lag behind. They discover that there is something where you have to react and the others have a certain head start.

7 Franziska: But aren't there any government agencies that should regulate that, I mean, you can't throw a drug on the market without having really tested it? That is simply not ethically acceptable. (Food, 426-468)

In turn 1, Claus—like Prince Charles—puts late effects up for debate by mentioning asbestos as a case where negative effects only became evident after a longer timeframe. Although he anticipates an asbestos-like scenario by transferring this knowledge to nano, he does not create an asbestos-nano analogy (note his “I just want to introduce this into the discussion”), but instead presents asbestos as a cautionary tale that should give rise to concerns about nano's risks. The asbestos case is thus used as *analogical evidence* to plausibilize a similar future for nano without ever arguing that this future will definitely materialize. In the second part of his turn, Carl further backs up his argument by referring to some information he gained about nano through a web search. While this Google-found (scientific) evidence does not address the riskiness of nano directly, it highlights that nanoparticles have ways of entering the environment when applied in certain consumer products. Thus, here the potential riskiness of nano is not established with scientific evidence but with the asbestos reference. In the omitted lines, Claus goes on reporting what he also encountered when searching for information about nano on the Internet, namely that a lot of money is made with nano-enabled products. This brings up the issue of commercial interest that also appeared prominently in the first empirical section of this chapter.

Franziska's reaction indicates that Carl's argument was successful in advising a precautionary approach to nano, as she picks up on the risk issue and inquires about scientific studies concerning nano's long-term effects—an information that was missing in Claus's account. The analogical reference to asbestos may have brought the risk issue on the agenda but it did not provide convincing evidence to establish nano's riskiness as a fact. The following responses (3, 4) then establish that due to the nature of long-term effects, these cannot be known (or studied) at present, thereby science is denied the necessary epistemological means to estimate what these effects might be. This assertion is not subsequently contested since Franziska merely displays outrage (“that's not right”) that under these circumstances nano-enabled food products are put on the market without regulation. She uses asbestos and nuclear power as *analogical evidence* to strengthen her claim that potentially risky technologies and materials are “usually” regulated and that this is the culturally established approach to have “fear of negative consequences” (i.e. consider possible risks). Despite their difference, Claus and Franziska's arguments share the demand that nano should be regulated in order to prevent it from entailing negative late effects.

In turn 6, Emil challenges Franziska's assumption that the "fear of negative consequences" prohibits the introduction of new materials and technologies by constructing it as an ideal that has never put into practice. He thus addresses that Franziska ignored that asbestos's negative effects revealed themselves only after a long time, which implies that neither risks were known nor regulation attempted at first. Like Christa from the medicine group, Emil characterizes the governance of technological developments as caught in a tension between producers who have no interest in regulation and those who can only "react" to the existing products and point to negative side-effects. Note the reappearance of the timing motif, here expressed in the "*lag behind*" metaphor. In her last turn, Franziska again displays outrage, calling upon government agencies to do something against this situation. She also mobilizes "ethics" as a resource to emphasize the moral unacceptability of the situation. Adding to the excerpts from the medicine group presented in the previous sections, excerpt 43 represents another example for how participants try to construct alerting arguments that political institutions should act on their behalf and regulate emerging technologies such as nano.

Two further accounts that use an analogical device to achieve an advisory effect can be found in the group discussing nano in consumer products. Here, thalidomide and CFC were also invoked as analogical resources besides asbestos.

#### **Excerpt 44**

Carl: Where- where are the moral limits of companies? Because they they- want to make profit in the first place. It's the same in medicine with pharmaceuticals. (...) And yes, let's maybe take a real example from history. Asbestos was at first also a great product with great characteristics, until later it became known or there was evidence that it's really harmful, right? And industry of course hides this as long as possible or in the pharma industry there were also various scandals. The thalido-thing [X: thalidomide] thalidomide, right. Industry knew about it for long a time, that it was harmful. But it was still used. Because it was all about profit. So, where is here the line? Or who oversees where the line is? (Conpro, 349-66)

#### **Excerpt 45**

Flora: I was reminded of the CFC story, right? That you don't know in the long run, of course also as regards the health area, but also the environment, what effects it will have. That's, if it is used now in excessive amounts, it would be dangerous if negative side effects showed (...) That is, actually it should continue to be observed. I mean, I- I suspect that it's likely that the industry doesn't have the time to observe it (laughs) or doesn't want to have it observed. (...) It for a fact will (...) come on the market, probably in big amounts. My opinion is or my wish is that it gets observed longer, on a small scale. The question simply is how this could be done. (Conpro, 555-568)

In excerpt 44, the asbestos reference alludes to the time lag in knowing about risks, while the thalidomide case is primarily invoked to refer to industry's practice of hiding knowledge about risks on purpose. Industry is thus presented as an actor with vested interests. To underpin calls for another actor to overlook industry, the thalidomide reference is used to portray industry in general, and the pharmaceutical industry in particular, as untrustworthy. In the group on consumer products the debate thus reaches a point where long-term effects are connected with the industry's interest in making profits. Put differently, the *market rationale* is blamed for putting consumers at risk.

In the second excerpt, Flora constructs a CFC-like scenario as plausible for nano in the future, but typically for these analogy-based risk scenarios it is left open whether nano will in fact turn out like CFC. Like in the previous excerpts, her account is not based on a direct analogy but is presented to merely recall this past case to call for action to avoid these possible undesirable futures. The important point is that nano does not have to be like CFC, asbestos, or thalidomide in the present to underpin such a claim, but the mere possibility of nano turning out like these previous substances in the future works as a good enough reason to call for regulation and closer observation. Argumentatively, there is thus no need for a direct analogy, since the construction of plausible futures does more or less the same work. Like in Carl's account, Flora's "wish" to "observe nano in small amounts"—which resembles the way drugs are tested in clinical trials today<sup>115</sup>—is contrasted with a perceived reality in which this costly and time-consuming observation (i.e. waiting before nanoproducts are put on the market) is considered unrealistic because commercial interests are thought to adhere to a *market rationale*. Against this background, and without envisioning another actor who could take up this vigilant role, Flora imagines a scenario as more plausible in which nano gets on the market without restriction.

Flora's and Carl's accounts, which both stem from the first phase of discussion in the group discussion nano-enabled consumer products, share a lack of imagination on "who" should regulate nano if economy cannot be relied on. Note how both excerpts end with questions concerning the realization of their demands for risk research. As we see in the next excerpt, taken from the issue card phase of the same group, the group continues to struggle with the same issue. The debate in this case was triggered by the diagnosis made by several participants that nano has already entered society in the shape of products and that there no studies yet exist that it is harmful (cp. the prequel to excerpt 43).

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<sup>115</sup> On a side note, there were also several instances in the material where participants tried to model consumer-product applications of nano after medication, because medicine was generally conceived of as an area where stricter safety tests are undertaken before a drug reaches the market.



**Excerpt 46**

- 1 Denise: What about these GMO things, is there any proof that it's bad for the body? That it's harmful? There is no definite proof. [But]
- 2 Ernst: [There] are two sides, I'd say.
- 3 Mod: Yes.
- 4 Denise: Yes, then with nanotechnology it's not any different. With that we're also in this (.) let's-wait-and-see phase. We'll wait and see what happens. Let's wait if it's good or-
- 5 Ernst: [if something happens.
- 6 Denise: Right.
- 7 Barbara: Yes, we also don't know about all these food additives (...) what do they do with us? That we also don't know.
- 8 Mod: You have- someone has at the beginning mentioned this asbestos story. Think about it, how did the asbestos story go?
- 9 Ernst: Asbestos was always harmless.
- 10 Barbara: Yes.
- 11 Ernst: Because it wasn't know (...) The connection wasn't know, right? That asbestos is also a nanoparticle.
- 12 Carl: And that the cancer rates somehow-  
(... ...)
- 13 Ernst: It was completely harmless.
- 14 Mod: It took 20 years even.  
(Several turns omitted)
- 15 Barbara: That's why we are living guinea pigs (laughs) because the bottom line is that you cannot yet estimate what will really happen.
- 16 Albert: A miracle that we all still alive, yes.  
(Collective laughter and joking) (Conpro, 2825-2900)

In the first three turns, two participants establish in collaboration with the moderator that there is no scientific proof yet whether GMOs are harmful or not, but rather “both sides”, that is, there exist pieces of evidence pointing to either harmfulness or harmlessness. This leads Denise to establish an analogical link between GM and nano based on a shared lack of consensus concerning their riskiness, (“not any different”, 4) what she calls the “let's-wait-and-see phase”. Of course, it could be argued—as in Chapter 7—that in Austria consensus has been reached by restricting the application of GMOs in agriculture, and that the wait-and-see approach was not taken. Denise and Ernst, however, construct an argument in which not societal consensus but scientific consensus is taken to determine whether society waits-and-sees or precautionary restricts the application of the technology. Afterward, Barbara (7) mentions another case, food additives that are already being applied in foodstuffs, where she also diagnoses ignorance of their health effects. Thus, she gives another piece of evidence that underpins the theory of a ‘let's wait and see’ attitude, while such products are already entering the market. Then, the moderator brings the debate back

to the asbestos case and encourages the group to consider the past. From turn 9 to 14, the group again establishes in collaboration with the moderator that for a long time (“20 years”, 14) asbestos was thought to be “completely harmless” (13). Ernst, like Franz in excerpt 42, claims that asbestos can be classified as a nanoparticle and thus constructs a direct analogy based on ontological sameness implying that nanoparticles are likewise harmful.

Against the background of the group’s knowledge of nanoproducts already being on the market, turn 15 and 16 indicate the effect of this analogical discourse on how the group rates society’s scope of action. Barbara concludes (“the bottom line”, 15) that “they” are powerless in anticipating risks and thus have to accept their role as “living guinea pigs”. Albert’s subsequent cynical comment plays with the idea that the risks of new technologies might actually not be that high since they—presumably referring to the group participants—are still alive (they are the living proof, so to speak). The ensuing laughter and joking contributed to close the debate about long term-risks in this phase of debate. In summary, the process of debate in excerpt 46 documents the power of the asbestos analogy and similar risk analogies in foregrounding a lack of human agency in anticipating and also preventing the negative long-term effects of new materials. In contrast to the previous excerpts, where analogical risk discourse co-emerged with calls for action, it here led to a display of a resigned, fatalistic attitude (cp. Horlick-Jones, Walls, and Kitzinger 2007, 97) and the articulation of hope that this mode of non-action is working out just fine (we are still alive).

In the food group we can trace a similar effect. Here, Franziska demanded several times that society should learn from past experiences with risky technologies: “you cannot expect that this time it will work out fine from the beginning” (1266), “we haven’t really learned from the past” (1319), “although we have already had enough experience in the past that things gobad again and again” (1653). All her assertions depart from the implicit assumption that long-term risks can be anticipated by scientific means and then contained by regulation, as we see below. However, as the following two excerpts illustrate precisely this assumption was contested.

#### **Excerpt 47**

- 1 Franziska: You have to think about it a bit more, about safety precautions, I’m now thinking a bit about nuclear energy. I’m absolutely pro nuclear energy and saying this I’m probably outing myself as absolutely bad, but I’m aware that it has to be done with certain safety precautions (...) and a lot of regulation, so that it can be used in a positive way (...)
- 2 Emil: (...) but I remember for instance, nuclear energy, at the beginning (...) they cut the limit values that indicated danger into halves over the course of three or four years and every time they said, we know until here it’s safe and then it’s dangerous, because that

was the state of knowledge and they stood there the scientists (...) and said we are the authority, we can estimate it. And two years later the value was halved again and in the meantime it's only a fraction of it (...) because simply more is known now (...) you always think you know it in the present. (Food, 1281-1301)

#### **Excerpt 48**

- 1 Franziska: If there were regulation (...) to investigate long-term effects before it's thrown on the market (...)
- 2 Doris: The problem is long-term effects cannot be studied; you can only wait and see.
- 3 Franziska: (... ...) we don't know anything about it, it could just as well be toxic or healthy and that's why I won't allow it and I think that will lead to regulation, that it will be investigated more.
- 4 Bertha: But long-term takes a minimum of 20 years, I've heard.
- 5 Franziska: Yes, of course, but-
- 6 Mod: Would you say that we should also do it in other areas when we introduce technologies?
- 7 Franziska: We- we should do it more.
- 8 Emil: Well, we actually don't do it anywhere. They haven't done it with mobile phones (...) that's somehow natural (...) that you want to immediately market it (...) to invest the same amount of money to estimate risks and wait for 10 years for long-term effects, that's not possible in a market.
- 9 Franziska: But with mobile phones it's different, because the phone lies there (...) it's not really like eating food and then it's inside of me (...)
- 10 Emil: Well, I think we're really going into the details now. I'm not well informed but there are people who say that always having a mobile phone in your pocket has very bad effects (...) and the technicians and scientists probably may also have different opinions. Basically, it's a very complex issue that we cannot see through as consumers.
- 11 Franziska: Well right, what I wanted to say was that the attitude of the general public is more skeptical regarding food compared to mobile phones (...)
- 12 Emil: I believe that too. Food is a very sensitive issue.
- 13 Bertha: But technologies as such are to be approved of, because otherwise we would still be living in the Stone Age, right? If nothing had been researched or technologically improved. I'm absolutely not against technology, but as far as food is concerned we can decide for ourselves. (Food, 1883-1948)

In excerpt 47, Franziska bases her argument for nano's regulation and more safety precautions on analogical evidence with nuclear power. In other words, she argues that the risks of such technologies can be contained. She displays awareness that in the given national context being pro nuclear power is a non-mainstream position (a concessive move).<sup>116</sup> Emil, however, appropriates the nuclear energy case to counter Franziska's claim

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<sup>116</sup> Consider again that this discussion took place before the nuclear meltdown in Fukushima. It is hard to imagine her making the same kind of argument after the nuclear disaster.

that risks can be contained. Scientific knowledge is never fixed, he argues, even though scientists may present it as factual. His counter-argument is that the risks of new technologies can never be known or anticipated with absolute certainty and thus fully contained, which implies that regulatory and safety measures may not work as Franziska imagines them to.

In the second excerpt, Franziska's calls for regulation and studies on long-term effects (1, 3) are similarly objected based on a claim that long-term risks only show over a longer period of time and thus call for a "wait and see" attitude (2, 4; cp. Denise in excerpt 46, turn 4)—to which Franziska finally agrees (5). What becomes apparent here is a consensus among the participants that science cannot provide this knowledge; it hence echoes Emil's argument from the previous excerpt. Then, the moderator enters the debate with a question that aims to stimulate the group's analogical imagination (6). Franziska, however, simply reiterates her call for action by formulating a normative standpoint for the future (7). Emil, then, makes explicit what Franziska only indirectly addressed, namely that risk research usually does not precede the market launch of new technologies at present (again a reference to the dominating *market rationale*). To present this as a common and usual practice, Emil makes use of an extreme case formulation (Pomerantz 1986)—extreme case formulations are generally employed when a speaker anticipates others to undermine their claims. But we also see that Emil tries to further corroborate his claim using the case of mobile phones as *analogical evidence* (8).

Yet Franziska accomplishes a *nano is not like nano* move whereby she constructs a relevant distinction between mobile phones and food. This in turn allows her to concede that mobile phones may be introduced without risk studies in contrast to food because they are framed as less risky (9). Although Emil is reluctant to argue on this point, he nevertheless mentions that there exist counter-positions assuming the riskiness of mobile phones. He emphasizes that there also might not be scientific consensus on this issue and that it is hence impossible for consumers (i.e. non-experts) to form an opinion based on scientific evidence. Since science is thus ruled out as basis for decision-making, another basis is implicitly called for. In turn 12 and 13, Franziska and Emil agree on the fact that application fields (should) matter for the public perception of nano or any other technology. Note how they avoid talking about their own distinctions between application fields but merely claim to observe what the "general public" thinks.

Finally, Bertha distances herself from a position that would reject technological progress in general, which allows her to argue for personal decision-making concerning food without being labeled as technophobic or the like. She also ascribes a special status to food, whereby she performs the distinction between food and other application fields that

Franziska and Emil established in an impersonal matter before. By speaking of a “we” she includes herself in society rather than speaking from an outsider position, as did Franziska and Emil. These last turns are interesting for how the *nano is not like nano* device is used to establish consensus in the group, and simultaneously protects arguments for individual choice and risk assessment. In contrast to claims about riskiness, which can always be contested (see turn 10), the *nano is not like nano* move additionally works as a strategy that enables the group to avoid a controversial debate about risks. By stating that the public considers some areas as more “sensitive” than others, the group also postulates and performs such a distinction as an acceptable and assertive stance in the debate.

A little later in the same group, the issue of long-term risks is further explored via the case of *X-rays*, which is brought up as another example for a technology that was introduced without knowing about its negative side effects yet.

#### **Excerpt 49**

- 1 Mod: The question is simply how do we handle such new technologies all in all and hence my legitimate question, well, how do we usually do it with technologies and I mean, most of the time we simply introduce them. So, you mentioned the example of mobile phones (...)
- 2 Emil: Yes, everywhere, also the discoverer of X-rays ultimately died of the rays, at the beginning you're like hurray, great, something new, sensational possibilities and then slowly it begins to dawn on you and then you start with introducing preventive measures and limit values. Today we are happy that we have X-rays of course, but some had to bite the dust for it, but that's, technology always developed like that. They didn't say back then that it could be dangerous, let's do some long-term studies.
- 3 Franziska: If you look at what the moon landing looked like, it makes you sick today when you see the technology they flew up there with.
- 4 Armin: Yes, I also think, what does that mean, long-term effects, just ten years, 20, 30, 50 years? Do we have to consider a longer time scale? And I think that it's impossible to stop the development for so long and to really say on all levels that I'm going to withhold it and just evaluate and test it and so on, that wouldn't work.
- 5 Emil: I think it would already be a big achievement and then many things would sort themselves out, if this accountability risk factor came in. Because if I say I don't have to do long-term studies, nobody does it, but I'll take the responsibility, then you consider it differently or, and if no insurance company can be found to underwrite the risk, then the alarm bells must be ringing, because the insurance companies they normally underwrite everything where they smell business, and they also have the best people to estimate risk, then you'd really have to say, tread carefully. (Food, 2007-2037)

In turn 1, we see that the moderator repeats her question from the previous excerpt, frames it as “legitimate”, and thereby also validates Emil's claim that a precautionary approach is

never applied with new technologies. The moderator's intervention thus here contributes to stabilize the factuality of this claim. Supported by the moderator, Emil (2) repeats his extreme case formulation that it is never done ("everywhere") and, like in the previous excerpt, he mentions a case, here X-rays, as *analogical evidence* to back up his argument. He thus again uses two fact-establishing devices. The argumentative implication here is that since the precautionary approach was never applied, it will also not be applied with nano. In his retrospective narrative the enthusiasm accompanying the introduction of X-rays entailed negative long-term effects ("some had to bite the dust"), which only then provoked regulatory measures. It presents the fact that some people had to die as accepted collateral damage in order to provide many with the positive effects of the technology. Emil thus establishes, in collaboration with the moderator, that this is the usual trajectory of technological developments—and that some people dying is not taken as reason enough to withhold new technologies. With her reference to the moon landing technology, Franziska (5) adds another example that underlines the point that technologies are not properly tested before being applied; but it could also be understood as a hint that this is no longer the state-of-the-art approach.

So far, the discussants and moderator constructed a shared theory concerning the general handling of new technologies without transferring the theory explicitly onto nano. In turn 4, Armin first scrutinizes the concept of long-term effects and the assumption that it could be possible to "withhold" new technologies while researching these effects, leading him to reject it as a feasible option. The important analytical point is that this specific understanding and assessment of long-term effects as unforeseeable in the present is stimulated by the preceding recollection of cases. All these cases share that long-term effects emerged over time and consequently neither scientific proof for their toxicity was available nor was precautionary action undertaken. This also explains why the participants use the term "long-term effects" and not for example "risks", since the concept of risks entails at least the potentiality of negative effects. These cases work as *analogical evidence* that suggests Armin's conclusion. References to GMOs or nuclear power—where more precautionary approaches could be identified—presumably would have made other conclusions appear more plausible.

The next turn (5) shows that since the group considers research into the long-term effects of new technologies unfeasible, some participants come up with other, more economical, recommendations of how to regulate the riskiness of new technologies. They still call for action in the form of regulation, but now—after having established science's limits in providing evidence for regulation—they no longer call for toxicological or other scientific assessments. Alternatively, Emil proposes a system of liability in which producers

are held financially accountable in order to sharpen their awareness of possible risk-related costs, entailing ideally a more precautionary application of new material or technologies by industry itself. Earlier Emil already made a similar argument for how such “self-regulation” (1673f.) could circumvent long-term risk studies. He then also drew *analogies with GMOs and the financial crisis* (see also Bruno’s argument in excerpt 36), using them as cases where the general public likewise would be or is “paying for it?” (1670) and not “those who brought this about” (ibid.).

A similar idea on how to self-regulate long-term consequences emerged at the end of the group on consumer products, where the impossibility of knowing risks even for experts was likewise articulated. Anticipating nanotechnological risks was here *compared to weather forecasting*, an area where the discussants also saw scientific models failing. As an alternative to the scientific mode of anticipating risks, the participants collectively imagined an economic rationale for risk governance, similar to Emil’s proposal: a “simple cost-benefit-calculation, not aimed at the moment but at the future. What will it cost me, if I have these long term consequences.” (Barbara, Conpro, 3964-6). Evidently, participants thus tried to take advantage of the market rationale they identified as a strong mechanism in technology development to secure risk regulation.

#### **8.4 Concluding discussion**

In this concluding section I will summarize and reflect on the role of analogies in this chapter more generally. In the first empirical section, the alerting function of the invoked analogies and metaphors was very much evident. While debating their chosen story cards, several participants took the chance to address specific actors that were “speaking” through the cards, in particular politicians and critical NGOs, and bring them into action. They thus responded to the story cards by constructing undesirable futures for nano that these actors should prevent either by regulation or communication. Analogies played a central role here, because these futures were based on and corroborated with analogies to previous regulatory and governance approaches ranging from stem cell research to the financial crisis. These past experiences were drawn upon as negative analogical examples to communicate how *nano should not turn out*, and what should be done differently this time around.

The same communicative intention was observable in the second empirical section that focused on the collective remembering of one particular case from recent Austrian technological history: Zwentendorf, Austria’s never operated nuclear power plant. The analysis here illustrated how these recollections were constructed to either highlight the general importance of societal countermovements or to emphasize the significance of

communication to the public to prevent nano from turning out like Zwentendorf in terms of governance process. The controversial debate about Zwentendorf revealed a general lesson in terms of *timing*, namely that public opposition or involvement in decision making over new technologies should start before investments are made. Another conclusion that could be drawn from this talk, that nano should likewise be opposed, was countered with a *nano is not like nano move*: the broad application spectrum of nano was advanced as an argument speaking against a general rejection of nanotechnology.

Moreover, the analysis in the first and second empirical section elucidated that analogies were discursively entangled with specific metaphors—in particular stemming from the image domains of *balance*, *light/seeing*, *timing* and *transportation*—that were either taken up from the cards and expanded or raised by participants themselves. These metaphors were used for instance to refer to the alluring promises of new technologies, neglected aspects, and the right timing of actions. Moreover, the metaphors fit together in a coherent alerting scenario that was constructed to sensitize actors in the field of nano governance. In sum, analogies and metaphors turned out to be central devices that participants drew upon to achieve an alerting effect with their talk.

While instances alluding to nano's potential *health, safety and environmental risks* also appeared in the first two empirical sections, they became the explicit focus in the third section. The excerpts here like the first two sections revolve around potential futures that should be prevented from becoming a future reality. Analogies and references to asbestos or thalidomide, among others, were employed to plausibilize and warn about future scenarios in which nano turns out like these if it is not regulated or examined more closely. While a direct ontology-based analogy with asbestos establishes certainty as to nano's riskiness, mere references to asbestos, which were more often made than direct analogies, establish possibility. Like a GM-nano analogy, references to asbestos account for the fact that there exists no clear scientific evidence of nano's toxicity yet, but such analogies nonetheless highlight that a lesson should be learnt from past experiences, as did Prince Charles with his allusion to thalidomide.

This also explains why *timing* reappeared as a central motif in the third section. More particularly, a dilemma of timing emerged when asbestos or other substances that turned out toxic or harmful in the long term were brought up. The *dilemma* is this: These cases, where risks only emerged after a long period of time, suggest that time is needed to gain evidence about long-term consequences. Risk analogies or risk references thus co-emerge with a specific understanding of long-term effects, that is, the impossibility of estimating risks in the present by scientific means. References to past cases where risks were not foreseen worked as *analogical evidence* for the argument that scientific risk assessment is



no viable option to assess nano's riskiness. In order to achieve this effect no direct analogy to nano was needed, since a mere reference to these cases suffices to establish the plausibility of such a scenario for nano (for similar examples from focus group debates see Myers 2007, 298).

Faced with the impossibility to anticipate long-term risks, this analogical discourse is followed by several examples of fatalistic statements that convey a feeling of passivity and display resignation in the light of an inability to anticipate risks. Whilst a fatalistic outlook has been ascribed to traditional cultures that lack a concept of risk (Bernstein 1996; Giddens 1999), the analysis here demonstrates that fatalism also results from a cluelessness as to how to carry out and guarantee reliable risk assessment on a scientific basis. But since it is also taken for granted that a precautionary approach is culturally-rooted and superior to other ways of introducing new technologies (*cultural comparison*), there seems to be no way around risk management. Hence, several participants proposed alternative strategies of risk management based on liability and economic models that conform to the identified dominating market rationale.<sup>117</sup> To summarize, asbestos-like trajectories made participants doubt that science possesses the necessary knowledge or tools to assess nanotechnology's risks, which either lead to clear demands for regulation, a fatalistic outlook where you can "just wait and see" whether negative side-effects emerge over time, or imaginations of alternative non-scientific ways of risk management.

A crucial question in the context of risk anticipation concerns the extent to which anticipation should be based on past experiences (Hutter 2010), especially past mistakes, scandals and catastrophes, and how societies can learn from these (Jasanoff 2005b). In other words, can we rely on the past as evidence to predict the future? The analysis presented in this chapter does not aim to provide an answer to this controversial question, but it nevertheless shows how citizens in public engagement settings try to act as observers of societal processes and feel comfortable or even responsible for giving recommendations to other actors such as policy makers on how to govern new technologies. Thus, although the participants were not explicitly invited to perform the role of policy advisors, they naturally incorporated this role when issues such as societal or safety risks were debated (for an example where lay citizens were invited into an expert advisory body see Jones and Irwin 2010).

At the same time, people cannot escape the influence of past cases and debates. Past negative experiences such as with the BSE crisis influence the credibility of experts and

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<sup>117</sup> Another alternative mode of risk management can be found in the debate about nano labeling, where consumption is imagined to decide over the course of new technologies. Like the alternative models discussed in this chapter, labeling represents another approach to managing the risks of new technologies rooted in a market rationale.

policy actors in subsequent debates over new technologies (Wynne 2001), but these experiences likewise shape imaginations about societal processes and the scope of science more broadly. Many of the analogies discussed bring with them a perception that risk assessments and measures undertaken by experts and regulatory institutions failed in the past, leading to a loss of public confidence in these established structures. While it could be countered that lay citizens' understanding of science does not correspond to the scientific concept of long-term effects—and there certainly lies value in mentioning current approaches in scientific risk assessment<sup>118</sup>—, I would caution against propagating educational strategies. Such educational efforts will not wipe out the lessons people extract from past failures since these are central to their lifeworlds and part of a culture's collective knowledge. Hearing public voices of concern and considering their proposed alternative risk regulation strategies here might prove a more fruitful avenue in the future.

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<sup>118</sup> My argument should not to be understood as a reification of 'lay' and 'expert' reasoning as fundamentally different, because as research has shown, whilst experts and lay people may account for their reasoning differently, the "patterns of risk reasoning by professionals have a great deal more in common with that of lay people than conventional wisdom might suggest" (Horlick-Jones 2005, 269).

## 9 General discussion on the roles of analogies

This general discussion seeks to weave together and further develop several insights concerning the major roles of analogies that emerged throughout the preceding empirical chapters. In the following sections, I will thus explore in more depth several functions and effects of analogies, and try to derive some broader conclusions from this discussion. While the representation of these roles in distinct sections may suggest a strict classification, it is important to keep in mind that these functions and effects can co-occur in one and the same analogical move. To put it differently, an analogy that incorporates an alerting function in discourse may simultaneously work as a rejection analogy. Other non-analogical, discursive devices can, of course, also enact these functions and effects. For instance, participants also imagined future scenarios that had an alerting character without making explicit use of an analogical device.

The following sections examine the interplay of acceptance and rejection analogies in debate and how these are entangled with a logic of choice (9.1); the role of anticipatory and averting analogies in plausibilizing and preventing futures (9.2); how certain analogies became killers in the sense of being extremely hard to counter, and entailed specific defensive discourse dynamics (9.3); the character of cultural analogies and attempt to link this concept with other conceptual vocabulary (9.4); three ways in which *nano is not like nano* moves were employed to achieve specific effects in talk-in-interaction (9.5.).

### 9.1 Acceptance and rejection analogies: Caught in a logic of choice

A central characteristic that reappeared in many instances of analogical discourse was that it was designed to argue either for the acceptance or rejection of specific nano applications or shifted between these two poles. I hence use the terms *acceptance and rejection (dis)analogies* to refer to any move by which analogies or distinctions worked to underpin and plausibilize arguments for the individual or collective acceptance/rejection of specific applications in the present or future. Acceptance analogies, such as the analogy between nanofood and functional nano food in Chapter 7, often emanated from application cards that were designed to reflect techno-optimistic expectations and promises. Thus, acceptance analogies and their accompanying scenarios are rooted in a master narrative of technological progress (Felt and Wynne 2007) and its seamless continuation in the future. Many acceptance analogies gained their rhetorical strength by being built out of similarities between nano and existing culturally accepted means and technologies (see also cultural analogies below). In a similar vein, Swierstra and Rip (2007) have emphasized that

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arguments presenting a new technology in accordance with earlier technologies mobilize existing moral intuitions to argue for its acceptability. Despite calling for the acceptance of what are often hailed revolutionary new technologies, they conversely stabilize the status quo of a society's less salient moral and socio-political orders.

By contrast, rejection analogies suggest and plausibilize the individual and/or societal refusal to adopt a new technology by highlighting nano's similarities with past technologies that have been rejected in the given cultural context. Rejection analogies co-emerge with attempts to fathom negative side-effects and potential undesirable ethical, social and political consequences of innovations, all of which aim to mobilize for opposition against techno-optimistic imaginaries. Analogy-based rejection scenarios appeared prominently in Chapter 6, where, for instance, an analogy between the enhancement chip and lobotomy was built to transfer lobotomy's negative moral status onto enhancement. Rejection scenarios also emerged while comparing the enhancement chip to academic enhancement and drugs, because in doing so the chip was imagined to amplify already problematic cultural tendencies. Thus, rejection analogies were built either by likening nano/enhancement to previously rejected technologies or by distinguishing it from culturally (at least partly) accepted means and technologies. Additionally, predecessor technologies such as GM food or nuclear power served as analogical evidence for the feasibility of the societal rejection of specific nano applications, while at the same time prevailing sociotechnical imaginaries such as Austria being entirely GM or nuclear power free were also presented as myths not corresponding to reality.

In terms of discourse dynamics, acceptance and rejection analogies often appeared in succession, i.e. rejection analogies were part of countermoves to undermine the effect of acceptance analogies. In Chapter 7, for instance, the "GM food is like nanofood" analogy followed after nanofood's similarities to functional foods were established in order to reinforce a societal rejection rather than acceptance scenario. Discourse oscillating between acceptance and rejection analogies, such as in the debates about human enhancement or labeling, bears witness to how speakers struggle with the framing power and agency of analogies. This struggle could also be seen as part of a larger governance shift that ascribes citizens' active agency in the configuration of science-society futures (see Chapter 1). Understood against this background, acceptance and rejection analogies construct citizens' agency quite differently: While acceptance analogies conceptualize individuals as subordinated to societal forces that rule out any choice other than adopting new technologies (i.e. individual resistance is either framed as infeasible or undesirable), rejection analogies stress the power of the individual and of citizenry as a whole to mobilize against commercial interests and political forces that promote new technologies.

Consequently, acceptance analogies are entangled with discussants' presentations of themselves as powerless and having no choice but adoption, whereas rejection analogies emphasize the civic or consumerist power to decide against certain innovations and thereby open up the possibility to resist a version of technocratic governance rooted in acceptance politics (Barben 2010). The fact that rejection analogies outnumber acceptance analogies in the empirical material shows that it was a central concern for many participants to enact and communicate that citizens have the right and power to decide over new technologies themselves.

Finally, let's draw some more general conclusions concerning the either/or logic of choice that lurks behind the interplay of acceptance and rejection analogies. Some discussants seemed to comply with this logic without much difficulty because they either came into the engagement setting with a preformed agenda or committed themselves more easily than others to argue for or against specific nano applications. However, the majority of discussants found themselves caught in this logic of choice and the dilemmas that emanated from it—a "dilemma" accurately denotes any situation in which a difficult choice has to be made between two or more alternatives. This is why I want to stress again that if we want to grasp the underlying concerns and value conflicts that urge people to act and talk in the ways they do, we have to pay more analytic attention to the dilemmas people encounter with when discussing new technologies and in their everyday lives (te Molder 1995). Take for example the debate about human enhancement (Chapter 6) that arose out of the dilemma whether decision-making about enhancing oneself via a nano chip implant should be located on the individual or collective level. While arguments for individual freedom of choice seemed to work for the case of GM and nano food (here they allowed a peaceful coexistence of individual acceptance or rejection), adherence to this value produced a dilemmatic situation in the context of human enhancement. Moreover, "freedom of choice" turned out to be a very powerful resource to argue for democratic modes of governance but, paradoxically, democracy may also entail that individual preferences have to be subordinated to collective decisions, which then counteracts the idea that every human being is always free to choose. Since many dilemmas of choice can in fact only be managed on the collective level, talk-in-interaction was guided by a tendency to strive for collective choice and societal consensus. Even in the debate about nano labeling, public deliberation was considered a prerequisite for reaching a culturally stabilized meaning of nano in specific application fields, because without such a process, many participants saw themselves unable to make individual choices that would not be random at best.

Hence, another dilemmatic situation emerges for participants in public engagement settings when they feel forced to commit to a standpoint or make a clear-cut choice, despite their prevailing ambiguousness and indeterminacy with respect to the emerging technology in question. Participants tried to talk themselves out of this dilemma and their attempts to escape the logic of choice were also reflected in how they chose their cards: Those who did not immediately connect nano-related issues to a pre-existing personal agenda strove to balance different positions presented on the cards, for instance by selecting cards that highlighted both positive and negative aspects (Felt, Schumann, et al. 2013). What I am formulating here is a call for more sensitivity to these processes. We need to be aware that taking a stance or making a choice always implies that a process of deliberation and imagination within one's mind or a group is stopped and followed by accountability and argumentative practices that serve to corroborate and defend these choices. Here, my argument resonates with recent claims for a shift from a managerial logic of choice and control to a process-oriented logic of care (Mol 2008) in the context of S&T governance, for instance by creating more open and diverse spaces of innovation and the establishment of long-term engagements (Felt, Barben, et al. 2013). We need to read participants' dilemmas and practices in engagement settings as important indicators that it is timely to stimulate continuous processes in which members of a society can carve out and negotiate collectively about their (non-)shared culture and values. Rather than surveying whether people accept or reject a new technology, the value of public debates about emerging technologies and not-yet existing applications lies in the way they can inspire collectives to work out which socio-cultural orders are considered in need of change or worth keeping. What should be at the top of our agenda is not only continuous engagement but also that these material-discursive spaces are created in ways that make refusing to choose for or against new technologies not just an eligible but even desirable stance. In this way, we may slowly come to learn that openness and flexibility in our dialogic encounters is more productive in the long term, even though this may initially appear to slow down innovation processes and political decision-making.

## **9.2 Anticipatory and alerting analogies**

Many of the analogies were anticipatory in the sense that they are employed to imagine and corroborate future scenarios. In such an anticipatory mode of comparing, analogies (and distinctions) often work as evidence to make certain futures appear more plausible than others. In most of these cases, anticipatory accounts are designed as general knowledge claims about the future and not as personal opinions. Personal opinions may survive in interaction when they are based on anecdotal evidence, but imagining sociotechnical future

scenarios requires a more socio-culturally accepted foundation to endure among competing knowledge claims. For instance, talk about paranormal events (Wooffitt 1992) rests on detailed accounts of personal experience, forward-looking statements about technoscientific futures, however, tend to be based on culturally shared experiences (see also cultural analogies).

In the material, we can distinguish between analogies that construct a sameness of substances (*ontological analogies*; e.g. nano=asbestos) or potential similarity of processes in the future (e.g. nano could become like asbestos). In contrast to ontological analogies, which render two things otherwise conceived as different essentially the same in the present, *process analogies* imagine a potential future trajectory for new technologies based on past knowledge of a different case. Interestingly, speakers sometimes tend to change from proposing strict ontological analogies to more future-oriented process analogies that have yet to be tested by time. By presenting similarities between two cases as a future potential, process analogies may also work to shield analogies from attempts of undermining.

Anticipatory analogical discourse is also designed to trigger actions that may range from reflecting and reconsidering practices to taking actual steps by regulating nano. Like representatives from industry or policy who tend to use analogies to persuade “the public” of nano’s merits, lay citizens in public engagement use future projections to mobilize for desired actions. Their addressees range from other citizens (“take action!”) to industry (“act responsibly!”) or policy makers (“hear us!”), because “participants in groups may frame their language and select their topics to have an effect on those they see (rightly or wrongly) as the ultimate audience for this group, not just the participants and researchers who are present” (Myers 2004, 86). Participants here use *alerting analogies*<sup>119</sup> and scenarios to make their voices heard and demand for instance from policy makers to learn lessons from past governance processes of emerging technologies. Alerting analogies rest on the shared belief that events and mistakes can repeat themselves under similar conditions, and that scientists and policy makers either have not yet learned from the past or lack the means to anticipate the consequences of new technologies. Participants’ alerting discourse here tries to fulfill such a wider communicative function.

Alerting analogies are characterized by imagining contingent and preventable futures, which indicates that we live in an age where the unpredictability of the future is widely accepted (Adam and Groves 2007) and where thus the mere potentiality of a plausible future is *real enough* to engender the same kind of action as if the realization of this future

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<sup>119</sup> It should be evident that alerting analogies may coincide more with rejection than acceptance analogies, because they also highlight neglected aspects and the necessity of action.

were absolutely certain. There is no longer a need for apocalyptic predictions—although they of course continue to exist<sup>120</sup>—but the mere plausibility of an undesirable future now seems to provide sufficient evidence to ring warning bells. Alerting analogies put ethical and political demands on those actors considered to be responsible for preventing these undesired futures. In parallel to the high hopes set in science and technology as the ultimate problem solvers, alerting scenarios and imaginaries have thus co-emerged as a counter-force to the master narrative of techno-scientific progress in order to “warn against risks or hazards that might accompany innovation if it is pushed too hard or too fast” (Jasanoff and Kim 2009, 123). In this light, analogy-based averting scenarios not only highlight neglected social, ethical, and political aspects of specific emerging technologies, but they likewise point towards the limits of scientific knowledge and the progress narrative.

Anticipatory analogies may bring a positive or negative bend to the imagined future scenarios—or put more bluntly, they tend to have either a more utopian or dystopian undertone.<sup>121</sup> However, the spectrum of positive or negative futures did not contain the extreme utopian visions or dystopian/apocalyptic nightmares that dominate in nano science fiction literature (McGrail 2010). In fact, references to science fiction were marginal in the material. But as in the science fiction literature, particularly Chapter 5 and 8 illustrated that there is a clear tendency towards the more dystopian corner of the continuum among the analogy-based scenarios (of course, there is also a middle ground where present realities are imagined to simply continue in the future). The reason for this presumably is that (the majority of) lay participants saw themselves responsible for providing counter-scenarios to the culturally more dominant techno-optimistic repertoire. In several instances, they stressed the necessity to restore balance in a society in which profit-oriented economic interests seemed to have gained the upper hand over the common good. By drawing on resources and analogies from what they see as a more techno-realistic repertoire, citizens demonstrate that they recognize a need to complement the dominance of a techno-optimistic repertoire and its focus on—often deemed—unrealistic promises.

We might therefore conceive of the articulation of more dystopian futures in public engagement settings as means by which participants hope to oppose the perceived dominance of economic interests in the governance of technoscientific innovations:

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<sup>120</sup> More than with nano, metaphors and analogies of catastrophe permeate the current discourse on climate change and geoengineering, where imminent visions of catastrophes have been worked up by both advocates and skeptics (Nerlich and Jaspal 2012).

<sup>121</sup> Note that utopian and dystopian futures both arise from a deep dissatisfaction with the present. In a state of contentment there is no need for one or the other.



After all, utopias and dystopias by definition seek to alter the social order on a fundamental, systemic level. [...] Utopia, dystopia, chaos: these are not just ways of imagining the future (or the past) but can also be understood as concrete practices through which historically situated actors seek to reimagine their present and transform it into a plausible future. (Gordin, Tilley, and Prakash 2010, 2)

Similarly Karl Mannheim (1936) already pointed out that utopian discourses can be understood as enunciations of oppressed social groups that are engaged in a struggle for equality. But when voicing alerting analogies, participants do not style themselves or citizens more generally as an oppressed group but rather as emancipated policy advisors, who feel capable and culturally versed in identifying problematic processes, rupture lines, and vulnerabilities in current socio-political systems. In that sense, these analogies also work as democratic means employed to gain ground in the governance of emerging technosciences.

STS scholars should also pay more attention to the “co-articulation of pessimistic and promising futures” (Tutton 2011, 425) in current debates about emerging technosciences to “foreground complexities and contingencies” (ibid.). In order to achieve such a more balanced view, work in the sociology of expectations tradition and on future imaginaries should more closely consider citizens’ modes of constructing futures. This has become indispensable in an age of public engagement, where citizens are invited to imagine alongside or together with scientific and political actors which sociotechnical imaginaries should be secured or averted. The “commonsensical” reflexivity that is articulated in public engagement settings here is essential in complementing more “expert” ways of imagining the future.

### **9.3 Killer analogies and how to kill them**

A central research interest of this dissertation was to trace what analogies do after their enunciation in terms of discourse dynamics. Hence, this section focuses on how specific analogies hindered or enabled (inter)actions in the group settings. Tracing the effects of analogies on talk-in-interaction is not an easy task due to the fluid character of such discourse: you simply can never determine with full certainty whether an analogy was “successful” or in the end “failed” to persuade interlocutors. This inescapable feature of discourse is why analogical agency can be best captured by looking at extreme cases, for instance when an account involving a (dis)analogy was (at least preliminary) successful in silencing other speakers, arguments, or cooperative dialogue more generally. I call any

(dis)analogies doing such work *killer analogies*. This term is inspired by the term killer phrase, which denotes accounts that are not designed to convince but to terminate the ideas of others. In brainstorming sessions, killer phrases disrupt interpersonal relationships, oppose the principles of team work and hinder creative processes, which renders them not merely unproductive means but also a form of violent or asymmetrical communication (Clark 1958). “You cannot compare that” is an example for a killer phrase and it captures what I mean with the term killer (dis)analogy: These are comparisons or distinctions constructed to close dialogue and the symmetrical flow of thinking/talking by enforcing a strong (personal) standpoint. In other words, killer analogies are designed to kill off the argumentative thread of another speaker and to expel a counter-argument from the conversational floor. They thus may appear in argumentative situations in which two hardened positions encounter each other without reconciliation. Additionally, killer analogies are powerful because they are rhetorically self-sufficient, that is, they stand in no need of justification because they are built from commonplaces (e.g. widely shared idioms) existing in a cultural context.

Killer analogies or phrases also relate to the practice of “search[ing] for the last word” (Billig 1987, 106). With this phrase Michael Billig refers to the fact that no matter how good an argument may seem from the perspective of its enunciator, one can never be sure whether an audience or opponent has been affected by it (see the similarity to the dilemma of tracing analogical agency above). In view of this fact, the search for the last word appears as a loophole out of this dilemma, because the hope that one’s words close a debate co-emerges with the wish to leave the argumentative battlefield as winner. Any search for the last word is thus tied to performances of self-presentation that are played out either towards others or to oneself: “One may not search for the last word to persuade the other, but to persuade oneself that one’s own arguments have escaped unscathed by criticism. In this sense, the momentum of argumentation with its search for the last word can be a process of self-persuasion, or perhaps, self-protection, rather than persuasion of the other” (ibid., 108). Rather than being interested in exploring new and other ideas, the search for the last word demonstrates inflexibility of thinking due to being fixed on mere self-identity stabilization. For that reason such practices counteract the principles of productive brainstorming and teamwork as these aim to provide space where ideas and not personal glory should reside at the center of all communicative efforts.

The empirical analysis has excavated several examples where discussants searched for the last word and made use of killer analogies in that process, for instance in the debate about human enhancement (Chapter 6), when the discussed brain enhancement chip was compared to clothing and pacemakers. These analogies presented human enhancement as

something that has been done since the beginning of mankind and thus impeded the articulation of concerns that can only be convincingly argued when the technology under consideration is understood as significantly novel. Robust killer analogies thus compared nanotechnology with practices and technologies that were successfully incorporated into present-day culture, which also makes them function as acceptance and cultural analogies (see next section). The use of a Nazi analogy in Chapter 5 is another quintessential case for a killer analogy. The use of such heavy rhetorical weaponry often entails a denigration or disregard of other perspectives, which is precisely why killer analogies may shatter interpersonal relations and mutual trust that afterwards has to be reestablished—in metacommunication or otherwise—to continue with conversation.

But how do discussants counter killer analogies—and were such attempts able to kill in turn or neutralize their harmful effects on interaction? Among the many defense strategies to ward off killer analogies, such as trying to change topic and simply ignoring them, one strategy stood out: attempts to change from an “argument is war” (Lakoff and Johnson 2003 [1980]) mode of talking to a mode of peaceful co-existence of divergent ideas and opinions.<sup>122</sup> We may also think of this as a way of reframing the group from a deliberative public engagement setting into a focus group. In other words, such counter-moves were formulated as indirect requests to accept differing opinions and life experiences. In practice this also meant that speakers reframed their own previous arguments as personal opinions and thus switched themselves into the co-existence mode when their arguments were threatened to be “killed”. Here, the analysis provides new insights into the context-related appearance of “opinions” in talk, that is, recourse to one’s talk being “just a personal opinion” co-emerges with checkmate-like situations in which interlocutors feel cornered. Invitations to change the communicative mode were often not immediately accepted (see excerpt 11 and excerpt 16), but the interlocutors nevertheless tended to approach consensus after some time, thereby rebuilding their shattered relationship.

Here, a detailed discourse analysis can illuminate which analogies function like killer analogies in specific contexts and thus raise awareness of how they impact discursive settings where team work and collective imagination are desired. Although discussants themselves are skilled in repairing interactional problems, I nevertheless want to provide some practical suggestions as to how designers, moderators or facilitators of public engagement settings can actively contribute to the creation of communicative spaces in which the use of killer analogies and rhetorical devices with similar adverse effects is minimized and thus becomes a less disturbing factor in dialogue processes. I think this is

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<sup>122</sup> In Chapter 7, for instance, we encountered how labeling was talked into being as a means that allows for such cease-fire, and the co-existence of different opinions on GM food in one socio-cultural context.

relevant for two reasons: a) to save time that must otherwise be invested in rebuilding mutual trust and b) to assist participants who lack the rhetorical competence to parry killer analogies and hence might refrain from entering discussion. Warding off killer analogies is hard and can often only be accomplished on a meta-communicative level by suggesting a different mode of communication or pointing out that they are unfair communicative means. As the example of Godwin's law or the establishing of brainstorming contexts demonstrate, it is possible and advisable to agree on shared principles to make communicative spaces more productive and safe by keeping such unfair moves at bay. Moderators and facilitators here could fulfill the role of a referee with the right to sanction violations of agreed rules. They could likewise point out the framing or ideological baggage of certain comparisons and distinctions. Additionally, by presenting established distinctions at the beginning of a discussion, dialogues could start by deliberating about such distinctions. Moreover, it is possible to think up new or to redefine existing "rules of the language-games" we play as well as to provide material devices that allow the reporting of verbal transgressions, such as the yellow or red cards within the PlayDecide discussion format. Holding up a material object may sometimes not only be easier than countering with words but it may also engender a playful atmosphere that immediately reduces the aggressiveness of an argumentative encounter.

After having written so much about the potential "negative" effects of certain analogies on discourse dynamics, let me finish this section on a more positive note, because in fact killer analogies are, as mentioned above, extreme cases. More often than not, talk-in-interaction flows freely between individuals, allowing for analogies and distinctions simply to emerge and disappear without producing irritating interactional effects. Thus, I would call any analogies that are not caught up in a battle of two sides *enabling or midwife (dis)analogies*. Such analogies allow for stimulating collective imagination and mutual learning processes that can bring new insights into fruition. No analogy is by itself a killer or midwife analogy, but everything depends on the network of actions with which it is entangled. The examples for such analogies are manifold in the material and they can be found whenever the argumentative weaponry is put to rest and a symmetrical interaction has taken its place. In such a place, different viewpoints and versions of the world no longer have to make use of an "opinion device" to turn a combat zone into a peace zone.

#### **9.4 Cultural analogies revisited**

In this section we revisit two interlinked research questions that have guided the empirical analysis: Which analogies prove to be assertive, robust or capable of surviving in the discourse, and thus point to socio-culturally accepted analogies (what I also called *cultural*

*analogies*)? And, which repertoires, experiential and referential domains—or templates (Kitzinger 2000b)—are drawn upon as basis for these cultural analogies in the groups? These questions emanate from an interest in explaining cultural dynamics and hierarchies; in other words, the modes of ordering (Law 1994) that silently underlie the discursive as well as non-discursive practices in a given cultural context.

I find coming back to these questions a rather difficult task because there are no easy answers to be given here. The best is to pay careful attention to the context that makes some analogies appear more pervasive than others, and here we indeed could observe that some analogical repertoires tend to attain more robustness or appear more often than others. The employed analogies as well as their acceptability changes depending on the specific applications and topics that were debated. It is hard to identify one dominant or cultural analogy even if only considering a single chapter. If we had to speak of one dominant analogy, one could argue that the GM-nano analogy could earn the title of cultural analogy or that GM food served as a very prominent analogical template. The case of GM food was used for the construction of a variety of analogies, each of which was built to corroborate different arguments. The debate about GM food thus provides rich material out of which analogies for nano can be constructed.

A robust analogical repertoire contains all those experiences that are historically as well as in the present shared by many people in a cultural context. But having for instance experienced that there was a debate over GM food in Austria is not enough, this experience also has to be aligned to a culturally shared interpretation in order to later become powerful in a public debate. This relates the concept of cultural analogies to what has been termed *frame viability*. This concept stresses that not all frames have the same assertiveness or ability to catch on. Here, most prominently narrative fidelity and empirical credibility have been suggested as characteristics that render frames viable (Gamson and Modigliani 1989). Additionally, “master frames” are said to evoke long-standing frames that “resonate with cultural narration, that is with stories, myths, and folk tales that are part and parcel of one's cultural heritage” (Snow and Benford 1988, 210). Such master frames come close to rhetorically self-sufficient arguments or cultural myths, all of which tend to escape the gaze of empirical scrutiny and hence are accepted without much evidence. Let me give two examples. First, one master frame that exerted power in the debate was the health risk framing; that is, analogies suggesting nano's potential (health) riskiness proved to be extremely viable in talk-in-interaction. Health risk arguments were oriented to as rhetorically self-sufficient because they were expected to be agreed upon by everyone. Hence, analogies that plausibilized health risk were very powerful in the way they undermined and corroborated positions. Even when empirical evidence was conjured up

### *General discussion on the roles of analogies*

that contradicted the existence of health risks (see section 6.6), discussants tended to uphold the health risk framing due to its strong cultural gravitational pull. Second, we encountered several instances where the local history with GM food or nuclear power was narrated as a success story, and although potential rupture lines and counter-stories emerged these did not really challenge these success stories in any fundamental way.

Cultural analogies are clearly tied to how I conceptualize killer and acceptance analogies, because a) what is shared is more able to kill off non-shared alternative perspectives, and b) acceptance analogies may work as cultural analogies when they invoke culturally consistent interpretations. Concerning the latter, I already clarified above that by being reframed as “merely” an individual opinion contested analogies are taken strategically of the cultural (where they find it hard to survive) and transferred into a personal realm, where they are allowed to exist.

In general, cultural analogies were based on templates (e.g. GM food) that worked like floating or empty signifiers (Laclau 2006), which absorb rather than emit meaning, because they are open to multiple, even contradictory interpretations.<sup>123</sup> As I already argued above (see section 2.4.5), in effect, there is not “the GM-nano analogy” but each time GM and nano are compared, an irreducible analogy with a context specific meaning emerges. The existence of floating signifiers indicates that multiple interests and actors try to impute and enforce their specific interpretations (Jørgensen and Phillips 2002). Accordingly, as long as analogies or their sources float, we witness a process of interpretative flexibility. When, an analogy becomes fixed, however, either one meaning has gained hegemony or diverging meanings have merged into consensus.

Cultural analogies were often build from a nation specific history with previous emerging technoscientific developments such as GM or nuclear power (Felt 2014). While literature based on research in English-speaking countries stresses that popular culture and science fiction plays a relevant role as a shared repertoire in public engagement settings (Davies 2011), my analysis of the Austrian material elucidates that science fiction was not a widely shared resource in the discussion groups. For instance, in section 6.1, the analogy with Data from Star Trek did not work as a cultural analogy but remained a more personal analogy based on a specialist knowledge base. This hints towards the precarious role of science fiction as a shared repertoire in debate. Thus, facilitators or “knowing” participants would here first have to make discussants acquainted with these science fiction examples in order to stimulate discussion, as it is sometimes suggested (Berne 2008). What is more, the analysis thus highlights that we should not underestimate the power of historical analogies as relevant resources in public engagement settings, notably because they also draw

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<sup>123</sup> Wullweber (2008) similarly argues that nano is itself an empty signifier.

attention to more local issues that may not be addressed in a globally oriented or US-based science fiction literature.

Finally, let me mention on a side note that cultural comparisons in which national or cultural practices of handling new technologies (such as paying attention to their potential risks) were distinguished from similar practices in other national contexts became an interesting collective move, whereby the groups were able to assure themselves of “their” culturally acceptable approach (see excerpt 42). Almost inevitably, these cultural comparisons coincided with a form of national or cultural self-assurance that constructed “our culture” as superior to “other” cultural approaches. But it must also be said that such cultural distinctions played a minor role in the discussion groups.

### **9.5 *Nano is not like nano* moves**

In this section, I attend to a discursive practice that I termed the *nano is not like nano* move. This specific move ties to one central research interest of this dissertation, namely to compare how nano was discussed or assessed when people talk about different application fields. Indeed, the discussants in the IMAGINE groups talked about different applications differently, for instance they often approved of nanomedical applications and the use of nano in ICTs, more than of nanofood or the use of nanoparticles in cosmetics. Based on survey research (Cobb and Macoubrie 2004; Cacciatore, Scheufele, and Corley 2009), the statement that attitudes towards and risk perceptions of nano depend significantly on the application area that people have in mind when forming their opinions has by now become a commonplace. In the course of doing the empirical analysis and under the influence of the action-oriented perspective, my interest thus shifted away from this rather descriptive question to explore what work people try to accomplish in interaction by distinguishing nanotechnological application fields and splitting the category of “nano”. In other words, what do interlocutors aim to achieve with their *nano is not like nano* moves in public engagement settings? Thus, in the following I will recap the different functions of such moves. Again, let me stress that these functions are not to be understood as mutually exclusive but they may be co-present in one move.

First, a main function of *nano is not like nano* moves was to enable critique of a specific product, vision or application area by simultaneously pre-empting potential imputations of being technophobic in the sense of “I’m not against technology as such but...”. The move thus worked as an anticipatory disclaimer and means for identity management in order not to arouse the impression of being a Luddite. Examples for this function appeared in Chapter 6 when the use of the nano-brain chip implant for medical purposes was presented as “good,” and its application for enhancement purposes as “bad”. Another example

appeared in excerpt 28, turn 2, in which Franziska presents herself as someone who is “actually very generous towards new technologies” in the context of her critique of nanofood. Interestingly, nano as an umbrella term for a variety of technologies and products lends itself to such moves—but of course constructing disanalogies between different technologies fulfills the same function.

Such *nano is not like nano* moves remind of how people try to avoid displaying racism because they are aware of its socio-cultural unacceptability (te Molder 1995, 17; Wetherell and Potter 1992). In much the same way, speakers seek to avoid being branded as technophobic. In order to make sense of such a practice it is helpful to include what we know about the broader cultural and national context in which the discussion groups took place. First, in the broader context of Western democracies the master narrative of technoscientific progress is alive and well, which means it has to be attended to when raising critique of new technologies and innovations. Second, the national context of the study, Austria, is a “special case” in the way in which “innovation resistance” is openly attributed to the general public in policy and media discourses<sup>124</sup> (see the quote from the Austrian Nanotechnology Action Plan in Chapter 1). The myth that Austrians are more resistant to innovation than people from other European countries has largely been fueled and stabilized by specific readings of Eurobarometer survey results and entangled with deficit-model based interpretations of public resistance against selected technologies such as nuclear power and GM food.

The repeated occurrence of the *nano is not like nano* move demonstrates that the existence of the technophobia myth co-shapes how people imagine being safe to voice critique of new technologies. By never being made explicit and thus questioned for its truthfulness in any of the discussion groups, the myth and its associated ineffable taboo—that one is (perceived to be) against new technologies—continues to exert power over the way accounts are designed. Of course, it is also an interesting question whether people in other (European) countries also use *nano is not like nano* moves to exculpate themselves from the stigma of technophobia, or whether this use is a characteristically Austrian phenomenon.

Having said that, I now come to a second function of the *nano is not like nano* move, when it worked as an argument why nano should not generally be rejected. As illustrated in excerpt 40, Franz uses the move to caution the group not to transfer their rejection of nuclear power onto nano and thus argues for a disanalogy between the two technologies

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<sup>124</sup> For recent media articles that cater and attend to this myth see the following examples: “Österreich mag sie einfach nicht” (Die Presse, 10 March 2009); “Österreicher Europameister der Technologieskepsis” (Kronen Zeitung, 15 April 2010); “Europameister der Technologieskepsis” (Der Standard, 30 November 2010).



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based on nano's broad application spectrum. Evidently, this function also relates to the first one since it aims to lead the discussion away from a scenario in which nano is generally rejected and thus potential attributions of technophobia could co-emerge.

The third function of the move in the discussion groups was best observable in Chapter 7 when distinguishing between different nanotechnological application areas was presented as a strategy allowing to circumvent the nano labeling dilemma. The distinction between application areas here was always entangled with their diverging assessment—one is “good” and the other is “bad”—thus allowing participants to take up a clear stance towards specific nanotechnological applications. An example of this dilemma-solving function is apparent in excerpt 30. Here, Albert explains that he can interpret a nano label by applying a *nano is not like nano* move, while other participants who do not think with such a move find themselves in the labeling dilemma.



## 10 Coda

This final part is not written in the style of conclusions, but it first rephrases the central theme of this dissertation, that analogies are always both imaginative and framing devices, in a more programmatic way. I will praise once more the merits of analogical imagination and of cultivating a critical analogical sensibility. The final section ends with an attempt to transcend words, dualism and logical argument, which makes it bound to fail from an academic perspective. It therefore should better be read as a kōan, designed to exhaust all analytic thought. With this we are back at the beginning and where “I” will always end.

### 10.1 Analogical imagination and sensibility

Poets, according to the circumstances of the age and nation in which they appeared, were called, in the earlier epochs of the world, legislators, or prophets: a poet essentially comprises and unites both these characters. For he not only beholds intensely the present as it is, and discovers those laws according to which present things ought to be ordered, but he beholds the future in the present and his thoughts are the germs of the flower and the fruit of latest time. — Percy Bysshe Shelley, *A Defense of Poetry*

A strong current running through this dissertation has its source in the value of the use of multiple analogies to stimulate imagination. Poets have been at the forefront in bringing to life multiple and unconventional analogies that may work powerfully in altering our one-dimensional and habitual perceptions of the world. I speak of poetry here in a very general sense, in much the same way Shelley in his famous essay “A Defense of Poetry” uses it to refer to the “expression of imagination” more generally. To Shelley, a poet is anyone who contributes to the future of civilization, be it its laws, arts, or moral orders; a wide definition that thus comprises artists, scientists, philosophers, politicians, spiritual teachers, and what have you.

This spirit of poetry reveals itself also in the writings of Ludwig Wittgenstein and Friedrich Nietzsche, who both coined inspiring analogies and thus perfectly embodied the interlacement of philosophical and poetic imagination. Wittgenstein in particular recognized the significance of analogies in his thinking because constantly coming up with new similes worked for him as an apt strategy to stay flexible and to resist the temptation of becoming satisfied with conventional ways of conceptualizing phenomena (cp. Savickey 1999). As he simply put it: “A good simile refreshes the intellect.” (Wittgenstein 1998, 3) In widening imagination by analogical and other means these philosopher-poets can be seen

## *Coda*

to have also acted as prophets. Metaphor and analogy have been the favorite tools of poets and prophets alike:

Through it the prophet leaps outside the circle of present experience, the realm of the factual and the commonsense, the typical and the regular. He parts company with those who are travelling the surer and steadier road of analogical comparison. By one act of daring he brings into creative relationship the apparently opposite and contrary and, if his metaphorical adventure proves successful, gains new treasure both for language and for life. (Dillistone 1955, 161)

A prophet here should be understood again in a wider sense as any spokes(wo)man or advocate of a new belief, theory or view of the world. When a once new belief becomes generally accepted, the words of such prophets may become legislation. We have come full circle then.

Such a conception of imagination and poetry can help us to conceive of analogical imagination as a flexible attitude towards thinking, language and life. To use such an analogical imagination in debates about emerging technologies such as nano means to stay capable to move from one analogy to another. Such flexibility arises from knowing that comparisons are never exhaustive and that “all analogies limp, because otherwise we would not have an analogy but an identity” (Post and Leisey 1995, 52). The perfect analogy cannot exist, especially not for multi-layered and fluid phenomena such as nanotechnology, but the limitations of individual analogies can be countered by coming up with a variety of analogies to enable a change of perspective.

Participants in public engagement settings, engage in such a constant (de)construction of analogies when given the space to express their collective analogical imagination. Engaging in dialogue or discussion with others who may come to challenge existing analogies thus represents a constant invitation to open the “usual analogies”—that may circulate in media and other domains—up for negotiation. Even when discussants try to enforce “their” analogies, the mere presence of others works as a beneficial corrective here. Analogical discourse in lay discussion groups on nano is characterized by the ongoing construction but also critical, interactive examination of multiple analogies. In contrast to the construction of single, robust analogies in professional ethics, lay discourse thus generates more open-ended and flexible comparison processes, in which relevant dimensions of an emerging technoscience are collectively imagined and explored.

But the multiplicity of analogies and distinctions that emerge in public engagement settings also hints at the contradictions and dilemmas people experience when having to engage with new technologies. Solving these challenges is often an impossible task because

they lie at the very root of well-entrenched socio-cultural practices and systems. But nevertheless, by using their analogical imagination, participants are able to come up with potential new solutions that could inspire the tackling of these issues on a political level. I hope to have shown in this dissertation that the underlying dilemmas do neither reveal themselves at a cursory glance nor by mere content analysis, but that a thorough and profound discourse analysis is indispensable to dig beneath the mess that the co-existence of multiple (dis)analogies appears to create on the surface.

A second current running through this dissertation was that analogies have agency by framing and constructing realities as well as in influencing discourse dynamics. Thus, we need to develop an analogical sensibility that enables us to perceive, appreciate and counter the influence of analogies. With analogical sensibility I mean a raised awareness for the aspects analogies hide and foreground, and what analogies do or fail to do in talk-in-interaction. I conceive of analogical sensibility as an openness that can be improved by closely looking at what analogies do in discourse, and not an assessment or evaluation. Since analogies are often taken-for-granted elements in language, we tend to stay unaware of their power in silently steering our thoughts and actions. Paying careful attention to analogies may assist in using analogical imagination in ways that may engender new analogies, frames and realities.

If we understand critique as the demystification or “unmasking of dominant, taken-for-granted understandings of reality” (Jørgensen and Phillips 2002, 176), analogical sensibility is an essential element in exercising critique. It has always been a main concern of discourse analysis to explore naturalized understandings of the world and to open these up for contestation and critical discussion, thereby allowing for change to take place. Here, attending to lay citizens’ talk in public engagement settings is one way to excavate versions of reality that tend to challenge dominant political expectations of new technologies. A critical analogical sensibility means that we attend to and put all knowledge claims and versions of reality up for an on-going democratic debate. This includes engaging critically with the entailments of analogies and the ways in which they may or may not contribute to solve dilemmas or stimulate dialogue about the issues new technologies might raise. However, analogical sensibility should not be confused with a pedagogical stance that is often embodied by professional ethicists: “A task of the ethicist is to develop analogies that may force open new horizons of interpretation. Such innovation should be highly valued as a pedagogical tool.” (Post and Leisey 1995, 47) Quite on the contrary, what I hope to have shown is that both analogical imagination and sensibility can and is be practiced by anyone, not just “experts”.

Finally, I hope that analyses exploring analogical discourse may foster a general sensibility for how and with the help of which analogies new technologies and certain futures are presented as more plausible or desirable as others, be it in the policy arena, in media coverage or public engagement settings. With a heightened and finely tuned analogical sensibility we can trace how stakeholders mobilize analogies strategically to influence public opinion—and this may enable us to make these strategies explicit and thus open them up for public negotiation.

## **10.2 Beyond dualism and words**

Language sets everyone the same traps; it is an immense network of well-kept wrong turnings. — Ludwig Wittgenstein, *Culture and Value*

Words, words, words, are the stumbling-blocks in the way of truth. (...) Words produce the appearance of hard and fast lines where there are none. Words divide; thus we call this a man, that an ape, that a monkey, while they are all only differentiations of the same thing. — Samuel Butler, *Life and Habit*

The dissertation at hand has struggled from its very beginning with words and the dualisms<sup>125</sup> they often entail. It could neither escape reproducing the fact that people tend to talk about nano in discussion groups in terms of acceptance or rejection, nor that by trying to carve out the distinct characteristics of an interpretative repertoire, a difference to other repertoires is constructed. Hence, this section could be read an attempt to escape finally from dualistic restrictions.

After analyzing conversations about nano and being confronted again and again with the multiple ways of how differences and similarities are drawn and discarded, you cannot but come to the conclusion that each difference drawn by language is always constructed and contingent. Language is nothing other than a rich network of analogies, distinctions and dualistic notions. Consequently, “[l]anguage is not life; it gives life orders. Life does not speak; it listens and waits. Every order-word, even a father's to his son, carries a little death sentence—a Judgment, as Kafka put it” (Deleuze and Guattari 1988, 76). Although, attributing language a non-life-like character might seem overly harsh, I think Deleuze and Guattari raise a crucial point here. The ordering character of language expresses itself most fundamentally in the distinction between “I” and “not-I”, because the enunciation of an “I” always entails a death sentence in a very literal sense: every bodily “I” has to die. But the “I”

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<sup>125</sup> I understand dualism in a very general sense as a conception of the world as being composed of binary oppositions, or the perspective that conceives a system that exists of two essentially different parts or processes.

## *Coda*

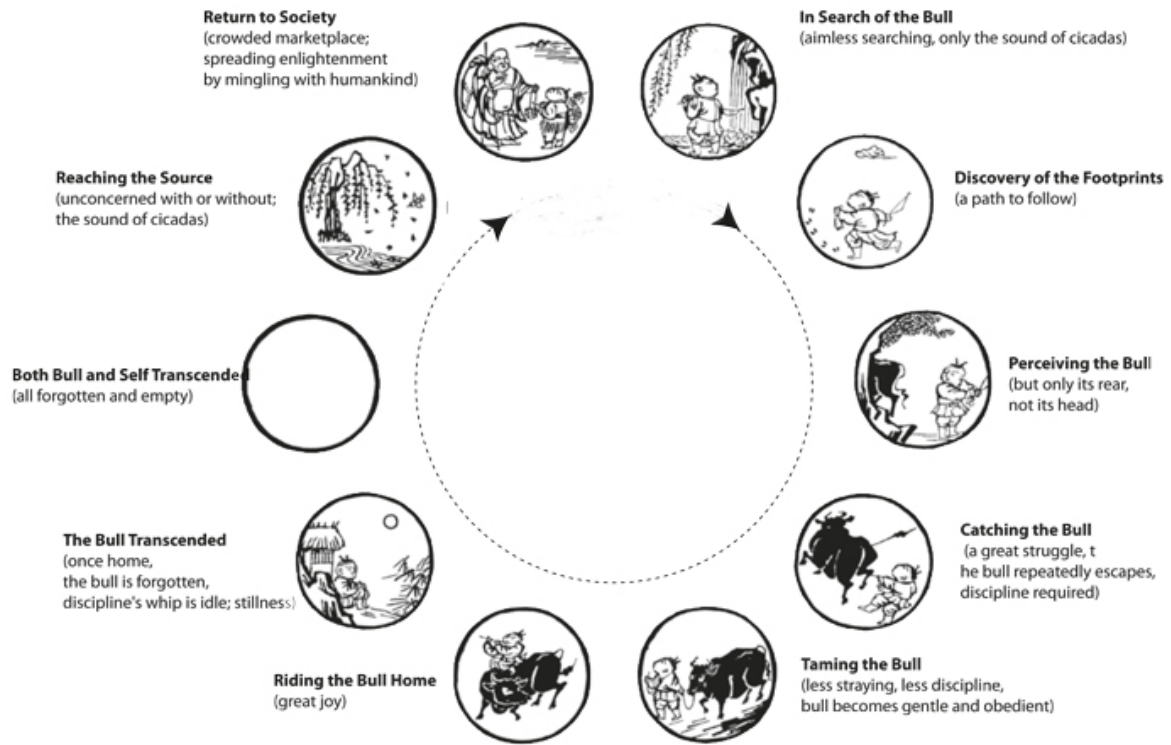
is also tied to less-fatal linguistic judgments that reproduce a long list of dualisms, such as between good or evil, praise or blame, acceptance or rejection. The I/not-I dualism is generally taken to be an axiomatic truth. But could it not be as likely that it is nothing but a myth inherited from our ancestors, transmitted via the medium of language from generation to generation and thereby imprinted in our brains? Why not try to live based on this assumption and see what happens? We all know moments of absent “I”-myths, for instance when we are so immersed in doing something that there is no room left to think the “I”-thought—this is what Csíkszentmihályi (1997) calls “flow” conditions.

Discourse in public engagement settings tends to work for most of the time in a rhetorical mode where analogies are employed to corroborate specific versions of the world and to defend them against counter-versions. I used many “argument is war” metaphors to denote encounters of different analogies, interpretative repertoires and future scenarios, but of course these metaphors themselves limit our imagination of how it could be otherwise. At the same time, if we would try to reframe controversial encounters with different metaphors, we might come to overlook speakers’ own situational framings. Nevertheless, we can observe flow-like moments in discourse when “argument is war” framings are absent from conversation and it is hence better described as collective imagination, experimentation and learning. Such discourse is characterized by interaction in which speakers draw upon their knowledge and experiences without being confronted with imputations of self-interestedness or the need for self-defense. These moments then resemble David Bohm’s (1996) model of dialogue, brainstorming sessions (Clark 1958) or agreement-oriented negotiations, all of which are attempts to search for an alternative to the agonistic model of argumentation. Future research and practical work on public engagement and group processes could pay more attention to the conditions that enable such interactional moments in which the power of order-words and “I”-myths is minimized.

On a final note, let me dedicate all that led up to this dissertation and that is to follow afterwards to the All-One as it expressed itself in Buddha, Bob Dylan, C.G. Jung, Ludwig Wittgenstein, Friedrich Nietzsche, Rainer Maria Rilke and all the other bodhisattvas, philosophers, poets, prophets, psychologists, and doctors that have contributed to my cure by making me slowly realize that we already live in a world beyond dualism.

This leads beyond words  
to ox herding.

# Coda





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## Appendix

### (1) System of transcription

(adapted from the Jeffersonian system)

[ ]	Square brackets mark the start and end of overlapping speech when positioned in alignment.
[	One square bracket at the beginning of a turn indicates that this turn connects without a pause to the previous one.
<u>Underlined</u>	Signals vocal emphasis in speech
CAPITALS	Marks speech hearably louder than the surrounding speech
(.)	A micropause below one second
(1)	Numbers in round brackets indicate pause in speech, in seconds
hyph-	A hyphen after (part of) a word indicates a cutoff or an abrupt stop of an utterance
.	Indicates falling pitch or intonation
?	Indicates rising pitch or intonation
(laughs)	Annotation of non-verbal activity
[[unclear]]	Speech which is unclear or in doubt in the transcript
(...)	A few words omitted
(... ...)	A few lines or turns omitted
X	unidentified speaker, with m/f for male or female

## (2) German transcripts

### Chapter 5

#### **Excerpt 1**

- 1 Bruno: Das wär überhaupt, diese DNS-Reparatur glaube ich, wäre die größte Aufgabe. Also wenn das gelänge, jemals damit zu lösen, oder teilzulösen, ich glaub das wär der große Durchbruch. (.)
- 2 David: Wohin?
- 3 Bruno: Der, der ganzen Technologie.  
(Lachen)
- 4 Christa: Wohin? [ ]  
(Durcheinandersprechen)
- 5 Bruno: Ja, natürlich, aber wer, das ist mir, das stimmt, ja? Wer bestimmt oder wer sagt dann, welche Teile zu reparieren sind? Wozu? Wohin? Wofür?
- 6 Eva: Und wer sagt, was der perfekte Mensch ist? Weil das ist eine, eine Wertung, [das ist...
- 7 Bruno: [Schon, aber das ist der größte Wunsch des Menschen (gleichzeitiges Sprechen) ist eigentlich die DNS, jetzt wird es schon versucht, also an Ungeborenen z.B., hab ich gehört, da wird schon versucht also solche Überlegungen anzustellen. Ich weiß nicht ob's stimmt, ich hab's nur gelesen. Und, und das muss also das größte Ziel der Menschheit sein sozusagen.
- 8 Eva: Na ich find nicht, dass das das größte Ziel der Menschheit sein muss (lacht).
- 9 Bruno: Naja, die DNS..
- 10 David: Es scheint so zu sein.
- 11 Eva: Ja, auch das größte [Ziel der Nazis war die Behinderten auszurotten, also das ist so...
- 12 Bruno: [Na, na, ich glaub...
- 13 David: [Das stimmt. Auch wenn's nicht gut ist.
- 14 Eva: Das find ich ganz dubios einfach. Ja.
- 15 David: Das ist ja krank. (3) (Med, 805-40)

#### **Excerpt 2**

- Bruno: Na ich mein mehr politisch hat's schon Missbrauch gegeben, nicht? Zyklon zB nicht (lacht) und solche Sachen (lacht). Gas mein ich jetzt. [Christa: Mhm] Also missbrauchen kann ich jeden technischen Fortschritt. Oder jeden medizinischen Fortschritt oder jeden (.) Was haben die Ärzte unter Hitler gemacht? Tschuldigung. (Med, 2695-8)

#### **Excerpt 3**

- 1 Bruno: Und was mich dann, das muss ich dazu sagen, was mich so fasziniert an dem Chip. Wenn es das wirklich geben sollte eines Tages, dann ist das natürlich der Durchbruch der Selbstverantwortung. Weil dann könnte ich dem Patienten, dem mündigen Patienten erklären, was er, und nicht weil's wer sagt, sondern weil das ein objektiver Signalgeber kundtut (.) was er richtig oder falsch macht. Um gesund zu bleiben, [um
- 2 Christa: [Ja, aber das geht ja wieder...
- 3 Bruno: [Jaja, natürlich, natürlich, ja natürlich, ja natürlich, wieder.

- 4 Christa: Das ist ja eine doppelbödiges Einfahrt. Die geht total verloren nämlich. [Bruno: Ja] Weil wenn's es dem wegnimmst, fällt er um und ist tot, weil er glaubt, er kann selber nicht mehr atmen.
- 5 Bruno: [Es, ja, es, natürlich.] Aber es geht letztlich immer wieder um die, eh (.) berühmte ethische Einstellung zu dem ganzen Thema.
- 6 Eva: Also ich hab auch dieses Nano-Labor auf einem Chip-Bild aus einem anderen Grund. Weil ich, für mich klingt das so wie, wie die perfekte, eben, wie die permanente Überwachung, das steht eh da. Und permanente Überwachung ist was, was ich überhaupt nicht für wünschenswerte halte, sondern für eine ganz furchtbare Phantasie einer, einer [ ].
- 7 Bruno: [Frau Kollegin, wollten Sie nicht, dass Ihnen jemand sagt, was Sie falsch machen oder richtig machen? (.) Ist das, ist das was Böses?
- 8 Eva: Was, was meinen Sie damit?  
(Lachen)
- 9 Bruno: Na wenn der Chip zB jetzt laut schreit. Als jetzt ein Beispiel
- 10 Eva: [Wenn ich, wenn ich, wenn ich irgendwie jetzt beschließe, ich will jeden Tag meine Cola und mein McDonalds-Essen essen, dann tu ich das und aus. Und wenn ich einen Herzinfarkt krieg, dann krieg ich einen Herzinfarkt. [Bruno: Na das ist, das ist, das ist ] Das ist wahrscheinlich aus medizinischer Sicht falsch, ja? Aber es ist mei-, meine Entscheidung.
- 11 Bruno: Aber dass der piepst und Sie können ihn dann vielleicht abschalten oder so, ich weiß es nicht [lachend], das ist ein anderes Thema, ned? Aber dass es das gibt fände ich als großen Fortschritt. Entscheiden, ist so wie beim Rauchen, entscheiden muss jeder selber. [lacht]
- 12 Eva: Na das ist ja die Sache, das Rauchen wird auch immer mehr, immer weniger zu einer freien Entscheidung, sondern immer mehr zu einer gesetzlichen Bestimmung. Also insofern ist es noch ein mehr ein Schritt in die Richtung, dass viel Leute eben nicht so entscheiden was ihnen grad taugt, sondern dass das einfach festgelegt wird. [Auch wenn sie nicht dafür sind] (Med, 842-92)

#### Excerpt 4

- 1 Franz: Aber zu dem, ich wollte dem Herrn W. noch sagen, von seinen Visionen, wollen Sie nicht, dass es einen Chip gibt, der Ihnen sagt was zu tun ist. Was ist wenn dieser Chip sich herausstellt, dass er mehr dem ÖBB-Fahrkartenautomaten ähnelt?  
[lautes Lachen]
- 2 Bruno: Das ist richtig. [Durcheinandersprechen und Lachen] Nein nein, ich gehe jetzt vom Idealbild aus natürlich, ja. Also ich bin jetzt Optimist und meine (lacht), dass es so etwas fehlerlos geben sollte. Dann, sonst...
- 3 Mod: Die österreichische Horrorvision ist also der ÖBB-Fahrkartenautomat.  
(Lachen)
- 4 Franz: Grad, grad als Piefke darf ich sagen (Lachen) der schon 25 Jahre schon da in Wien, also mehr als die Hälfte meines Lebens, der deutsche Automat ist natürlich nicht besser. (Lachen) Aber was ich damit eigentlich sagen will, ist eben, natürlich gibt's irgendwie Möglichkeiten und alles liest sich gut in, was weiß ich, Scientific American oder Science Magazine oder wie es heißt. Aber in der Umsetzung ist vielleicht dann so wie wir es kennen, wie wir's schon 100 Mal erlebt haben. Es ist eben nicht das Perfekte.

### Excerpt 5

- 1 Franz: Und was mich vorher (.) beeindruckt hat, was der Herr Czipin gesagt hatte, eben auch hier in dem Zusammenhang [räuspert sich], mit nämlich Ursache und Wirkung Bekämpfung, bekämpfen. Wenn es möglich wird Dinge zu reparieren, die vielleicht durch Umwelteinflüsse hervorgerufen sind (.) Handystrahlung, was weiß ich, suchen Sie sich aus was Sie wollen (.) Feinstaub, und es gibt dann die Möglichkeit es zu reparieren, könnte das nicht dazu führen, dass dann eine gewisse Nachlässigkeit mit der, mit dem Emissionsschutz eintritt, dass die Sachen, die das verursacht haben, dann vielleicht etwas lockerer gesehen wird, weil man sagt, na da gibt's ja was von Ratiopharm.
- 2 Christa: Genau. (.)
- 3 David: Den Teufel mit dem Beelzebub austreiben.  
(Bruno lacht)
- 4 Franz: Ne, eben das was wir immer machen oder was halt bei der roten Karte bei mir da eben stand mit der Ideologie der technischen Machbarkeit. Also es gibt ein Problem, na wir haben eine Lösung – aber wir beseitigen nicht das Problem an der Ursache, falls es überhaupt möglich ist, wenn die technische, ja, das Herumdoktern an den Symptomen vielleicht das einfachere ist, möglicherweise auch Lukrativere für gewisse Lobbys. (Med, 922-42)

### Excerpt 6

- 1 Christa: Wir wachen dann gemeinsam auf, wenn wir rausgehen [andere lachen], von unsere Träumen.
- 2 Bruno: Naja. (1)
- 3 Christa: Wir können ja philosophieren.
- 4 Bruno: So ist es.
- 5 Anna: Ihr Idealbild, dass dieser Chip recht objektiv ist, an das glaub ich irgendwie auch nicht. Weil den muss ja auch irgendwer herstellen.
- 6 Eva: Wahrscheinlich sagt er dann so: „Nimm das Medikament von Pharmafirma, - firma Y!“  
(Christa und Anna lachen)
- 7 Christa: Und nur das. (2) (Med, 969-84)

## Chapter 6

### Excerpt 7

- 1 David: Um da nochmal drauf zu sprechen zu kommen, warum wir die Kärtchen gewählt haben. Ich war immer schon ein großer Fan vom Data. Und das hört sich einfach so abstrus an, dass ich mir das überhaupt nicht vorstellen kann, dass es so was wirklich irgendwann einmal geben soll. Und wenn, dann ist es eigentlich nur ein erschreckender Gedanke, wenn man das so liest, Aggression zu kontrollieren – [die Solaten so jetzt] Vollgas (lacht) und man drückt da noch einen Knopf, oder, und dann kommen schnell die Nanoroboter und bauen ihn wieder zusammen.  
(Alle lachen)
- 2 Franz: Fan von was?
- 3 David: Ja, wenn der Soldat jetzt, da steht man kann Angst und Agression kontrollieren.
- 4 Franz: Karte 3? Oder was?
- 5 Christa: Fan von Tätern haben Sie vorher gesagt?
- 6 David: Von Data aus Raumschiff Enterprise.
- 7 Christa: Achso, okay. (Med, 1228-49)

### Excerpt 8

- 1 Franz: Auch das Leben ewig zu verlängern  
2 Christa: Ja, wozu eigentlich?  
3 Franz: Wir müssen mehr im qualitativen Bereich gehen  
4 Christa: Vielmehr was für ein Leben.  
(... ...)  
5 David: Also wenn jemand den Kelch des ewigen Lebens gefunden hat, dann wird er ihn nicht so schnell aus der Hand geben, glaub ich und das sicher nicht jemandem anderen zur Verfügung stellen.  
(... ...)  
6 Franz: Wenn's das ewige Leben gibt, dann gibt's auch ein Mittel zu sagen, ich mach jetzt denn Knopf aus, das war's jetzt, gefällt mir nicht. Das wird dann genauso möglich sein für die Leute. (...) dann sagen die Leute: mach den Apparat aus. (.) (Med, 1309-41)

### Excerpt 9

- Franz: Es wird aber andere Dinge geben, die irgendwie moralisch vielleicht viel problematischer sind als jetzt irgend so eine Beschichtung, und wo es eben dann darum, wie eben dieses Rumdoktoren an Verhaltensweisen, ob vielleicht irgendwelche Nervenstimulanzen oder so oder Blockierungen, aggressives Verhalten unterdrücken, dann kommen wir in die gleiche Diskussion rein wie Lobotomie in den 60er Jahren oder wann das war, und dort wird man dann diskutieren. Aber das Wesentliche ist nicht eben nur Miniaturisierung und Verkleinerung. Die sorgt nur dafür, dass wiederum solche Sachen möglich sind, wovon man aus schlechten Erfahrungen von vor 30 Jahren jetzt die Finger gelassen hat. Aber inzwischen darüber anders denkt. (Med, 3052-60)

### Excerpt 10

- 1 Agnes: Ja, Konkurrenz wird stärker sein.  
2 Benjamin: Ich mein es gibt ja schon, ein blödes Beispiel, das mir jetzt einfällt, mit Ausdauerstärken. Ich mein jeder, der in der Früh und, wo steht überall ein Kaffee, einen Kaffee trinkt, ist eigentlich nichts anderes als eine Art Minidoping. Im Sinne von, ich bin jetzt müde und ich muss in der Früh jetzt arbeiten und besser trinke ich einen Kaffee und bin leistungsfähiger.  
3 Christine: Aber es gibt Studien, die beweisen, mit jeder Tasse mehr Kaffee wird deswegen nicht die Aufmerksamkeit gestärkt. Tschuldigung, nur als Einwurf.  
4 Daniel: (...) ich trinke nie Kaffee. (...) Aber ich sehe bei den anderen, die kommen in die Arbeit total fertig, brauchen erst, man darf's nicht ansprechen, bevor sie nicht 2 Tassen Kaffee haben. (...) Die gehen davon schon aus, sie brauchen den Kaffee, dass sie dann erst leistungsfähiger sind.  
5 Benjamin: So placebomäßig.  
6 Daniel: Ja, placebomäßig.  
7 Benjamin: Na gut, aber wenn's funktioniert, funktioniert's. Gut, das können sie mit dem Chip genauso machen. Du sagst, du willst einen Chip rein (...) und placebomäßig denkt man sich, mah, jetzt bin ich gescheit. (Lachen) Und dadurch dass er dann denk, dass er selber dran glaubt, ist er dann vielleicht auch besser. (ICT, 831-859)

### Excerpt 11

- 1 Christine: Ich meine eine, eine Schulkollegin, die ein Doppelstudium absolviert hat, hat damals, Anfang der 80er Jahre schon damit gelebt, sich – ich weiß jetzt nicht mehr wie dieses Medikama-, Medikament heißt – die Ausdauer eben stärkend,

den Wachzustand mehr ausprägend, eben dadurch mehr aufsaugen können und eine Prüfung antreten. Keine Ahnung. War ohne Rezeptgebühr in Apotheken zu bekommen. Sie hat das natürlich nur gezielt eingesetzt. Weil ich auch annehme, dass das, wenn man das regelmäßig nimmt, nicht unbedingt sehr gesundheitsfördernd ist.

- 2 Benjamin: Ja, das ist so ähnlich wie diese Coffeinsache oder Red Bull ist auch Coffein.
- 3 Christine: Ja. Ja.
- 4 Benjamin: Was ich mir grad gedacht hab, weil Sie gefragt haben, genau auf meine konkrete Situation. Was würde jetzt morgen passieren, wenn ich heute so eine Operation hätte, oder am Montag von mir aus? (...) Also ich würde einfach mehr arbeiten glaub ich. Es würde darauf hinauslaufen, dass die Leute mehr arbeiten. Jetzt hier, in unserer Gesellschaft. Was aber glaub ich nicht heißt, dass Sie glücklicher werden deshalb.
- 5 Christine: Ja. Darum hab ich mir gedacht, der eine Aspekt ja, ich würde, weil ich das als Ausgleich immer gern hab, Kunst/Kultur, ich glaub ich bräuchte einen 2. Chip. Das für mich, um das jetzt wirklich ad absurdum zu führen.

### **Excerpt 12**

- Franz: Und das, Angst vor der Zukunft ausschalten, das machen wir halt, indem wir uns halt die Birne vollschütten. Wir machen das jeden Tag, ja. Und wenn's was anderes gibt als Bier, dann würden manche halt das nehmen. Da bleiben auch welche über, die sich halt zudröhnen oder was, wie heißt das Zeug da, am Karlsplatz da? (Med, 1350-4)

### **Excerpt 13**

- 1 Mod: Und wenn sehr viele Leute in Ihrer Umgebung, in der Sie arbeiten, sich das machen lassen würden und daher die Leistungsdifferenz zwischen Ihnen und Ihren Kollegen groß werden würde.
- 2 Daniel: Okay, gehen wir jetzt mal davon aus, okay gut, jetzt kommt der Chef, fangt an, einer muss gehen, oder so. Ja, dann ist es ein bisschen blöd. Aber letztendlich würde ich dann auch gehen glaub ich dann eher. Das, das gleiche mit: „Trinkst, trinkst ein Bier mit mir? Ja oder nein? Wenn nicht, dann tschüs.“ Das ist nur dieses Gruppending.
- 3 Agnes: Ich glaub da würde er schon sehr schnell zu diesem Konsumzwang kommen. Also vor, vor 15 Jahren hab, haben nur einzelne Handies gehabt, dann ist die große Welle gekommen und jetzt hat jeder mindestens ein Handy (lacht). Und da ist der Konsumzwang, man muss es dann nehmen, weil alle das haben. Und wenn alle das haben, da, ich glaube das ist schwer da Stand zu, zu halten. (ICT, 1095-1108)

### **Excerpt 14**

- 1 Agnes: Sowohl Nanotechnologie oder Gentechnologie, das ist glaub ich ziemlich gleich. Also inwiefern dürfen wir uns oder können wir uns verbessern als Menschen? Oder ist uns also Veränderung der, der Menschen selbst. Ja.
- 2 Benjamin: Da hab ich eine blöde Frage. (.) Okay. Wenn ich jetzt in der Steinzeit bin, das erste was der Mensch gemacht hat, ist, er zieht sich mal irgendwie ein warmes Fell an, damit ihm nicht kalt ist. (Lachen) Ist das nicht auch schon eine Veränderung des Menschen? (Lachen) Und jetzt einen Nanochip irgendwo, das ist so ein halt 100 Mal stärker, aber die gleiche Idee eigentlich. (.) Ist eine provokante Frage. Tschuldigung. (ICT, 1779-87)

### Excerpt 15

- 1 Agnes: Jetzt, darüber hab ich noch nicht nachgedacht (lacht). Das muss nach-, nachgrübeln, ob, ob ich mir etwas auf den Körper drauflege oder ob ich in den Körper hineinlege, das ist vielleicht-
- 2 Christine: [Genau.  
(gleichzeitiges Sprechen)
- 3 Daniel: (... ...) Also ich schätze jede und jede neue Erfindung oder jede neue Sparte, kommt immer in die Ethik hinein. Da sagen sie immer, das wollen sie nicht.
- 4 Mod: Da ist eine, eine Frage drinnen gewesen, die ja doch vielleicht relevant ist. Nämlich die Frage, oder die Frage ist gestellt worden, spielt das eine Rolle, ob das außerhalb meines Körpers ist oder ob das in meinem Körper ist?
- 5 Christine: Also für mich ist das schon ein massiver Unterschied.
- 6 Daniel: Na gut, da kommen wir wieder, da kommen wir wieder auf, auf die Religion zurück, bei Zeugen Jehovas ist ja auch dass zB kein Blut und alles solche Sachen, das ist auch diese Abwehr gegen Technologie.
- 7 Mod: Ja. Aber Religion ist ja nur ei-, ja, Religion ist sicher eine Facette davon. Aber ich denk mir, Sie haben gesagt, das macht einen großen Unter-, wenn ich Sie richtig verstanden hab? Ja.
- 8 Christine: Ja, schon. Weil ich denk mir, also wie der, der Carl gesagt hat, das Fell hat da eine Schutzfunktion. Aber es, als Wärmespender, aber es ist, es ist nicht so wie ein, ein Chip, der irgendwo dann vielleicht doch auch im Körper drinnen Gegenreaktion oder (...) Es ist für mich schon ein, ein Eingriff. Alles was irgendwie subkutan, ist ganz einfach ein, ein, ein, eine andere Art der Veränderung.

### Excerpt 16

- 1 Benjamin: Und was ist ein Herzschrittmacher?
- 2 Christine: Oh ja. Okay. (lacht)
- 3 Benjamin: Also für mich, ich hab das jetzt auch ein bisschen noch in der Diskussion geändert, ist was Gutes, dass mir das hilft.
- 4 Christine: Da im Extremfall, ja, ja okay, ja.
- 5 Daniel: Oder eine Impfung. Ganz normal.
- 6 Benjamin: Oder Impfung.
- 7 Christine: Ja, im Extremfall, wenn ich dann nimmer anders, also ich mein die Frage Schweinegrippe oder nicht, also ich mein stellt sich für mich nicht – ein eindeutiges nein. Aber da, wo es dann lebensverlängert oder Dinge vereinfachend, erleichternd lebbar macht, EHER ein Ja. Aus der Notsituation heraus. Aber nicht von Vornherein bedingungsloses Überlaufen.
- 8 Benjamin: Also wo man wirklich sozusagen nachher sagen kann: messbar, ich hab jetzt da den und den Vorteil gehabt, wie zB länger leben können.
- 9 Christine: Ja. Ja.
- 10 Benjamin: Während irgendein Chip, wo dann halt, weiß nicht, der für nichts verwendet wird außer für Werbung oder irgendwas ähnliches, ist Schwachsinn einfach.
- 11 Christine: Ja. (ICT, 1824-51)

### Excerpt 17

- Daniel: Ich wollte sagen, ich schätze das Entscheidende dran ist das Umfeld auch in dem Sinne. Weil wenn ich jetzt, ich schick mein Kind zB in den Kindergarten und lass es nicht Zeckenschutz impfen, ich sag: „Sicher nicht, weil das ist schlecht“ – aber alle anderen kriegen eine Zeckenschutzimpfung, dann reden die Eltern schon warum sich der nicht impfen lass oder was. Dann bist eher fast gezwungen, dass

du es auch impfen lasst oder so. Dass der Gruppendruck da reinkommt. (ICT, 1930-5)

### Excerpt 18

- 1 Franz: Für mich gingen jetzt diese Beispiele eher dahin, ja, dann wollen wir das aber alle. (...) Was ich sehe ist, das andere was auf irgendwelchen Kärtchen war: kann es nicht sein (...) dass ein Druck dadurch entstehen kann, Leute, die jetzt irgendwo nicht so ganz mithalten können, dass sie sich unter Druck gesetzt fühlen, dass man – und ich glaube, dass das ein Thema wär, wo sich Leute wehren würden. Also so eine Art verpflichtendes Doping.
- 2 Christa: Aber das ist, genau, ich wollte grad sagen, das ist nichts anders als Doping. Warum erlaubt man Doping nicht für alle? Dann sind die Voraussetzungen für jeden Sportler wieder gleich. Nein, da wird's verboten und einige wenige oder eh schon ganz viele machen's dann, weil die Leistung ja anders gar nimmer möglich ist. Das wär genau dasselbe dann.
- 3 Franz: Ja, aber wenn's jetzt nicht verboten wäre und es bereits diese Expertenkommission gäbe, die EOCs oder wie die da eben heißen, würd es erlaubt oder so, würd's wahrscheinlich auch eine Bewegung geben von Leuten, die sagen, da wollen wir jetzt nicht mehr mit. Weil Magersucht ist nicht verboten. Es ist schädlich, ist genau so was wie Doping, es ist für mich fast ein gleiches Thema. Es geht da um einen bestimmten Berufsbereich um irgendwie mithalten zu können. Und es gibt eine breite Bewegung dagegen. Die ist jetzt vielleicht nicht so effizient oder so, aber die Einstellung ist eher, ne, da muss mal ein Strich gezogen werden. Und das kann ich mir da eben auch vorstellen, selbst wenn manche Leute da vielleicht freiwillig mit anfangen. Sich irgendwas einpflanzen lassen, weil es klein ist, weil's funktioniert. Es gibt auch 2 – genauso wie bei Doping – 2 Denkvarianten: es passiert offen oder es passiert eben nicht offen, sondern es wird erstmal nur gemunkelt, dass es so was gibt, dass manche das nehmen, dass nicht jeder da Zugang zu hat. Das hat könnte für mich auch eine Rolle spielen, dafür wie die Öffentlichkeit damit umgeht und Gruppen in der Öffentlichkeit sich dann bilden und sagen, wir machen so eine Art Attac gegen Nano oder so, ne?
- 4 Eva: Ich denke mir, dass es früher oder später irgendwelche Skandale geben wird. Also irgendwas von diesen Entwicklungen wird mit irgendwas unverträglich sein im Körper oder es wird sicher früher oder später irgendeine Komplikation auftreten, vielleicht sogar eher auf der langfristigen Ebene. Und (.) nachdem es auch so was ist, wo man die Risiken nicht wirklich einschätzen kann, und dass es dann zu einer Gegenbewegung kommen wird, wenn das offen wird oder wenn es so ist wie mit der, mit den genveränderten Lebensmitteln, dass das eben, dass das in der Öffentlichkeit schon so wahrgenommen wird, da gibt's wirklich ganz, ganz große Risiken, das ist schon offensichtlich, und da müssen wir uns jetzt dagegen stellen. (Med, 3379-3420)

### Excerpt 19

- 1 Bruno: Aber darf ich jetzt die Frage stellen, ich mein das ist alles okay. Darf ich jetzt die Frage stellen, was wird denn wirklich gegen diese Lebensmittelgeschichte unternommen? Wenn wir so oft drüber reden. Was wird dagegen unternommen? Welche Initiative, welche wirtschaftlich-politische Entwicklung? Wo?
- 2 Eva: Was heißt unternommen? Es ist zumindest ein-
- 3 Bruno: [Naja, ich mein ich weiß schon, ich weiß schon was Sie meinen. Und dass das auch sozusagen am Programm steht dort und da. Aber was spielt wirklich?



- 4 Agnes: Das Bioangebot vielleicht.
- 5 Daniel: Ja.
- 6 Franz: Ja.
- 7 Agnes: Du kannst dich ja entscheiden.
- 8 Bruno: Ja, na okay, ist wieder, jetzt sind wir wieder bei dem: ich kann mich entscheiden.
- 9 Franz: Ja, weil ich mein das, ich kann mich da nur wiederholen. Das was, das eigene Verhalten, dass man eben erstens nicht kauft, und darüber hinaus – weil das merkt ja vielleicht keiner oder nur zeitverzögert über die Marktforschung – auch den Lauten macht und sagt: behalt dir deinen Kram selber, ich kauf das bewusst nicht (.)
- 10 Bruno: Wär aber beim Chip das Gleiche dann. Beim Chip dann das Gleiche. Ich lasse ihn mir einsetzen, Beispiel, oder nicht. Bewegung ist es eigentlich dann nicht. Es ist eine Reaktion.
- 11 Franz: Nein nein, aber es kann schon auch eine Bewegung entstehen, dass es einfach, dass man eben sagt, ich bin jetzt bewusst dagegen, so wie es eben Leute gibt, die sagen, das mit dem Impfen ist Augenauswischerei oder so. Oder das Risiko, das gab's mal bei diesen Kombinationsimpfungen glaub ich mit Masern, Mumps, Pocken und allem zusammen oder so. Da gab's dann schon auch eine Änderung. Es war halt jetzt nicht so das Riesending in der Pressen. Aber da ist gesagt worden, wir bieten jetzt Alternativen an, eben nicht die Kombipräparate oder so. Wo dann das gesagt wurde: ist irgendwo was drin, dran an der Sache, dass jetzt bestimmte Risikogruppen dann eben auch nicht gezwungen werden oder so. In Britannien war das glaub ich mit der Gebärmutterhalskrebsimpfung da. (Med, 3422-55)

#### Excerpt 20

- 1 Mod: Sollten wir dann als Gesellschaft sagen, also wir sagen zu diesem Segment Nein? Sie haben nämlich vorher was total Interessantes gesagt, bei der Diskriminierungskarte haben Sie gesagt, es ist für Sie wichtig, dass es Zugang für alle gibt in dem Sinn. Und jetzt würde ich einfach die, ja, ketzerische Frage mal in den Raum stellen und würde sagen: warum sagen wir beim Radfahrersport nicht Doping für alle? Jeder darf dopen was er will und dann schauen wir wer gewinnt.
- 2 Agnes: Weil's gesundheitsschädlich ist. (zwei Zeilen ausgelassen) Ja. Also ich würde sagen, dass, wenn eine Sache nur Vorteile bringen wird, ich hätte keine Probleme damit, wenn meine Leistung, meiner Leistung geholfen wird und nicht irgendwas anderes.
- 3 Christine: Ich nur, wenn ich wüsste, dass ich keine Begleiterscheinungen dadurch zu befürchten hätte.
- 4 Agnes: Ja. Genau. Wenn's völlig, vö-, keine Nebenwirkungen hat, dann bin ich mit allem einverstanden. Aber das wissen wir ja nicht zum (lacht).
- 5 Benjamin: Also eine Antwort wär mal sozusagen, weil das olympische Komitee als privater Verein gesagt hat: bei mir dürfen nur Sportler teilnehmen, die nicht dopen. (...) Das ist jetzt, das ist jetzt sozusagen, und von mir aus gibt's die, den Verein XY, der sagt: bei mir können alle machen, was wir wollen, wir machen die Doping-Olympiade. Das ist mal die eine Sache (Lachen). So. Und dann ist aber die zweite Frage, aber ich kenn mich halt beim Doping jetzt nicht so im Detail aus, ist ja vielleicht auch wurscht. Ich glaub es ist ja auch gesetzlich verboten. Das ist ja wieder was anderes. (...) Und es kommt glaub ich von der Gesundheitsschiene. (... ..) Von mir aus, wenn jetzt ein, ein Sportverband kommt und sagt: ich mach jetzt einen anderen, ich mach jetzt meinen eigenen Sportverband und wir dopen alle und fahren um die Welt mit dem Rad in einer Woche, dann sollen sie's

machen. (... ..) Und dann kommt wieder die Gesundheit glaub ich. (ICT, 1941-2019)

### **Excerpt 21**

- 1 Mod: Und der Körper hat halt als normale Funktion nicht Blutaustausch eingebaut. Mit Sauerstoffversetzung, Sondern der hat (lacht), das hat er ja nicht als Basisfunktion, die ich einfach einschalten kann. Also die Frage ist: was nehmen wir dazu als, also inwieweit sagen wir, das ist wunderbar, wir bauen jetzt diesen Körper mit den neuen Möglichkeiten um? Und ab wo ist es dann sozusagen ein Problem?
- 2 Agnes: Na gut, aber was, wenn Sie das jetzt so sagen, dann würde ich schon sagen, wenn, wenn der Körper nicht dafür gebaut ist, dass eben frisches Blut bekommt (...) dann sollte man es nicht, weil es eben der Gesundheit nicht zuträgt.

### **Chapter 7**

#### **Excerpt 22**

- 1 Agnes: Ja ist interessant. Also diese Gentechnologiever-, -verbot oder, oder, oder so quasi Gütezeichen „ohne Gentechnologie“ von, wie, wie ist es dazu gekommen? Ich glaube das ist auch durch die Masse entstanden. Also dieser Druck, dass man kei-, auf Genomprodukte verzichtet ist eigentlich auch durch, also durch die Masse entstanden.
- 2 Daniel: Ja, die Masse hat's verlangt, deswegen ist es hingekommen.
- 3 Benjamin: Und wahrscheinlich weil irgendwelche, weil irgendwelche Biobauern damit angefangen haben mit „Nicht-Gen“. Das Thema kommt glaub ich nicht von nichts. Und es ist auch interessant, dass wir jetzt glaub ich hier über Nanotechnologie sprechen. Weil es ist ja auch schon die Message, dass es schon irgendwas gibt, wo Diskussion angefangen wird.
- 4 Agnes: So, ohne Nanotechnologie (lacht). (ICT, 2440-53)

#### **Excerpt 23**

- 1 Daniel: Na (...) Kennzeichnen, ich glaub das war in Deutsch-, in England war das glaub ich, da haben sie immer, immer mehr deutsche Produkte ist, ich glaub 2. Weltkrieg war das oder vorher war das, immer nach England gekommen und sind immer dort gekauft worden. Und das hat den Engländern gereicht, sie wollten, dass ihre, ihre Import Ding kommt, deswegen haben sie durchgesetzt, dass es gekennzeichnet wird. Deutsche Arbeit. Und dann war das Problem, dass genau das Gegenteil passiert ist. Jetzt haben alle Leute nur deutsche Arbeit gekauft. (lacht) (.) Die Engländer wollten verhindern, dass sie's nicht kaufen und jetzt haben sie: ah, das ist deutsche Arbeit, okay, dann nehm ich's. Ist dann nur (.), ich schätz, das dann entscheidet automatisch die Erfahrung, das Volk ob's anerkannt wird oder nicht anerkannt wird.
- 2 Mod: Aber war denn der Punkt, den Sie machen mit dem Vergleich zur Gentechnik, dass man etikettieren sollte? Also Labeling, also Labels machen sollte, dass, dass da drauf steht sozusagen: beinhaltet einen Nanobestandteil dieses Produkt, ele-, elektronische Produkt.  
(einige Zeilen ausgelassen, in denen der Moderator einen Witz macht und Agnes lacht)
- 3 Benjamin: Ja. In der Pause hab ich mir diesen, den Apfelsaft angeschaut und da steht blöd drinnen, es ist Zucker drin oder es ist kein Zucker drinnen. Ich mein das ist so

was Banales eigentlich, wenn man drüber nachdenkt und das steht aber drauf. Und jetzt reden wir über Gentechnik oder Nanotechnologie – warum soll's nicht draufstehen? Also ganz blöd gesagt: was spricht eigentlich dagegen? (.)

Transparenz zu schaffen ist sicher nichts Schlechtes.

4 Daniel: Gut, sie fangen schon an diesen, diesen Nano da, Nano zu benennen, wie den iPod Nano. Also kauft sich jetzt jeder, weil da steht jetzt Nano oben, weil es ein kleiner iPod ist. (ICT, 2455-88)

#### **Excerpt 24**

1 Emil: Muss das draufstehen eigentlich?

2 Claus: Nein, das muss nicht draufstehen, nein, und die Konsumentenschützer wollen's aber, dass das eben da drauf steht.

3 Daniel: Ja, das wär sehr wünschenswert.

4 Emil: Also das wär für mich absolut Voraussetzung.

5 Claus: Die Wirtschaft, also die Industrie lehnt's ab.

6 Emil: Aber jetzt sind wir wieder bei der ersten Karte, genau, was, was traut man den Konsumenten zu, sagt man, du kapiert das eh nicht, so wie es da drin steht, wozu soll ich's draufschreiben, du lässt dich nur von irgendjemandem aufhetzen, oder sagt man okay, ich schaffe Wahlfreiheit, wir sind in einer Demokratie, jeder kann entscheiden, was will er, was will er nicht, jeder hat die Möglichkeit sich die Informationen zu holen, manche versteht man, manche weniger, aber wenn man mal anfangt nicht zu deklarieren, also dann ist bei mir Feuer am Dach. Das fängt auch bei der Gen-Technik an, da kann man auch so oder so dazu stehen, aber wenn's mal nicht mehr draufsteht und dem Konsumenten sagt, ja nimm's, das ist gut für dich, dann ist bei mir die Schmerzgrenze überschritten.

#### **Excerpt 25**

1 Doris: Wobei aber die Kennzeichnung doch auch ein Schlupfloch hat, weil wenn die Kennzeichnung dann so abläuft wie beim Gentechnischen, dann haben wir keine Chance. (...) weil dort gibt es auch Gebiete, ich weiß nicht, bis zu einem gewissen Grad ist es frei und ab da wird's gekennzeichnet, aber wenn ich das jetzt überhaupt nicht will bin ich aufgeschmissen.

2 Mod: Bei aufbereiteten Lebensmitteln zum Beispiel gibt es ja eine Prozentgrenze unter der sie nicht etikettieren müssen und die ist gar nicht so gering.

3 Doris: Genau (... ..) Also ich hab jetzt in einer Ausbildung einen Dozenten gehabt, der hat uns klargemacht, dass wir nicht dem Irrtum auflaufen sollen, dass wir keinen gentechnisch veränderten Mais in Österreich haben. (... ..) Es ist nicht immer deklariert. Und wenn das mit der Nanotechnologie dann auch so sein wird, na dann nutzt mir die beste Kennzeichnung auch nichts.

4 Emil: Na das Problem ist da wirklich, dass einfach diese Gesetzgebung und Industrie, die sind in einem Boot ... (food, 2224-76)

#### **Excerpt 26**

Doris: Ich mein einen Punkt hab ich jetzt irgendwie sagen wollen und bin nicht dazu gekommen, es ist so ähnlich wie, wie zum Beispiel das, ich bin jetzt bei der, bei der funktionellen Ernährung noch immer, da gibt's ja in der Werbung so kleine Flaschen gegen Cholesterin, mir stellt's jedes Mal die Haare auf, weil ich denk mir, das kann nie funktionieren und die Leute kaufen's, weil's geworben wird und es wirkt aber sicher nicht, das ist, das gehört wahrscheinlich auch in dieses Kategorie mit den zugesetzten Vita-minen, Probiotika und solchen Dingen. (Food, 568-74)

### Excerpt 27

- 1 Doris: Also bei der Karte Zwei, ich hab sie nicht gewählt, aber ich möchte nur anmerken, da steht also die Neuerung verspricht weniger Fett bei vollem Geschmack. Ich meine heute sind wirklich sehr viele Leute übergewichtig, weil ihnen Fett fehlt. Und zum Abnehmen braucht der Körper Fett und wenn ich das mir anschau, dass statt dem Fett dann das Nano kommt und, und noch weniger Fett als jetzt schon, was eh schon zuwenig ist, also irgendwie denk ich mir, gesünder werden die Leute nicht.
- 2 Franziska: Na das sind ja reine Marketingstrategien kommt mir vor, also überall weniger Fett, das ist rein.
- 3 Armin: [Light, Nano-light.  
(... ...)]
- 4 Bertha: Es hört sich gut an, nur es schmeckt nicht gut. (...) Das ganze fettarme Zeug schmeckt mir überhaupt nicht.
- 5 Mod: Ja, aber das Versprechen dafür ist, dass ja Nano-Technologien dieses Problem, dass es nicht schmeckt, behoben werden sollte. (... ...)
- 6 Doris: Na das werden die Leute sicher genauso wieder kaufen. (.)
- 7 Emil: Ja, wenn's entsprechend beworben wird schon, man braucht sich ja nur Actimel anschauen. Und wenn da drei Kugeln mehr drinnen bleiben, das...  
(Lachen)
- 8 Doris: Also ich hab noch nie Actimel gekostet.
- 9 Emil: Ich auch nicht, aber es ist verrückt, wie die Leute. Also man sieht ja, wie die Regale voll sind, die Werbung war ja genial und sehr intensiv. (Food, 897-942)

### Excerpt 28

- 1 Mod: Würden Sie annehmen, dass so etwas nicht gekauft wird?
- 2 Franziska: Ich kann's mir ehrlich gesagt nicht so vorstellen, dass das total boomen wird, weiß nicht, weil ich denk mir, ich bin ein bisschen skeptisch gegenüber so, ich glaub nicht, dass die Leute so dumm sind, also ich mein klar, fettarm klingt gut aber ich glaub auch inzwischen, dass die Leute erst draufgekommen sind, dass diese ganzen Light-Produkte und fettarmen Produkte doch nicht so das Wahre sind. (...) jetzt ist, ist eh eine Gegenbewegung da und, und so was, wenn so was, wenn ich so was lei hör, dann befremdet das mich und ich bin eigentlich groß-, also neuen Technologien sehr großzügig gegenüber eingestellt und wenn sich Leute da ein bisschen Gedanken drüber machen, kann ich mir kaum vorstellen, dass, dass das wirklich einschlagen wird, zumindest nicht in den nächsten paar Jahren, vielleicht in ein paar Jahrzehnten, wenn dann, wenn sich die Welt komplett anders entwickelt hat einfach. (zwei Zeilen ausgelassen)
- 3 Emil: Aber wenn natürlich deklariert wäre, so wie jetzt auch die Gentechnik, also Gentechnik setzt sich, so wie es bei uns ausschaut im Moment dann auch nicht durch, weil die Konsumenten es einfach nicht wollen und es draufstehen muss, wird das, und die Supermärkte prahlen damit, dass sie keine Gentechnik Produkte mitnehmen ins Sortiment. Und wenn das deklariert werden muss glaub ich auch, dass die, die Stimmung eher, dass die Leute sagen nein ich glaub, das ist mir zu unheimlich, das brauch ich nicht wirklich, das ist mir zu technisch (...) ich glaub alle haben irgendwo die Sehnsucht möglichst natürlich, ob sie es jetzt tun oder nicht, aber im Grunde glaub ich will jeder sich möglichst natürlich ernähren. Und leidet halt drunter, dass er's nicht schafft, keine Zeit, kein Geld oder was auch immer. (Food, 975-1002)

### Excerpt 29

- 1 Emil: Wenn dann das Nano neu kommt, dann hat das ja glaub ich mit dem Image zu tun, mit dem Marketing. Also die Gentechnik, die haben's irgendwie nicht geschafft rechtzeitig, da hat das vorher gekippt, ist mein Eindruck, ja, al-so in der Bevölkerung ist das einfach, in Österreich sind sicher 80 Prozent der Bevölkerung will das nicht im Essen haben (...) Bei Nano ist es glaub ich noch unentschieden (...) wenn Nano sich in Richtung Gentechnik entwickelt, dass es pfui ist, hat's wahrscheinlich auch verloren, wenn's schick wird, das ist wahrscheinlich eine Frage, ob die Marketingstrategen für die Nanoforschung.
- 2 Franziska: Ja aber ist es nicht da, dass Nano genau, dass Gentechnik genau deswegen so böse ist, weil man irgendwie, ja weiß nicht, wie was Fremdes ist, weil es was, also unnatürliches ist und Nanotechnologie insofern kommt mir vor, ist ja eigentlich insofern ja dasselbe (...) ich kann mir nicht vorstellen, dass so was schick wird, wenn's in der Gentechnik nicht schick geworden ist, also. Da wird ja genauso diese Skepsis also dabei sein.
- 3 Emil: Na das kann, für mich schon ja, aber ich denke, für die große Wirkung nach außen ist auch sehr viel Marketing gefragt, also es gibt wahrscheinlich andere Dinge, die auch nicht viel besser sind, die aber schon auch schick sind, weil's halt einfach anders gelaufen ist, aber weiß nicht. (Food, 1076-99)

### Excerpt 30

- 1 Albert: Also ich hab die Lösung für euch. (... ...) es sollt einfach ein Pickerl geben, so: „nanotechnologiefrei“, oder? [Denise: Ja, das ist] Wenn's das gäbe, dann, ich mein wenn, wenn einer mal damit anfängt, bei der Sonnencreme nanofrei, oder, dann denken sie alle, ups, das ist nanofrei, bei den anderen ist Nano drin, na dann nehmen wir das vielleicht doch nicht, ja? Schmieren sie sich vielleicht nicht ein.
- 2 Barbara: Ja aber dann muss ich ja schon wissen, ob Nano gut oder schlecht ist. Das wissen wir ja zum Großteil noch gar nicht.
- 3 Albert: Na, wenn frei draufsteht impliziert das automatisch, dass, wenn's nicht frei ist, dass es schlecht ist.
- 4 Barbara: Na warum? Es gibt ja dann auch Leute, die sagen, okay, ich kauf nur das wo Nano drin ist. Weil ich bin der Meinung, dass das so toll ist.
- 5 Albert: Bin ich auch bei Medikamenten oder bei Technologie zB, aber wenn, aber auf meinen Körper möchte ich's nicht schmieren, in meinen Lebensmitteln möchte ich's nicht drin haben. Ja, also, wenn nanofrei draufstehen würde, also ich würd's kaufen. (Conpro, 1707-34)

### Excerpt 31

- 1 Mod: Also wollen wir ein Etikett da wo wir sagen, ohne Nanotechnologie? Das ist eine Form der Etikettierung, eine andere Form der Etikettierung: Nanotechnologie ist da drinnen.
- 2 Denise: Also mir wär's eigentlich lieber, wenn drauf stehen würd: ist drinnen.
- 3 Carl: Ja.
- 4 Denise: Also dann weiß ich's und dann weiß ich ja, wo das Etikett nicht oben ist, da ist's nicht drinnen. Im Umkehrschluss.
- 5 Carl: Ist immer die Frage, ob man's jetzt als gut oder als böse ansieht, das Ding, ned?
- 6 Barbara: Genau.
- 7 Denise: Ich würd's einmal als Warnsignal sehen.
- 8 Carl: Wenn's was Schlechtes ist so wie Fett, ja, Fett, dann ist es ohne Fett, ja?
- 9 Albert: Ja aber Fett an sich ist ja auch nicht schlecht, oder? Zuviel Fett ist das Problem.
- 10 Carl: Aber so wird's halt vermarktet.

11 Barbara: Und welches Fett. (lacht) (Conpro,1982-2007)

### Excerpt 32

- 1 Albert: Wenn ich weiß, dass da nichts drinnen ist, na, bin ich auf der sicheren Seite.  
[Carl: Naja.] Dann muss ich mich auch nicht damit auseinandersetzen, ob das gut ist oder schlecht, sondern, ich hab's einfach nicht. Aus und fertig.  
(Einige Zeilen ausgelassen, in denen Albert, Carl und Barbara sich darauf einigen, dass Substanzen die früher mit großen Vorteilen vermarktet wurden nach einigen Dekaden als gesundheitsschädlich eingestuft werden können.) Aber ich bin wie gesagt der Meinung, wenn irgendein Hersteller irgendeines Produktes anfangen würde es zu bewerten mit nanotechnologiefrei, was automatisch impliziert, wenn's nicht frei ist, ist es schlecht.  
(... ...)
- 2 Mod: Wie werden denn andere Lebensmittel gekennzeichnet? Haben Sie sich das mal überlegt?
- 3 Albert: Gentechnikfrei.
- 4 Barbara: Ja da steht immer nur frei drauf. Also dass einer Gentechnik verwendet, hab ich noch nie gelesen. Oder?
- 5 Albert: Oder Bio.
- 6 Denise: FCKW-frei hat's eine Zeit lang oft gegeben.
- 7 Barbara: Ja.
- 8 Albert: Na das Gesetz war, dass alles FCKW-frei sein muss, glaub ich ned?
- 9 Carl: Also wenn's, ich glaub wenn's geregelt ist, dann ist es immer, dass ich was Böses, also einen schlechten Stoff, fernhalte.
- 10 Barbara: Ja.
- 11 Carl: Also das, das definiert, okay, das ist ein schlechter Stoff, ist gefährlich, warum auch immer, den habe ich jetzt definitiv draußen. So, da gebe ich aus eben seitens der Behörde sag ich mal, dem Konsumenten eine Sicherheit, wenn das draufsteht, kannst dir sicher sein, ist es nicht drin. (Conpro, 2032-87)

### Excerpt 33

- 1 Carl: Oder eben kontrolliert gibt's ja diverse Siegel jetzt vom Fleisch her, AMA-Gütesiegel und dergleichen. Vertraut man, da gibt's eine Behörde, die prüft das regelmäßig und genau, und wenn die das geprüft hat, dann ist das in Ordnung.  
(... ...)
- 2 Barbara: Naja, dadurch kann's aber auch sehr positiv sein. Es heißt eben nicht automatisch, dass es schlecht ist, ned? [Durcheinandersprechen, Lachen] Also wie soll ich dann entscheiden, auch wenn drauf steht frei oder nicht frei? (lacht)
- 3 Carl: Wenn ein Unbe-, Unbedenklichkeits(.)symbol, also -zertifikat dann da wär. Das ist dann geprüft.
- 4 Barbara: Ja, aber das setzt ja voraus, dass es geprüft ist. Und im Moment ist es aber nicht so.
- 5 Carl: Ja eben. Ja, jetzt noch nicht, ja. Also das würd, sage ich mal, eher sicher machen, okay, das ist geprüft, ist unbedenklich. Und, und dann ist egal was drin oder nicht drin ist. (Conpro, 2087-120)

### Excerpt 34

- 1 Flora: Also, also die nahe Zukunft ist, oder Gegenwart irgendwo auch ist die Undurchschaubarkeit für mich. (... ...) Ja. Es wird dann schon eben in die Öffentlichkeit kommen, es wird, denk ich mir, einerseits wird's Skandale sicher auch geben, um das eben natürlich medial auch voranzutreiben, und andererseits

wird's sicher auch dann gewisse Art von Kennzeichnungspflicht geben, denk ich mir. Und dann in weiterer Zukunft wird natürlich in Teilbereichen eventuell auch der Missbrauch gemacht werden (...) in ferner Zukunft denk ich mir, wird's eventuell, jetzt Schreckensszenario, Katastrophen geben, aber auch eventuell revolutionäre Veränderungen.  
(... ...)

2 Denise: Also ich hab Zukunftskarte 14 und 15, weil ich glaub, dass das Thema mal total aufpoppen wird, ja, dass plötzlich alles, boah, Nanotechnologie, und haben wir ja alles nicht gewusst und hin und her. Dann kommt eine Kennzeichnungsfrist, ah – -pflicht, und dann wird das Ganze abflauen und, dann ist es halt drinnen, ja? Dann ist es so wie Konservierungsstoffe. Die sind halt auch drin, da kann man sich dafür oder dagegen entscheiden. Aber es ist jetzt nichts Revolutionäres mehr, sondern man gewöhnt sich dran. Es ist jetzt nichts mehr, wo man sagt, boah, da ist Nanotechnologie drinnen, sondern, ah ja, das ist halt ein T-Shirt, das hat Nanotechnologie. Also ganz normal wird das dann glaub ich. (... ...) sondern dass dann halt alle Jacken Nanosachen haben. Weil's ganz normal ist.  
(zwei Zeilen ausgelassen)

3 Barbara: Naja, das wird so sein wie bei den Kalorien oder so. Das steht auch überall drauf (.) Wenn nichts Gravierendes passiert. Das wissen wir ja nicht. Es kann ja sein, dass dann ein totaler Skandal ist und Nano überhaupt so verteufelt wird. (... ...) Es kann aber auch sein wie bei den Konservierungsstoffen, ned? Eine Zeit hat's keine Deklaration gegeben, dann ist drauf gestanden, dass welche drinnen sind, und jetzt steht überall schon drauf „ohne Konservierungsstoffe“ (lacht). (Conpro 2916-71)

## Chapter 8

### **Excerpt 35**

Franz: Ja, ich denke, also Politik sollte sich nicht von vornherein irgendwie einseitig auf eine Seite schlagen, weil's ein Zukunftsthema ist und man ja immer irgendwie draufhüpft, auf alles womit man gern als Zukunftsträger assoziiert werden will. Ich hatte als erstes mit den [räuspert sich] gesetzlichen Rahmenregelungen auch ein bisschen anders verstanden, wenn ich das vergleiche mit der Stammzellenforschung und so, wo immer gesagt worden war, das Fehlen der gesetzlichen Rahmenbedingungen würde Österreich oder – es sind nicht nur Österreich, andere Länder haben darüber auch geklagt – behinderten, im Vergleich zu anderen Ländern. Und ich denke, dass wir da das gleiche Thema sehen werden, wenn irgendwas hier nicht erlaubt ist oder kritischer gesehen wird oder stärker gepusht wird, wird's nach irgendwo anders verlagert. (...) Und wenn dann Leute das Glitzern in den Augen kriegen, dann wird auch gelogen werden, dass sich die Balken biegen. (Med, 191-203)

### **Excerpt 36**

1 Bruno: Mir fällt dazu jetzt ein, ein Parallelbeispiel aus der jüngsten Vergangenheit ein. Es ist nicht gar so lange her, da hat man den Begriff Globalisierung (.) geboren, sag ich einmal, gebo-, also mehrheitlich unter die Bevölkerung gebracht. Viele haben gesagt: Was ist denn das und Globalisierung und ist das für uns schlecht als Österreicher? Bringt das was? Was könnte das schaden, was könnte das nützen? Und inzwischen hat uns die Wirtschaftssituation überholt, also die Situation, die dann kommerziell sch-, bankenmäßig entstanden ist. Und plötzlich heißt es, war die, die Globalisierung Schuld, dass es so weit kam? Jetzt ist die große Frage nicht

die Schuldfrage für mich, sondern wie das der, der Mitbürger sieht. Man, man verbindet mit dem Begriff Globalisierung etwas Negatives, das in der Zwischenzeit passiert ist.

- 2 Und so ähnlich wäre dann das Thema für mich auch was Nanotechnologie betrifft. Es kann ja sein, dass irgendwann einmal, wenn es nicht die Rahmenbedingungen gibt (...) na klar, na klar, schon wieder die neuen Technologien, nicht? Wir zahlen drauf. Also da gilt es glaub ich rechtzeitig zu schalten oder Aufklärung zu betreiben, in welcher Hinsicht was damit verbunden ist, welche Konsequenzen man schon kennt.
- 3 Und die Risiken, ich denke jetzt an die Impfungen zB, wo die Leute immer kritischer werden, wenn man die Risiken nicht nennen kann oder nicht wirklich nennen kann. Und genauso wird's da sein. Bei allen diesen Begriffen, die neu in die Gesellschaft hinein schwappen, kommt sofort die Frage: na warum sagt man uns nicht die ganze Wahrheit? Und das scheint mir bei der Nanotechnologie dann auch der Fall zu sein, wenn sie, noch ist es ja Insiderwissen hätte ich bald behauptet, ja? Ich weiß nicht, ob's stimmt, aber (lacht) mehrheitlich ist der Begriff noch sehr dunkel. Und – glaub ich halt, ich weiß es nicht. Da müsste man, ich kann jetzt nur über meine Generation reden. Also (lacht) das muss nicht stimmen. Aber wahrscheinlich wäre es da die Aufgabe, rechtzeitig Information, auch Material, Informationsmaterial, Diskussion oder Beispiele zu nennen. Um die Furcht zu nehmen.

#### **Excerpt 37**

- 1 Christa: Aus dem Grund hab ich gleich die AG gegen Nano genommen (lacht). Weil ich bin immer gern gegen irgendwas (lacht), bevor ich noch weiß worüber ich, also das hat so, das hat so spät '68er-Geschichten wahrscheinlich, das Gen in mir. Na, ich find's immer wirklich ganz toll, wenn etwas, was sowieso von der Wissenschaft, von der Wirtschaft, von der Politik sehr hochgehalten wird, auch immer so einen Gegenzug erfährt, um eine Balance auch in der Gesellschaft zu halten, ja? Und das hat mich einfach am meisten angesprochen. Weil das eine verselbstständigt sich sowieso von alleine, weil viel Geld dahinter steckt und viel Anerkennung und Prestige und weiß ich nicht, Gottheit von mir aus. Und da sind dann die für mich immer wichtig, die sich nicht nur blenden lassen, sondern die auch die Gegenseiten beleuchten wollen. Deshalb hab ich diese Karte genommen. (... ..)
- 2 Franz: Ja. Also was mir als greifbarster Begriff in den ganzen Zettelchen auch aufgefallen war, war eben der Begriff „Ideologie der technischen Lösbarkeit aller Probleme“. Da hab ich gesagt, damit kann ich was anfangen, das ist etwas, was mich schon öfter beschäftigt hat. Und im nächsten Satz „soziale und politische Strukturen, die Menschen krank machen, werden ausgeblendet“. Das ist glaub ich, ja, auch so ein zweiter Aspekt, dieses Ausblenden am Anfang und dann erst etwas zu spät aufwachen. (Med, 250-70)

#### **Excerpt 38**

- 1 David: Darf ich gleich eine Frage zurück in den Raum werfen, wenn's jetzt geht um Balance in der, in der Gesellschaft. Zurück, ich war damals nicht dabei in den 60er Jahren, Thema Atompolitik, Atomkraftwerk, die neue Lösung aller Menschheitsprobleme usw. usf. Schauen wir uns die Situation heute an: wir haben keine Ahnung wohin mit den ganzen Brennstäben, das [zeigt
- 2 Christa: [Aber ich war demonstrieren, das kann ich sagen (lacht). Ein reines Gewissen (lacht).



- 3 David: Das glaub ich, das glaub ich dir. Insofern, die gesellschaftliche Balance frag ich: wo ist sie? Da stehen überall Atomkraftwerke, [die stehen mitten in der Gesellschaft].
- 4 Christa: [Aber in Österreich stehen Gott sei Dank keine was uns nichts hilft].
- 5 David: Eins steht, aber das läuft nicht.
- 6 Christa: Ja, das läuft nicht, genau.
- 7 David: Hauptsache ist, man hat viel Geld ausge-, ist viel Geld ausgegeben worden. [Cf: Ja] Aber das ist die Frage, wo ich mich dann frage, wo die Balance bleibt?
- 8 Christa: Na die ist sowieso nicht in Balance. Also oder diese...
- 9 David: Es ist ja schwer übergewichtig [Die gibt's sowieso nicht].
- 10 Christa: [Genau. Und so, und deshalb sind solche Organisationen oder Menschen, die sich kritisch einem ganzen tollen Thema widmen wo alle solche Augen kriegen.
- 11 David: [Absolut wichtig. Aber ich bin Politikerin, ich bin meinungslos.
- 12 Christa: (lacht) Deshalb hab ich das genommen. Zieht sich ein bisschen wie ein roter Faden durch mein Leben vielleicht. Aber ja. Man kann nicht mehr tun als kritisch zu sein.  
(Durcheinandersprechen) (Med, 293-324)

### Excerpt 39

- 1 Bruno: (...) Heute, wenn wir die letzten 20, 30 Jahre ausblenden, steht man am Standpunkt, na Gottseidank, Österreich hat's geschafft, wir haben keine Atomkraftwerke. Ich hab aber genügend Bekannte, die sagen: hört's endlich mit dem Bluff auf – rund um uns stehen so viele Atomkraftwerke, dass es wurscht ist, ob wir auch eins hätten oder nicht. [Cf: natürlich] Das heißt [Durcheinandersprechen, Lachen] Natürlich. Aber übertragen, jetzt kommen, jetzt kommen wir auf unser Thema: übertragen würde das für mich heißen, was Sie gesagt haben, solange es mir nützt ist alles super. Könnte aber sein, dass es Gefahren gibt, die ich nicht kenne, also bin ich schon skeptisch, ja? Und das kommt jetzt auf die Politik oder so, was, welche Grundlagen schaffen wir, um das zu überprüfen. Oder um den Menschen das Gefühl zu geben, es wird überprüft, es wird, es wird kontrolliert oder es läuft in Bahnen.
- 2 Christa: Das Problem ist, dass Politiker auch nur Menschen mit ihren eigenen Vorstellungen, Ideologien sind (...) und alle zufrieden zu stellen, ist nicht machbar.
- 3 Bruno: Naja. Aber dann kommt, dann kommt die Wirtschaft natürlich wie er sagt [David: Richtig, da kommt] und sagt: Moment, wenn wir nichts tun in Österreich, macht das der Deutsche oder der Schweizer
- 4 Christa: Jaja.
- 5 Bruno: Oder der weiß ich, sind wir schneller, machen wir was (lacht), ist unsere Chance.
- 6 Christa: Trotzdem-
- 7 David: [Müssen, müssen wir runterhüpfen, nur weil alle runterspringen?
- 8 Bruno: Naja, ja, ja. (.)
- 9 David: Aber die österreichische Lösung ist eh klassisch Zwentendorf, jetzt steht da ein Atomkraftwerk, aber läuft nicht.
- (Lachen)
- 10 Christa: Find ich gut.
- 11 David: Ja, ich find's auch gut. Aber besser wär's gewesen, wenn's gar nicht stünde.
- 12 Bruno (lacht)
- 13 Christa: Ja, da hat man die zu spät gebremst (lacht).
- 14 David: Na, aber wenigstens noch die Kurve gekratzt. (Med, 364-405)

#### **Excerpt 40**

Franz: Ja, ich glaub aber es ist trotzdem schwierig zu vergleichen. Atomkraft dient halt dem, dem Ziel Energieerzeugung, ist ein sehr wichtiges Thema. Aber Nano ist viel, viel breiter. Das kann alle, alle möglichen Bereiche sein, eben Medizin ist ja nur ein Aspekt. Das kann irgendwelche Sachen, Verfahren effizienter machen, Materialeigenschaften usw. und deswegen ist es viel schwieriger, das jetzt so über einen Kamm zu scheren. Wahrscheinlich wird man da in 10 Jahren auch nur den Kopf drüber schütteln, dass man das alles unter einem Begriff subsumiert hat, und dann werden das ganz getrennte Themen sein. (Med, 407-14)

#### **Excerpt 41**

1 Albert: Aber nützt das überhaupt was? Wir können's ja nicht verhindern, wir können's nicht ausschließen, wir können's nicht verhindern, es wird trotzdem kommen

2 Carl: Ja das ist die Frage, ob man's eben irgendwie verhindern kann, ja? So lange warten, bis man mehr drüber weiß. Bis man wirklich sagen kann-

3 Barbara: [Oder man setzt zumindest Zeichen, ned? Weil das ist so wie mit unserm nicht aktivierten Atomkraftwerk. Lachen die anderen vielleicht auch drüber. Aber es ist einfach ein Statement, dass man sagt, es geht auch ohne. Oder die Bevölkerung kann so dagegen sein.

4 Xm: Wir importieren aber auch (lacht). (Conpro, 2699-2707)

#### **Excerpt 42**

1 Bruno: Aber von der Gefahr ändert sich nichts. Man hat damals weniger gewusst-

2 Franz: Ja welche Gefahr?

3 Bruno: Na, die vermutete Gefahr. [Ja] (lacht)

4 Franz: [Jaja, eben,] das ist ja auch etwas komplett Diffuses. Deswegen spricht mich ja eben auch dies an, die „Ideologie der technischen Lösbarkeit aller Probleme“ steht da. Also wir reden eben von diesem (.) nur, man muss halt dran glauben, dass alles machbar ist, was wir auch immer so ein bisschen den Amerikanern vorhalten, dass wir sagen, das ist wieder typisch deren Lösung – für alles gibt's irgendwo eine technische Lösung, ja? Und das Gegenteil wäre halt, oder die Gegenposition, dass man sagt, jede Technik, die eingeführt wird, so schnell kann man gar nicht schauen, wird sie auch schon missbraucht oder eben birgt sie eben Risiken auf die wir nicht eingestellt sind.

5 Christa: Ja die man auch noch nicht vorahnen kann, ja?

6 Franz: Oder die erst später, wo wir früher Asbest, und ist Asbest ist ja auch ein Nanopartikel denke ich. Man weiß ja (.) was genau das Problem ist.

7 Eva: Ja ich sehe irgendwie die Parallele zu, zu den gentechnisch veränderten Lebensmitteln. [Franz: Ja.] Weil das auch so war, ja, es tut halt neue Möglichkeiten und gleichzeitig weiß man noch überhaupt nicht, was das eigentlich für Auswirkungen und auf die Umwelt, wenn man's, oder auch auf den Menschen, wenn man solche Lebensmittel isst. (... ..) Und die Forschung selbst wird einfach nur als was Positives gesehen, einfach nur weil's neu ist, ja, Hauptsache neu. Aber, aber was das dann für Konsequenzen hat, über das wird eigentlich erst immer erst viel zu spät nachgedacht, wenn es schon da ist. (Med, 416-49)

#### **Excerpt 43**

1 Claus: (...) also das wären eigentlich die Spätfolgen, weil sie haben zum Beispiel Jahre früher, ich möcht da nur so was in die Diskussion leiten, beim Asbest haben sie es ja auch nicht gewusst, die Spätfolgen, die sind dann erst rausgekommen und so

ähnlich wird das bei der Nanotechnologie auch sein, ja? Glaub ich halt zumindest. Weil zum Beispiel, da gibt's ein Beispiel, das ist übern Google und zwar in den Socken gibt's auch schon die Nanotechnologie, und wenn man die wäscht, die Socken, gehen diese Nanopartikeln raus ins Wasser, ja, und das Wasser haben ja wir dann in der Umwelt. (... ..)

- 2 Franziska: Ja, inwieweit sind die Langzeitfolgen eigentlich schon untersucht?
- 3 Claus: Gibt's ja keine.
- 4 Doris: Können sie ja nicht, wenn sie erst anfangen mit der Nanotechnologie, das weiß niemand.
- 5 Franziska: Dann find ich's aber ehrlich gesagt prinzipiell ein bisschen komisch, dass da keine Regulierung in die Hinsicht, dass man alles rausschmeißt was man hat, kann's auch nicht sein. Naja ich mein, prinzipiell sonst hat man ja auch Angst und so, Angst vor, vor negativen Auswirkungen, ja Asbest oder Atomenergie und sonst was und wird hinten und vorn reguliert und ja, wir machen's nicht und bei Nanotechnologie, da gibt's überhaupt keine Regulierung man schmeißt einfach auf den Markt, das kann ich mir fast nicht vorstellen.
- 6 Emil: Ja, aber so war's überall, weil am Anfang kennt's ja noch niemand und natürlich die das betreiben, die haben ja kein Interesse an Regulierung und die, die sozusagen die auch die mögliche oder auch nur Ängste oder Gefahren aufzeigen, die hinken ja immer hinten nach, die entdecken, da gibt's ja was, da muss man jetzt reagieren und die an-deren haben ja einen gewissen Vorsprung.
- 7 Franziska: Ja gibt's da nicht irgendwelche Behörden, die da eigentlich das regulieren müssten, ich mein, man kann ja nicht ein Medikament raus schmeißen, das man eigentlich nicht wirklich getestet hat, das ist ja rein ethisch nicht vertretbar. (Food, 426-468)

#### **Excerpt 44**

- Carl: Wo, wo sind die moralischen Grenzen von den Unternehmen, na? Weil die, die wollen in erster Linie einen Profit machen. Das ist ja in der Medizin genau dasselbe in der Pharma. (...) Und ja, also, nehmen wir vielleicht ein Beispiel wirklich aus der Geschichte: Asbest war ja auch zuerst ein super Produkt mit super Eigenschaften, bis man dann halt später dann wirklich draufgekommen oder Beweise gehabt hat, dass es wirklich schädlich ist, ned? Und da, das wird natürlich sehr lange von der Industrie natürlich so versteckt wie möglich oder in der Pharma hat's ja auch schon diverse Skandale gegeben. Das Contra-Ding, das [X: Contergan.] Contergan, na? Da hat's langes Wissen schon gegeben seitens der Industrie, dass das schädlich ist. Ist aber trotzdem weiter gemacht worden. Weil's halt um den Profit gegangen ist. Also wo ist da die Grenze? Oder wer schaut eben, wo die Grenze ist? (Conpro, 349-66)

#### **Excerpt 45**

- Flora: Mich hat's ein bisschen an diese FCKW-Geschichte auch erinnert, nicht? Dass man halt langfristig nicht weiß, natürlich auch beim Gesundheitsbereich, aber auch bei der Umwelt, wie sich das auswirkt. Das heißt, wenn das halt in zu großen Mengen jetzt verwendet wird und im Einsatz ist, würde die Gefahr bestehen, dass, wenn sich negative Seiten zeigen. (...) Das heißt, eigentlich sollte man das erst noch beobachten. Ich mein, ich, ich befürchte fast, dass natürlich die Wirtschaft zu wenig Zeit das zu beobachten (lacht), oder haben will. (...) Tatsache wird sein, dass es halt (...) auf den Markt kommen wird, wahrscheinlich auch in großen Mengen. Meine Meinung wär, oder mein Wunsch wär, dass es halt noch

länger beobachtet wird, im kleineren Stil. Die Frage ist halt nur, wie das umsetzbar ist. (Conpro, 555-568)

#### **Excerpt 46**

- 1 Denise: Gibt's bei diesen Gentechniksachen jetzt überhaupt schon den Nachweis, dass das irgendwie schlecht für den Körper ist, also dass das schädlich ist? Da gibt's ja auch noch keine endgültige Studie. [Aber]
- 2 Emil: [Gibt's beide Seiten, sag ich einmal.]
- 3 Mod: Ja.
- 4 Denise: Ja, aber so ist es ja bei der Na-, also bei der Nanotechnologie ist es jetzt ja meiner Meinung nicht, nach nicht anders. Da sind wir auch in diesem (.) Schau-ma-mal-Stadium. Schauen wir mal wo's hingeht, schauen wir mal wie's gut [oder
- 5 Ernst: Ob was passiert, ned?
- 6 Denise: Genau.
- 7 Barbara: Ja, oder wir wissen ja nicht was passiert, wenn, das ist ja mit diesen ganzen Lebensmittelzusätzen (...) was machen die Verbindungen mit uns? Und das wissen wir ja da genauso nicht.
- 8 Mod: Sie haben, irgendjemand hat von Ihnen Asbest ganz am Anfang eingeworfen. Überlegen Sie mal, wie war denn die Asbest-Geschichte?
- 9 Ernst: Asbest war immer unbedenklich.
- 10 Barbara: Ja.
- 11 Ernst: Weil man nicht gewusst hat, dass (...) den Zusammenhang hat man nicht gesehen, ned? Dass, dass Asbest auch ein Nanopartikel ist.
- 12 Carl: Und dass irgendwie die Krebs-, anscheinend Krebsraten- (... ..)
- 13 Ernst: War völlig unbedenklich.
- 14 Mod: 20 Jahre hat's gedauert sogar? (... ..)
- 15 Barbara: Ja. Drum sind wir eigentlich die, die lebenden Versuchskaninchen (lacht). Weil im Endeffekt ja, kannst du's ja noch nicht abschätzen, was wirklich passiert.
- 16 Armin: Ein Wunder, dass wir noch leben alle zusammen, ja. (Lachen und Scherzen) (Conpro, 2825-2900)

#### **Excerpt 47**

- 1 Franziska: Man muss sich doch ein bisschen mehr darüber Gedanken machen über Sicherheitsvorkehrungen, ich denk da jetzt ein bisschen an Atomenergie, ich bin absolut für Atomenergie und werd mich wahrscheinlich damit als absolut böse outen, aber mir ist bewusst, dass das mit gewissen Sicherheitsvorkehrungen gemacht werden muss (...) dass da eben wirklich viel Regulierung dabei sein muss, um es wirklich positiv nutzen zu können (...)
- 2 Emi: (...) ich erinnere mich zum Beispiel auch Atomenergie, am Anfang (...) da hat man diese Grenzwerte, die schädlich waren, wie die im, glaub ich drei- oder Vierjahresrhythmus halbiert worden sind und jedes Mal haben die gesagt, wir wissen bis dahin ist es ungefährlich und dann wird's gefährlich, weil das war Stand des Wissens und sie haben sich hingestellt, die Herren und Frauen Wissenschaftler, (...) und haben gesagt wir sind ja die Instanz, wir können das beurteilen und zwei Jahre später ist er halbiert worden der Wert und inzwischen ist er nur noch bei einem Bruchteil davon, (...) weil man immer mehr dazu gelernt (...) am Anfang waren sie überzeugt, sie wissen's. (Food, 1281-1301)

#### Excerpt 48

- 1 Franziska: Aber wenn diese Regulierung daherkommen, (...) um Langzeitfolgen zu erforschen und das einmal anzuschauen, bevor man das alles auf den Markt wirft (...)
- 2 Doris: Das Problem ist Langzeitfolgen kann man nicht erforschen, das kann man abwarten.
- 3 Franziska: (... ...) wir wissen noch nichts drüber, noch kann's genauso gut giftig sein wie es gesund sein kann und deswegen lass ich mich jetzt noch nicht drauf ein und ich glaub, das würde schon ein bisschen zu so einer Regulierung auch kommen, dass man sich das mehr anschauen würde.
- 4 Bertha: Aber Langzeit dauert mindestens 20 Jahre hab ich gehört.
- 5 Franziska: Ja natürlich, aber-
- 6 Mod: Würden Sie sagen, dass wir das sonst in anderen Bereichen, wenn wir Technologien einführen machen?
- 7 Franziska: Wir- wir sollten's mehr machen.
- 8 Emil: Na wir machen's eigentlich nirgends. Beim Handy hat man's nicht gemacht, (...) das ist auch irgendwie fast natürlich, (...) dass man's natürlich sofort vermarkten will (...) und jetzt noch einmal so viel Geld um Risiko abzuschätzen zu investiert und vielleicht 10 Jahre warten wir sowieso damit wir Langzeitfolgen, ist ja markttechnisch überhaupt nicht denkbar.
- 9 Franziska: Aber grad beim Handy denk ich mir das ist wieder was anderes, weil Handy, das hab ich halt da liegen (...) es ist nie als wenn ich jetzt wirklich Lebensmittel zu mir nimm, als wie wenn ich das Zeug iss und das dann in mir drinnen ist. (...)
- 10 Emil: Gut, da sind wir wahrscheinlich ganz im detaillierten drinnen, ich kenn mich jetzt nicht aus, aber es gibt ja Leute die sagen, ein Handy das ich jetzt immer eingesteckt hab, da oder wo, hat sehr wohl genauso schlimme Auswirkungen (...) Und die Techniker sind wahrscheinlich und die Wissenschaftler sind auch sehr unterschiedlicher Ansicht, im Grunde ist es ein komplexes Thema wieder, das wir überhaupt nicht durchschauen können so als Konsumenten.
- 11 Franziska: Aber eben, was ich sagen wollt war eigentlich mehr die Einstellung der Bevölkerung dagegen, ich glaub, dass sie bei Lebensmittel gegenüber schon so um einiges skeptischer sind als gegenüber so einem Handy (...)
- 12 Emil: Das glaub ich auch, ja, ja. Ich glaub Lebensmittel ist sehr sensibles Thema.
- 13 Bertha: Aber Technologien an und für sich sind zu befürworten, weil sonst würden wir noch in der Steinzeit leben, ned? Wenn nie was geforscht worden wäre und technisch verbessert, ja? Also gegen Technik bin ich überhaupt nicht, aber eben wie gesagt, die Entscheidung bei, bei solchen Sachen, Lebensmittel oder was, die können wir selber fällen. (Food, 1883-1948)

#### Excerpt 49

- 1 Mod: Die Frage ist halt, wie gehen wir insgesamt mit Techniken, einfach mit solchen neuen Techniken um und deswegen meine berechtigte Frage meine berechtigte Frage, naja wie machen wir das sonst mit Technologien und ich mein, meistens führen wir sie einfach mal ein. Also Sie haben das Beispiel des Handys genannt (...)
- 2 Emil: Ja überall, auch der Entdecker der Röntgenstrahlung ist im Endeffekt dann gestorben an den Strahlen, am Anfang ist man Hurra, toll, was Neues, sensationelle Möglichkeiten und dann schön langsam dämmert's einem und dann beginnt man Vorsichtsmaßnahmen und Grenzwerte einzuführen. Und heute sind wir froh, dass wir Röntgen haben natürlich, haben sich halt ein paar dran

glauben müssen, aber das ist, so ist Technik immer entstanden, der auch nicht damals gesagt, das könnte gefährlich sein, machen wir mal Langzeitforschung.

3 Franziska: Wenn man sich anschaut, wie die Mondlandung ausgeschaut hat, da wird einem ja heute schlecht mit was für einer Technologie sie das raufgeflogen sein.

4 Armin: Ja ich glaub auch, was heißt Langzeitfolgen, nur zehn Jahre, 20, 30, 50 Jahre, muss man das größer sehen, den Zeitraum und ich glaub das ist unmöglich die Entwicklung einfach aufzuhalten so lange und zu sagen jetzt wirklich auf allen Ebenen, ich halte das zurück und evaluiere nur und teste und so, das wird nicht funktionieren.

5 Emil: Ich denke, es wär schon viel getan und dann würd sich vieles von selber regeln, wenn dieser Verantwortungs-, Risikofaktor rein käme, weil wenn ich sag ich muss zwar keine Langzeitforschung machen, niemand macht sie, aber ich übernehme die Verantwortung, dann überlegt man sich das ja ganz anders oder, und wenn keine Versicherung sich findet, die das Risiko übernimmt, dann müssten doch die Alarmglocken schon schrillen, weil die Versicherungen, die versichern alles normalerweise, wo sie ein Geschäft wittern, und da offenbar, also die haben auch die besten Risikoeinschätzer glaub ich angestellt, da müsste man da wirklich sagen, da ist Vorsicht geboten. (Food, 2007-2037)

## English abstract

Ever since the appearance of nanoscience and -technology (short: nano), historical analogies, particularly with GMOs and asbestos, have co-emerged in public debate and guided political decision-making on nano. At the same time, the governance of emerging technologies has entered an “age of public engagement” with nano in many Western democratic states, which means that lay citizens are increasingly invited into dialogue fora to deliberate and decide about the future of nanotechnology. Drawing analogies to known and familiar phenomena, esp. to former technologies, also plays a central role in such settings. The aim of the dissertation at hand is to explore the role of analogies in public engagement spaces. More specifically, it seeks to capture the functional orientation and effects of analogies in talk-in-interaction, as well as the general significance and agency of analogies in public debates about nano.

The dissertation primarily builds on and provides results to research strands in STS such as public understanding of and engagement with science and technology as well as work on the performative role of futures in innovation processes. Theoretically, a perspective on the powers of analogy is developed that moves beyond a cognitivist approach to integrate imaginative, framing, and collective features of analogies. Methodologically, the concept of analogical discourse is proposed as an alternative to a static conception of analogies that allows tracing the interactional development and negotiation of analogies and distinctions in discourse. A broader discourse analytic framework influenced mainly by discursive psychology underpins this concept. The data used for the empirical analysis stems from four 4-hour discussion groups with Austrian citizens on different nanotechnological application fields.

The main result of the first of four empirical chapters is that analogies were used to counter promises of nanomedicine and to point out aspects that remain unaddressed in techno-optimistic accounts. The chapter on human enhancement then illustrates that the invocation of analogies worked to implausibilize and reject the idea of human enhancement. Focusing on discussions about nano labeling, the third empirical chapter traces how analogies contribute to but likewise are used to deal with the dilemma as to whether nano should be seen as positive or negative when applied in consumer products. Finally, the last chapter is concerned with the ways in which analogies are deployed to alert of futures that should be avoided, either by the integration of the public into the governance of new technologies or the establishment of risk management strategies that reach beyond scientific predictions.

The detailed empirical analysis shows that analogical discourse in lay discussion groups on nano is characterized by the ongoing construction but also critical, interactive examination of multiple analogies. In contrast to the construction of single, robust analogies in professional ethics, lay discourse thus generates more open-ended and flexible comparison processes, in which relevant dimensions of an emerging technoscience are collectively imagined and explored. In such analogical discourse central cultural dilemmas

emerging out of conflicting values and logics are also worked up and partly managed. Analogies are used to corroborate the acceptance or rejection of nano; to alert specific actors (e.g. citizens, industry or policy makers) to avoid undesirable futures; and to kill off counter-arguments (killer analogies). Moreover, the role of cultural analogies that are based on culturally shared experiences and assumptions, as well as *nano is not like nano* moves that distinguish between different nanotechnological application fields to achieve several functions are explored. Taken as a whole the dissertation highlights the merits of analogical imagination as it is emerging in lay discussion group settings while simultaneously seeks to illustrate critical analogical sensibility to the framing and discourse dynamic effects of analogies in action.



## Deutsche Zusammenfassung

Mit dem Aufkommen der Nanowissenschaften und -technology (kurz: Nano) haben auch historische Analogien, besonders mit Gentechnik und Asbest, begonnen die öffentlichen Debatten und politischen Entscheidungsprozesse um Nano mitzubestimmen. Gleichzeitig ist die Governance von neuen Technologien in vielen westlichen Staaten mit Nano in das "Zeitalter des öffentlichen Dialogs (oder Engagements)" eingetreten. Das bedeutet, dass Laien bzw. BürgerInnen zunehmend dazu eingeladen sind in Dialogforen über die Zukunft von Nano zu beraten und entscheiden. Vergleiche mit bekannten Phänomenen, besonders vorangegangenen Technologien, spielen auch in diesen Settings eine zentrale Rolle. Das Ziel der vorliegenden Dissertation ist es diese Rolle in Dialogsettings mit BürgerInnen näher zu erforschen. Im Speziellen wird versucht die funktionale Orientierung und die Effekte von Analogien in der Interaktion, sowie die generelle Signifikanz und Wirkung von Analogien in öffentlichen Debatten um Nano zu erfassen.

Hierfür wird auf verschiedenen Forschungssträngen der Wissenschafts- und Technikforschung aufgebaut, insbesondere auf Arbeiten zum öffentlichen Verständnis von und Engagement zu Wissenschaft und Technologie sowie zur Performativität von Zukünften. Dabei wird eine theoretische Perspektive in Hinblick auf die „Kraft“ von Analogien entwickelt, die über einen kognitivistischen Ansatz hinausgeht und imaginative, rahmungsbezogene, und kollektive Merkmale integriert. In methodologischer Hinsicht wird das Konzept des analogischen Diskurses als Alternative zu statischen Konzeptionen verwendet, das erlaubt die interaktive Entwicklung und Verhandlung von Analogien und Unterscheidungen im Diskurs zu erforschen. Dieses Konzept wird ebenfalls in einem breiteren diskursanalytischen Rahmen verortet, der in erster Linie auf der Tradition der diskursiven Psychologie aufbaut. Die Daten für die empirische Analyse stammen aus vier 4-stündigen Diskussionsgruppen mit österreichischen BürgerInnen zu unterschiedlichen nanotechnologischen Anwendungsfeldern.

Das zentrale Ergebnis des ersten von vier empirischen Kapiteln ist, dass hier Analogien dazu verwendet werden um den Versprechungen der Nanomedizin zu kontern und auf Aspekte hinzuweisen die in techno-optimistischen Aussagen fehlen. Das Kapitel zu Human Enhancement illustriert wie Vergleiche dazu dienen, die Idee des Enhancements als unplausibel und ablehnungswürdig darzustellen. Auf Diskussionen zum Thema Kennzeichnung von Nanoprodukten fokussierend zeichnet das dritte empirische Kapitel nach, wie Analogien dazu beitragen aber auch verwendet werden mit dem Dilemma umzugehen, ob Nano in Konsumprodukten positiv oder negativ eingeschätzt werden sollte. Schließlich beschäftigt sich das letzte empirische Kapitel mit der Art und Weise wie Analogien dazu genutzt werden vor Zukünften zu warnen und ihrer Vermeidung aufzurufen, entweder indem die Öffentlichkeit stärker in die Governance von neuen Technologien einbezogen wird oder indem neue Risikomanagementstrategien etabliert werden, die über fehlerhafte wissenschaftliche Vorhersagen hinausgehen.

Die detaillierte empirische Analyse zeigt, dass analogischer Diskurs in

Laiendiskussionsgruppen durch eine andauernde Konstruktion und kritische, interaktive Überprüfung von multiplen Analogien charakterisiert ist. Im Gegensatz zu einem Ansatz der versucht einzelne, robuste Analogien zu konstruieren, wie es in der professionellen Ethik der Fall ist, generiert der Laiendiskurs offenere und flexiblere Vergleichsprozesse, in denen relevante Dimensionen von neuen Technologien kollektiv imaginiert und exploriert werden. In diesem analogischen Diskurs werden zentrale kulturelle Dilemmata, die aus einander widersprechenden Werten und Logiken entstehen, aufgeworfen und zu managen versucht.

Analogien werden dabei verwendet um die Akzeptanz oder Ablehnung von Nano zu stützen; spezifische Akteure zu alarmieren um unerwünschte Zukünfte zu verhindern; und als Totschlag-Analogien, die Gegenargumente erfolgreich unterminieren. Zudem wird die Rolle von kulturellen Analogien, die auf breit geteilten Erfahrungen und Annahmen beruhen, und von diskursive *Nano ist nicht gleich Nano* Bewegungen, in denen zwischen nanotechnologischen Anwendungsbereichen für bestimmte Effekte unterschieden wird, diskutiert. Gesamt gesehen zeigt diese Dissertation die Leistung von analogischer Imagination wie sie in Laiendiskussionen entsteht, gleichzeitig forciert und setzt sie forschungspraktisch eine kritische analogische Sensibilität um, die es ermöglicht Effekte von Analogien auf Rahmungen und diskursive Dynamiken nachzuzeichnen.

# CV

## Scientific Work Experience

- Since October 2013 · Project leader at *Open Science – Lebenswissenschaften im Dialog*; projects: “Personalized Medicine for and with Citizens” and “Animal Testing for Biomedical Research”, both funded by the Austrian Federal Ministry of Science and Research (bmwf), Vienna
- Nov 2012 – Sept 2013 · Research fellow at the *Institute for Advanced Studies on Science, Technology and Society (ias-sts)*, Graz
- Since 2009 · Lecturer at the *Department of Science and Technology Studies* (University of Vienna)
- Oct 2008 – Sept 2012 · Scientific project collaborator at the *Department of Science and Technology Studies* (University of Vienna) in two projects: “Making Futures Present: On the Co-production of Nano and Society in the Austrian Context” (FWF); “Nanomaterials: Possibilities and Risks of a New Dimension” (Sparkling Science, bmwf); Department service: management of transcription work
- Oct 2005 – Sept 2006 · Scientific project collaborator at the *Institute for Research on Qualifications and Training of the Austrian Economy (ibw)*, Vienna

## Higher Education and Training

- Oct 2008 – Mai 2014 · Doctoral studies at the *Department of Science and Technology Studies*, University of Vienna; doctoral thesis: “Nano Is Like...The Role of Analogies in Public Engagement with Nanotechnology in Austria”.
- Jan 2007 – Sept 2008 · SoQua –Vocational Qualification in the Social Sciences, Vienna
- Oct 2006 – Sept 2008 · Post-graduate Program in Sociology, *Institute for Advanced Studies (IHS)*, Vienna
- Oct 2004 – Sept 2006 · Studies in Sociology at the University of Vienna
- Oct 2000 – Jan 2005 · Mag.<sup>a</sup>, Media and Communication Studies, English and American Studies, University of Vienna, with distinction

## Selected Publications

- Felt, Ulrike/Schumann, Simone/Schwarz, Claudia G. (forthcoming): (Re)assembling Natures, Cultures and (Nano)technologies in Public Engagement. *Science as Culture*.
- Felt, Ulrike/Schumann, Simone/Schwarz, Claudia G./Strassnig, Michael (2013): Technology of Imagination. A Card-based Public Engagement Method for Debating Emerging Technologies. *Qualitative Research*, DOI: 10.1177/1468794112468468

- Kubicek, Bettina/Miglbauer, Marlene/Muckenhuber, Johanna/Schwarz, Claudia (eds.) (2012): *Arbeitswelten im Wandel. Interdisziplinäre Perspektiven der Arbeitsforschung*. Wien: facultas.
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- Schwarz, Claudia (2008): Zuhause zwischen populärem Fernsehen und Popmusik. Casting Shows im Spannungsfeld von musikindustrieller Vermarktung und milieuspezifischer Aneignung. In: Brunner, Anja/Leitich, Lisa/Parzer, Michael (eds.): *pop: modulationen. Beiträge junger Forschung*. Innsbruck/Wien/Bozen: StudienVerlag, 39-62.
- Schwarz, Claudia/Röthlin, Florian/Plaschg, Wolfgang (2008): Aber bitte mit Schlag! Zur Legitimation von Lust, Macht und Gewalt in der SM-Szene. *SWS-Rundschau* 3/2008, 264-284.
- Schwarz, Claudia (2007): “Der ist der Fescheste” – Identitäts- und Geschlechtskonstruktion in der Aneignung der österreichischen Casting Show ‚Starmania‘. In: Döveling, Katrin/Mikos, Lothar/Nieland, Jörg-Uwe (eds.): *Im Namen des Fernsehvolkes. Neue Formate für Orientierung und Bewertung*. Konstanz: UVK, 155-177.
- Schwarz, Claudia (2006): Der Event im Wohnzimmer. Die familiäre Aneignung der Casting-Show *Starmania*. *SWS-Rundschau* 2/2006, 209-229.
- Schwarz, Claudia (2006): Gründungsalltag, Gender und Gründungsfinanzierung. Eine genderdifferenzierende Studie zum Gründungsprozess österreichischer UnternehmerInnen mit dem Schwerpunkt auf der Unternehmensfinanzierung. *ibw-Schriftenreihe* Nr. 133.