

# Research for Industry

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## SOLAR ENERGY

—Comes of Age

**SOLAR ENERGY** has come of age. At an epochal five-day meeting in Arizona in November, the working models and basic research reports of a hard core of dedicated solar energy scientists were displayed to an enthusiastic audience. About 500 industrialists, government representatives, and businessmen from the United States and 34 foreign countries converged at the University of Arizona, Tucson, for a two-day technical Conference on Solar Energy, after which they were joined by 600 others at Phoenix for a three-day World Symposium on Applied Solar Energy. And they came away from the meeting attuned to the role solar energy can play in supplementing fossil-fuel resources throughout the world.

Of considerable significance at the Arizona meetings, sponsored by the Association for Applied Solar Energy, University of Arizona, and SRI, were the favorable reactions generated by the bringing together of widely diverse elements of the science and business communities. The scientists more fully compared their work with that of colleagues from all over the world. They learned what has been accomplished and what remains to be done in specific areas of solar-energy research. And this interchange of ideas evolved a spirit upon which science thrives.

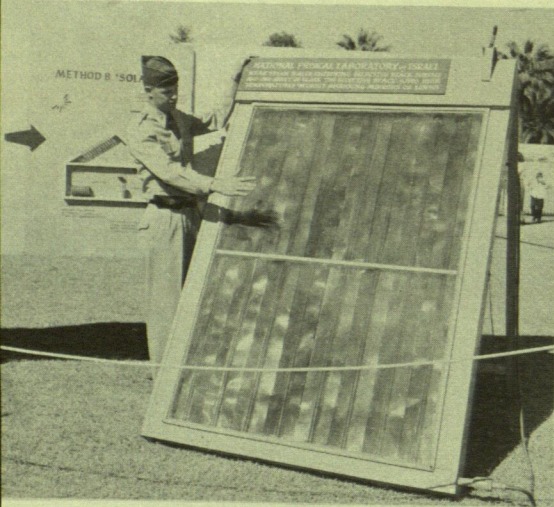
Vital communications lines were opened between the scientists and government, education, and industry officials—the financial leaders and government agencies to stimulate world demand for solar installations; industry to produce, sell, and utilize the devices in quantity; and the researchers to conduct economic and marketing surveys preliminary to the introduction of small-scale applications.

It was abundantly evident to the participants that practical uses of solar energy are not too distant. This also became apparent to the 75 members of the press and the 29,000 citizens who viewed the Solar Engineering Exhibit on two acres of the Phoenix Civic Center. Among the 77 exhibits they examined were working models, some of which were virtually ready for the proper engineering, industrial economics, and manufacturing know-how.

The 120 reports and papers presented at the Conference and Symposium dealt with the major fields to which the equipment manufacturers can turn: high-temperature furnaces, solar stills, conversion to mechanical and electrical energy, algae and higher plant cultures, application of solar space heating and cooling, and other conversion processes.

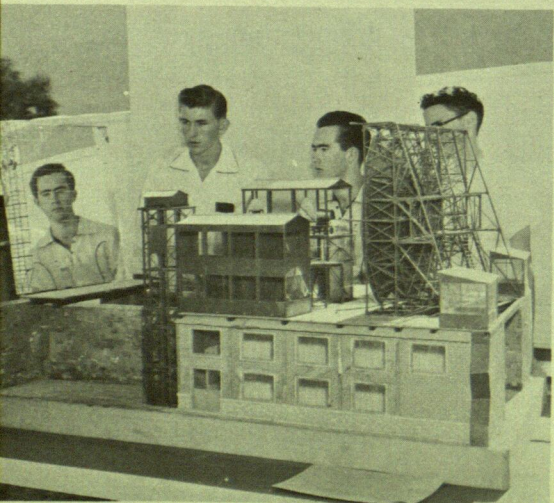
Gratifying to the veteran proponents of solar energy was the announcement





Selective surface collector, designed by Dr. H. Tabor of the National Physical Laboratory of Israel, Jerusalem, has black surface which absorbs sunlight and generates heat to produce steam

Model of solar furnace built by Dr. Felix Trombe atop Mont Louis, France. Parabolic mirror 35 feet in diameter enables furnace to achieve temperatures above 3,000 degrees (C.), and is used in production of refractory materials



at Phoenix that the French National Research and Scientific Organization is building a 1,000 kw., 200-foot-diameter solar furnace for use in high-temperature industrial applications.

(Subsequently at SRI, American Machine and Foundry Company has authorized a contract for testing performance, power output, and modification needs of a solar irrigation pump from Italy.

Also, the Office of Scientific Research, U.S. Air Force, is supporting a continuing Institute project for converting solar energy into chemical energy through the production of hydrogen from water. The hydrogen can be stored and ultimately converted with a high efficiency into electrical energy in a hydrogen-oxygen fuel cell.)

The commercial large-scale possibilities of residential space heating and cooling and water heating were indicated. Participants were reminded that solar water heaters have been in use for 50 years and that they are efficient and economical and function well.

Various Symposium reports corroborated that flat-plate collectors would supply normal space-heating requirements of residences with adequate roof or wall area. But as yet they are not competitive with present prices of fuel in the United States.

Others stressed that further research directed toward integrating collectors at low cost in house designs would make the sun-powered devices more economically feasible. Intermittency of energy supply, however, makes this application less acceptable—the collectors would not be working or paying their way around the calendar. The year-round potential of combination space heating—air conditioning equipment, however, could well bridge this obstacle. The sun-soaked and construction-booming Southwest United States was cited as a proper area for houses which incorporate the collectors, and eventually the coolers.

To the villager in India, Mexico, or

## SOLAR ENERGY RESEARCH CENTER

A Solar Energy Research Center in Arizona is under consideration to provide a laboratory for basic and applied research projects and to establish the authoritative source of world-wide information on solar-energy developments.

As outlined in preliminary discussions, the Association for Applied Solar Energy would sponsor the Center, to be operated by SRI.

In addition to housing the laboratory, there would be Center facilities to:

Publish a world digest of scientific papers and other pertinent reports.

Maintain the library of international publications and publish supplementary data for the bibliography compiled by SRI.

Foster world-wide contacts with scientists, engineers, and industrialists in the field.

Also, field stations would be established on Southwest sites as needed.

Egypt who spends as much as 5 per cent of his annual income for fuels, a cooker priced at \$15 is theoretically economical. However, the market is limited. In many cases, annual incomes fall short of the cooker price; therefore the need for considerable outside financial assistance.

(A ready market for the portable, novelty cookers is the United States where they could be produced within several years to supply the growing picnic and barbecue fad. Several manufacturers expressed a keen interest in the cookers in Arizona.)

The farmers of Iran, Mexico, or Asia would welcome a small solar pump. For the moment, solar pumps involve much higher initial investment; once installed,

operating cost is low. But, again, widespread capital resources are lacking. An Italian solar pump aroused the interest of Arizona farmers to such an extent that "50 could have been sold on the spot, if available," one observer commented.

## Urgent Power Need

The urgency of power equipment in energy-shy countries was described to the Symposium. Some of the under-industrialized countries are especially receptive to progress toward inexpensive energy sources. These nations are faced with an immediate problem: they have no prospects for cheap power.

The economics of solar-energy utilization hinge on the initial cost of financing, taxes, obsolescence rate of equipment, and prices for competing energy. Interest in solar radiation, therefore, may be greatest in areas where high fuel costs combine with low labor and materials costs in building the devices. Initially, solar power may be small-scale, with greatest appeal in rural areas removed from other energy supplies.

A critical factor is distance between points of distribution and use. Electricity at the powerhouse, for instance, is considerably lower priced than after it has been transformed, transmitted, re-transformed to a lower voltage, and distributed to the consumer.



Sir Edward C. Bullard, director of the National Physical Laboratory, Teddington, England, gives welcoming speech at Phoenix luncheon



Points of distribution and use for solar energy usually are almost identical. It is a negligible distance from wall to house heater; from shop roof to small lathe. Consequently a higher per-unit cost can be attractive—there are no railroads, high-tension lines, wholesalers, packers, or other expensive distribution functions.

Other Symposium Conference highlights follow:

Papers dealing with solar radiation showed that small stills can provide drinking water at reasonable rates in world areas where water supply is short and fuel expensive.

Experimental growing of chlorella to obtain higher yields of proteins and fats disclosed that valuable animal feeds may be derived from industrial cities' sewage.

Meteorologists were greatly concerned about the shortage of installations throughout the world to measure solar radiations.



West meets East at Arizona. (Left to right) John Jay Hopkins, chairman and president, General Dynamics Corporation; Lewis W. Douglas, chairman of the board, Southern Arizona Bank and Trust Company; Dr. M. L. Khanna, senior scientific officer, heat and power division, National Physical Laboratory of India, New Delhi; and Dr. Hiroshi Tamiya, president, Tokugawa Institute for Biological Research, Tokyo



### DR. HOBSON TO LEAVE SRI MARCH 31

**E**ARLY LAST MONTH Dr. Jesse E. Hobson, director of Stanford Research Institute since March 1948, submitted his resignation effective March 31.

The necessity for a period of complete relaxation and rest prompted Dr. Hobson's decision. He announced that he has no plans beyond March 31 and will remain active in the administration of the Institute until that time.

Expressions of extreme regret have been received from many friends of Dr. Hobson and of the Institute since publication of his decision to resign.

In his letter of resignation addressed to Dr. J. E. Wallace Sterling, president of Stanford University and chairman of SRI's board of directors, Dr. Hobson said:

"My enthusiasm for Stanford Research Institute, its purposes and objectives, its staff and its services, is greater than ever before. The Institute today is in sound financial condition, plans are developed for its permanent

buildings and it has an excellent and devoted staff which has been molded into an effective working team.

"The Institute is performing research of high quality and is nationally and internationally recognized as an institution of vitality and leadership in applied research. The basic policies of the Institute are established, have been adequately tested and are now considered to be outstanding and progressive among public service research organizations. My identification with SRI during these eight years will always be a source of pride and satisfaction to me."

Receiving the resignation for SRI's board, Dr. Sterling said, in part:

"Dr. Hobson's resignation is a source of regret to Stanford Research Institute's board of directors. We are grateful to Dr. Hobson for the important role he has played in guiding SRI to the strong and productive position it now occupies."

Under Dr. Hobson's leadership SRI has grown during the past nine years to become one of the largest of the nation's independent applied research organizations.

### Staff of 1,200

At the time he took the Institute's helm, the staff numbered fewer than 50 people and the annual research rate was \$250,000. Today SRI has a staff of 1,200 and an annual rate of \$10½ million in active commercial and government contracts.

Dr. Hobson is a native of Marshall, Indiana. He graduated with distinction from Purdue University and took his Ph.D. magna cum laude from California Institute of Technology in 1935.

Immediately prior to his appointment to head SRI, he was director of Armour Research Foundation for four years.

He has been an instructor in mathematics at Earlham College, an instructor in electrical engineering at Armour Institute of Technology, central station engineer for Westinghouse Electric Corp.

and director of the Department of Electrical Engineering, Illinois Institute of Technology (1941-44).

Eta Kappa Nu, honorary society of electrical engineers, named Dr. Hobson "Outstanding Young Electrical Engineer of the United States in 1940." The society further honored him by electing him to the presidency for its golden anniversary year, 1953-54.

Dr. Hobson has been board chairman of the National Electronics Conference, member of the Division of Engineering and Research and the Building Research Advisory Board of the National Research Council, the National Security Industrial Association's Ordnance Advisory Committee and of the American Industrial Development Council.

Currently he is chairman of the Committee on Research of the American Institute of Electrical Engineers.

Dr. Hobson was consultant to the Manhattan District of the Army Engineers during 1943-44 and was chairman of the Mexican-American Conference on Industrial Research in 1945. Under the auspices of the Mutual Security Agency he participated in a series of industrial research activities in Germany, Austria, and Italy during 1951-52.

### TWO-DAY ECONOMICS MEET TO OPEN IN LOS ANGELES

Some 500 of the country's top industrial leaders are expected at an Industrial Economics Conference to be held in Los Angeles on January 30 and 31.

Sponsored by SRI under the theme "Company Planning and Technology," the meeting at the Statler Hotel will be keyed for general management, sales managers, research directors, company planning and development executives, and industrial economists concerned with long-range planning for corporate growth.

The program has been built around discussions of aids for corporate plan-



ning: modern market research techniques, operations research, high-speed electronic data processing, and improved forecasting methods.

### Monday's Events

At a banquet the first day J. Peter Grace, Jr., president of W. R. Grace & Company, will speak on "Dynamics of Industrial Planning"; Jesse E. Hobson, director of SRI, will be chairman.

The conference will open Monday under the chairmanship of F. B. Ortman, chairman of the board, Gladding McBean & Company. "Guideposts for Forward Planning" will be discussed by Weldon B. Gibson, director of economics research, SRI. "Planning for Company Expansion Under Today's Conditions" will be the subject of Robert C. Tait, executive vice president, Stromberg-Carlson Division, General Dynamics Corporation; and Hugh Clary, president, Clary Multiplier Corporation, will speak on "Long- and Short-Range Planning—A Personal Experience in Company Growth."

At the luncheon chaired by E. Finley Carter, manager of research operations, SRI, "Technological Frontiers" will be discussed by Don G. Mitchell, chairman and president, Sylvania Electric Products, Inc.

There will be three speakers at the afternoon session, at which Edmund T. Price, president and general manager, Solar Aircraft Company, will be chairman. They will be Hall L. Hibbard, vice president, engineering, Lockheed Aircraft Corporation, "Development Planning in the Aviation Industry"; George L. Parkhurst, chairman of the board, Oronite Chemical Company, and vice president, Standard Oil Company of California, "Long-Range Planning in the Chemical Industry"; and Dean O. Bowman, co-ordinator of long-range planning, Crown Zellerbach Corporation, "Elements of Corporation Planning."

### NEW SRI ASSOCIATES

Eight more companies have joined the Institute's Associate Plan, bringing the amount of units subscribed to 150, and the total number of Associates to 115.

**Schlage Lock Company**  
San Francisco

**MacMillan & Bloedel Limited**  
Vancouver, B.C.

**California Packing Corporation**  
San Francisco

**American Can Company**  
New York City

**Matson Navigation Company**  
San Francisco

**Eli Lilly and Company**  
Indianapolis

**Simpson Timber Company**  
Seattle

**Hammond Lumber Company**  
San Francisco

### Tuesday's Program

Specific approaches to corporate planning will be the theme of second-day activities, which will have as chairman William Paul, president of the Los Angeles Stock Exchange.

Speakers will be Marvin Bower, managing partner, McKinsey & Company, "Building Present and Future Management"; Thomas H. Vaughn, vice president, Colgate-Palmolive Company, "The Growth Factor in Research Planning"; and J. W. Corbett, vice president, system operations, Southern Pacific Company, "Planning Operations." At the luncheon, Gerhard Colm, chief economist, National Planning Association, will speak on "Technology and Economic Progress."

Additional information and advance registration forms for the conference are available from Paul J. Lovewell, assistant director of economics research, at SRI's Menlo Park home offices; and Harrison A. Price, 727 West 7th Street, Los Angeles.

### NEW NUCLEAR ENERGY INFORMATION SERVICE

A clearinghouse for reports on nuclear-energy activities has been established by SRI.

The Nuclear Energy Information Service is equipped and staffed to interpret and analyze latest data for client companies in noncompetitive fields.

Major functions which the Information Service performs are to:

Screen and supplement classified information for AEC Access Permit holders. The Information Service evaluates data, which facilitates client participation in the nuclear-energy program.

Assist in interpretation and application of regulatory procedures established by the AEC and other government agencies.

Represent clients at scientific and industrial meetings. Staff members contact representatives of government, industry, and research organizations to work out problems relating to the participating company's role in the nuclear-energy program.

SRI informs clients of technical and economic developments in such diverse areas as ore exploration, by-product application, financial programs, diversification potentials, and production technology matters.

Clients spell out their specific field of interest to the Information Service upon initiating the association. Thereafter, they are advised of such information as directly affects those interests.

Other facilities at SRI relating to nuclear energy are a major radiation source (a 4,000-curie cobalt-60 installation); an AEC Industrial Information Depository, a collection of about 8,500 unclassified AEC reports; and the 1,000 scientific papers presented by 30 countries



### BIMSON JOINS BOARD

Walter R. Bimson, chairman of the board of directors, Valley National Bank, Phoenix, Arizona, and president and director of Arizona Bancorporation, has joined SRI's Board of Directors. He is a leading figure in the development of industrial and business potentials in the Rocky Mountain area.

Mr. Bimson came to Valley National Bank in 1933 after serving in an executive capacity with the Harris Trust and Savings Bank, Chicago. He is a native of Colorado.

SRI's 39th member of the board is also a director of Allison Steel Company, Valley National Company, Bagdad Copper Company, American Institute for Foreign Trade, Valley National Bank, and the Association for Applied Solar Energy. He is a member of the Economic Policy and Small Business Advisory committees of the U.S. Chamber of Commerce and a member of the Board of Regents of the state university and colleges of Arizona.

and international agencies at the "Atoms for Peace" conference in Geneva last August.

Further information is available from the Institute's Nuclear Economics Group, Economics Research Division, or the Nuclear Engineering Group, Physical Sciences Research Division.



# Fats-in-Feed for Beef



**P**RODUCT DIVERSIFICATION serves industry in providing a more stable base of operations. And SRI research experiments indicate that diversification is the course for the fat-rendering industry to take.

The producers of animal tallows and fats are confronted with the problem of disposing of a huge and growing surplus. In 1953 this amounted to more than 1 billion pounds. The figure is expected to go higher. In the past, foreign demand has halved this surplus. But exports are subject to fluctuation, because of normal seasonal price changes and variations in foreign demand.

This oversupply has come about largely through the advent and growing popularity of detergents, which cut sharply into the demand for tallows and fats for soapmaking.

Translated to figures, the synthetics took 58 per cent of soap sales in 1954; a forecast has been made that this figure will climb to 75 per cent in 1962.

## New Outlets

In localizing the problem, Tallow Research, Inc., was formed as a nonprofit organization by West Coast renderers and meat packers. SRI's facilities were utilized by Tallow Research as one approach to finding new outlets for the fats.

The Institute thereafter experimented, with success, in incorporating fat supplements in chicken feed. (This was dis-

cussed in *Research for Industry*, May 1954.)

When 3 per cent fats were substituted for a like amount of corn, the growth response was comparable to that of the control chicks, but less feed was consumed. Thus the fats-in-feed are attractive cost-wise to the growers.

Independent of SRI's research projects, acceptance of fats-in-feeds for poultry has been noteworthy, with the Midwest and East leading the way. This reception has been attributed to the proximity to a major source of the cheaper fats—grease from hogs. The West has held back because of the greater cost factor of tallows from beef.

An index of this new outlet's significance is the report that in 1953 the addition of fats to commercial feeds approached 200 million pounds. The figure has been rising. In the first quarter of this year the monthly total was nearly double the figure in the first quarter of 1954, rising from 5,200,000 to 9,200,000 pounds per month.

However, there was a twin approach to the problem of leveling off the surplus.

SRI biologists, experimenting with the addition of animal fats to beef feed, have come up with similarly promising results for the industry.

The experimental animals comprised 196 Hereford steers in the 15-18-month class. They were fed a grain ration plus various supplements of fancy tallow or yellow grease for 91 days at a northern California feed lot. (Tallows are ob-

tained primarily from cattle. "Fancy" is the top grade. Yellow grease may contain animal and vegetable fats and is of an intermediate grade.)

Incorporating a tallow content of 2.25 per cent in the grain ration produced increased weight gain, improved feed efficiency, and savings in the cost of producing the gain. Boosting the content to

**The melted animal fats in the beef cattle experiments were sprinkled over the grain ration in the feed trough. The fat was distributed uniformly in the feed by a multipronged fork.**

A relatively simple and inexpensive unit was built to melt the tallow and yellow grease.

A 30-gallon drum was centrally suspended inside a 55-gallon drum. A 2-inch effluent pipe at the bottom led to a shut-off valve in the outer wall of the larger container.

Attached to the outer drum on the side opposite and below the valve level was a 220-volt thermostatically controlled immersion heater. The heating element was placed to extend into the space below the 30-gallon drum.

The space between the drums was sealed except for a small opening at the top to permit the addition of water to the jacket.

To obtain a liquid which could be weighed and mixed into the ration, the fat was preheated for three to four hours at water temperature of 150 degrees (F.). The fats were stabilized with an antioxidant to control rancidity.

The grain was mixed daily and consisted of the following ingredients: dehydrated alfalfa meal, alfalfa hay, oat hay, barley hay, barley, cottonseed meal, safflower meal, MC-47 (sugar-beet liquor), and a mineral mix.

4.5 per cent of the ration showed only a slight improvement in feed efficiency, which was nullified by the increased cost factor.

Otherwise, acceptance by the feed industry is predicated on familiarization with the beneficial aspects of the fats-in-feeds. Continued usage by the beef feeders would substantially depend on periodic changes in prices of fats.

## Feed Lot Traffic

An approximation of the traffic through the feed lots in California indicates the value of beef cattle as consumers of the fat-added feeds. Roughly 1,200,000 head of cattle come to California feed lots during a year for fattening prior to the trip to the slaughterhouse.

Adding 2 per cent fats to the feed ration, some 70,000,000 pounds would be consumed by the cattle, or 7 per cent of the national potential surplus.

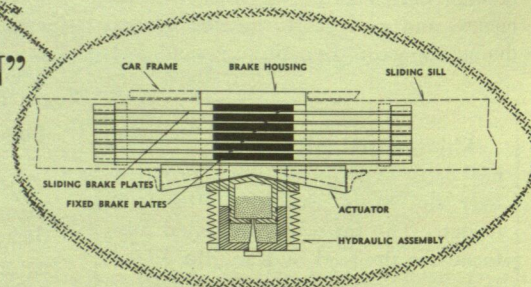


Blood sample is taken to determine fat and vitamin levels in cattle fed tallow and grease rations





## “HYDRACUSHION” FOR BOXCARS



**C**OLLISIONS and many minor bumps and jolts are inherent in the movement of railroad freight cars. Though sometimes noticed only because of the loud noise which accompanies them, these impacts represent hidden costs to railroads, shippers, and insurance firms amounting to millions of dollars annually. The costs are represented by damaged freight, car repairs, and down-time.

Freight cars are drawn, and receive shocks, through the mechanism which couples the train together. A key portion of this device, called the “draft gear,” is designed to cushion against the damaging high-energy impacts.

The Institute and the Southern Pacific Company have recently developed an improved draft gear called a “Hydracushion.” The new safeguard uses hydraulic buffers which have long been employed successfully in many military applications and in aircraft landing gear.

In the Hydracushion system the frame that supports the car and rests on the trucks does not carry the locomotive pulling force to the car behind. Instead, the train load is transmitted from one coupler to the next by a sliding sill that is free to move, under restraint with respect to the car frame and body. The

sliding sill, running from coupler to coupler, is connected at the center of the car to the Hydracushion mechanism which is rigidly suspended from the car frame. A series of horizontal metal brake plates that move with the sliding sill meshes with corresponding brake plates of the Hydracushion device much as the fingers of one hand can be arranged to move back and forth between the fingers of the other. If the car receives an impact, the sill reacts horizontally, the sliding plates moving between the fixed brake plates. Because the sliding and stationary brake plates are held in mesh under pressure, the resulting friction absorbs energy and slows down the sill gradually, thus cushioning the shock to the car and its load.

However, it is important that the friction between the movable and fixed plates be proportioned to the severity of the impact, i.e., to the acceleration created by the impact. If the amount of friction is small for high impact, the rate of energy absorption is too small, and the car and its load will be subjected to excessive acceleration. If the friction is too great at light impacts, the cushioning effect is too small.

This variation of pressure on the plates in accordance with degree of impact is

accomplished by the hydraulic mechanism. Under impact, as the sliding brake plates are forced between the fixed plates, a wedge-shaped member compresses a piston in a reservoir containing oil. This piston in the oil under pressure. The oil can escape—and the pressure be relieved—through a center hole at the bottom. Extending through the hole is a tapered stationary pin which determines the pressure developed in the trapped oil in such a way that the braking effect is made almost proportional to the magnitude of impact as desired.

After impact, longitudinal springs return the sliding sill to the neutral position ready for the next bump.

The Hydracushion system has been tested in use on a standard 50-foot boxcar of the Southern Pacific Company for a year, and results to date indicate excellent performance in the protection of freight from high damage potential.

### JOHN YELLOTT NAMED ASSISTANT DIRECTOR

John I. Yellott, formerly director of research for the Bituminous Coal Research, Inc., Locomotive Development Committee, has joined SRI as an assistant director.

Headquartered at the Mountain States Division in Phoenix, Arizona, he will be



primarily concerned with the development of a solar-energy research program in conjunction with the Association for Applied Solar Energy.

Mr. Yellott started his ten-year association with Bituminous Coal in 1945. During his directorship he originated a program for development of coal preparation, combustion, and ash-separation equipment for the open-cycle coal-burning gas turbine. In furtherance of this

activity he established and supervised combustion research and development programs at Armour Research Foundation, Battelle Memorial Institute, Purdue University, Southern Research Institute, and the Institute of Gas Technology.

Prior to his affiliation with Bituminous Coal, Mr. Yellott was a consultant on atomic power for the Manhattan Project at the University of Chicago from 1943 to 1945. Concurrently he established a basic and applied research program for the American Gas Association and was director of the Institute of Gas Technology.

SRI's new assistant director received his Master of Mechanical Engineering degree in 1933 from Johns Hopkins University. During 12 years in engineering education and industrial research, he taught at the University of Rochester, Stevens Institute of Technology, and Illinois Institute of Technology, being professor and head of the mechanical engineering department at the latter institution.

Mr. Yellott holds a number of U.S. and foreign patents on inventions ranging from supersonic sound generators to coal pulverizers and fly-ash separators.

### PROJECT COMPLETED FOR 32 SPONSORS

The Institute has recently concluded a project for Aeronautical Radio, Inc., a nonprofit corporation owned by the joint Airlines Electronic Engineering Committee. Though small in total research effort the project, concerned with the development of a new automatic radio direction finder for civil airlines, has wide interest because of the extraordinary breadth of its sponsorship.

A total of 32 separate sponsors, including 20 U.S. airlines, 6 foreign-flag airlines, 4 U.S. airframe manufacturers, and a British and Australian manufacturer of electronic equipment contributed to the support of the program.



## Tenth Associates Day

The Geneva "Atoms for Peace" conference and recent developments in particle technology, machine bookkeeping of bank checking accounts and high-temperature research were covered at SRI's 10th Associates Day program, November 9, at the Hotel Mark Hopkins in San Francisco. Attending the day-long meeting were about 500 representatives of the 113 associate companies and guests.

Principal speakers were George William Dowrie, professor of finance emeritus, Stanford Graduate School of Business; Arthur D. Bragg, manager of the General Electric Company, Pacific District, Apparatus Sales Division; Reese H. Taylor, president of the Union Oil Company of California; and Clifford F. Hood, president of United States Steel Corporation.

Excerpts of Mr. Hood's talk, "Knocking on the Door of Opportunity," follow:

"These past 50 years or so truly belong to science and research.

"Fifty years ago, less than a handful of business firms maintained research laboratories. Today, some 6,000 American companies have their own research facilities. Thousands of other business firms are engaged in technical studies of vast significance utilizing such organizations as Stanford Research Institute. Industry is literally mass-producing progress through an annual expenditure estimated to be around \$2.5 billion.

"We, as a nation, do not possess

greater quantities of raw materials than other lands, for vast deposits of vital minerals lie untapped on other continents. We do not have a greater proportion of manpower, for we represent only 6 per cent of the world's population. We do not have a monopoly on scientific intellect, for achievements of great significance have appeared at various times in various parts of the world.

"What is it, then, that we possess in abundance? First of all, there was established in this nation a political climate and an economic atmosphere through which we enjoyed freedom of opportunity and the right

to expect and gain a reward for our endeavors. Our abundance resulted from a way of life where those who had the desire could be equipped with the necessary mental tools, where more businesses could exist to finance and stimulate rapid applications of inventions and scientific discoveries.

"Research has given our nation's industries a means of adapting mechanical processes to the manufacture of many consumer items. But instead of viewing automatic control mechanisms as new sources of national wealth and well-being, they are being branded in some quarters as deterrents to progress.

"Flagrant misunderstandings of our economic system have spread over the land like a great blight. I am sure that all of you have been wondering what the answer might be. It is imperative that some means be found to adhere to the



fundamental principles upon which our government and our economy were originally based.

"We see evidence of many organizations, long dedicated to the perpetuation of freedom, now beginning to approach this task with logic and careful planning. Another encouraging sign resides at Stanford Research Institute. Here economic research has been placed on a par with research in other sciences. Many of the Institute's projects encompass research into the economic aspects of a problem which are coincidental with studies of a mechanical, physical, or chemical nature. And the Institute practices what it preaches. It pays its own way.

"Our industrial leaders, moreover, are beginning to voice convictions in this area, and I suspect that this may become a prime mover in getting us back on solid ground. I refer specifically to a statement made earlier this year by Roger Blough, chairman of United States Steel. He said that the ability of 'research in aiding in the leveling out of the dips and abysses of our national economy is little recognized and far from understood or appreciated.'

"I can assure you that our chairman is not advocating anything like planned economy. Rather I feel that he is interested primarily in putting more planning into our individual company approach to economic matters, and in recognizing the potency of research and the products of research in reducing our economic hills and valleys.

"Significantly, a short item contained in the 1954 Annual Report of the Stanford Research Institute seemed to indicate the still untapped resources of research in leveling out the dips in our national economy . . . a project in the public interest for the San Carlos Apache Indians.

"Indians are provided by our government with land and certain services rendered by the Bureau of Indian Affairs. *They do not receive financial aid, but*

*must develop their own means of income.* Those living on the San Carlos reservation had seen their opportunities for financial stability diminish year by year. They knew that prompt action was necessary if they were to keep their opportunities open. They were eager to know how they could best utilize their land resources and their personal abilities.

### Tribe's Aptitudes

"They turned to research. They asked this Institute to study their problem and help plan their course of action in the years ahead. The team assigned to the project consisted of an economist, a geologist, a mining engineer, an agriculturist, a lumber expert, an anthropologist, a chemical engineer, and a social psychologist. They studied the land, its mineral deposits, forests, and grazing areas. They surveyed the members of the tribe to determine their skills and aptitudes. They considered markets, both present and future, as well as costs, relative prices, distribution, and other factors.

**A limited number of copies of the proceedings of SRI's 10th Associates Day are available to BULLETIN readers who apply to the Public Relations Department, Menlo Park, California.**

"It seemed to me, as I contemplated this study, that the Institute has opened up a vast new field of research into problems that involve economic, technical, and human considerations. I felt also that it could well have its parallels in matters even greater in scope. Certainly this study aided the Apaches, and perhaps the same solution lies in adapting this approach on an enlarged scale which eventually might envision national problems.

"Research may be our best hope. But first, we must keep the opportunities



open for business to function properly. We began our history as the one best hope for the salvation of freedom in a world that was locked in the unholy grasp of tyranny. This task has not changed in 200 years. It has only become more difficult to accomplish.

### Capital Outlays

"Research in this nation represents considerable capital outlays in laboratory facilities and their maintenance. An immeasurable investment resides in the creative people who staff these facilities and apply their knowledge and abstract approach to research problems. The conclusion of a successful research project, in turn, frequently requires additional heavy expenditures to place a new product on the market, to alter operating procedures, and even, in many instances, to launch a new business or industry. Restrict the sources of this capital, and research is likewise restricted. Eliminate the opportunities for normal, balanced growth in a nation, and the need, the value, and the potential of scientific research are eliminated as well."

### CHARLES BLACK TAKES BUSINESS MANAGER POST

Charles A. Black has assumed new duties as manager of business operations of SRI, succeeding George R. Herbert, now executive associate director.



Formerly assistant manager of business operations, Mr. Black came to the Institute in 1954

following service as a Navy lieutenant commander during the Korean action.

He has held executive positions with Castle and Cooke, Ltd., and Hawaiian Pineapple Co., Ltd., in Hawaii.

### NEW PHYSICAL SCIENCES SECTIONS ESTABLISHED

Two new operational sections have been established within the Physical Sciences Division to broaden the services of the Institute.

A Chemical Physics Department has been set up under the chairmanship of Dr. Clinton M. Kelley, formerly a member of the Engineering Division. Included in this department will be projects relating to electrical and optical materials such as semiconductors, dielectrics, and physical electronics. Dr. Marjorie W. Evans and Dr. Henry Wise will direct research in burning, detonation, explosions, and other aspects of combustion physics. Activities will also be carried on in high-temperature fused salts and applied mathematics in the new division.

Hiroshi Nagano, International Fellow from Japan, will work with the photoconductor project group.

A separate Metallurgy Section has been established within the Chemistry Department under the management of Rudolf H. Thielemann. The personnel in this section formerly were members of the Chemical and Metallurgical Engineering Section.

Mr. Black's scope of duties will encompass accounting, contract administration, purchasing, personnel services, and security.

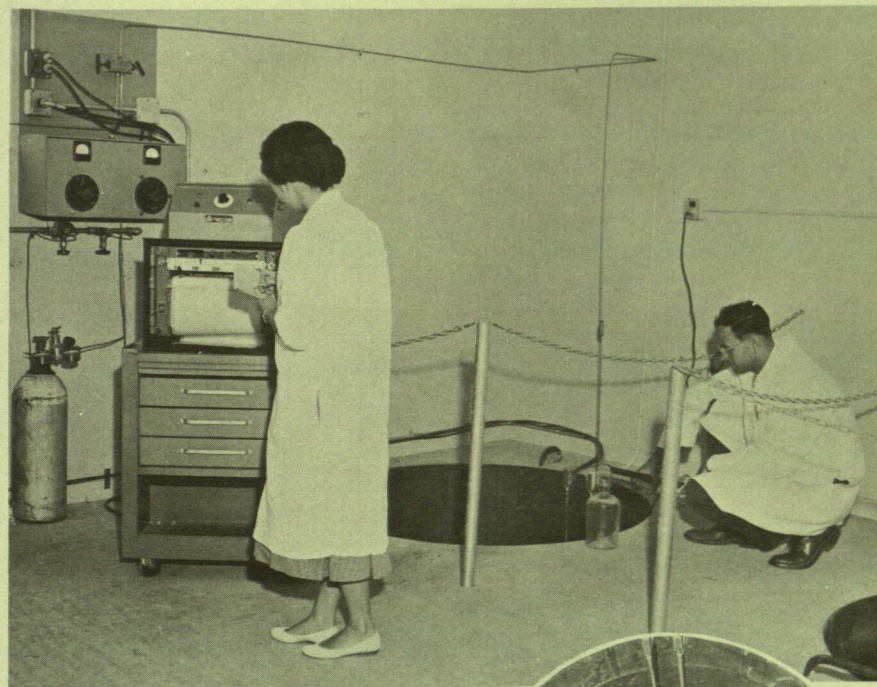
### CALENDAR OF EVENTS

**January 30-31**  
**Industrial Economics**  
**Conference**

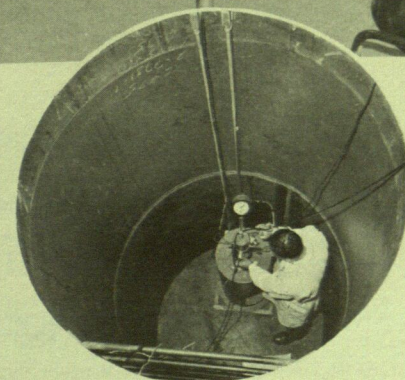
Statler Hotel  
Los Angeles

**April 4**  
**Social Science Seminar**

Mark Hopkins Hotel  
San Francisco



### ORGANIC HIGH PRESSURE RESEARCH LABORATORY



Many reactions in organic chemistry must be carried out under high pressures. To continue research on oxidation of hydrocarbons, polymerizations, catalytic hydrogenations, and other reactions which necessitate moderate to high pressures, the Institute has established a special Organic High Pressure Research Laboratory.

Outstanding features of the new facility are two sunken steel caissons ten feet deep and five feet in diameter which protect chemists and equipment from possible explosive reactions. One of the holes contains a magnetically stirred

autoclave and the other a rocking-bomb assembly.

Controls and instrumentation are mounted outside of the caissons and steel lids can be placed over the holes in extremely hazardous experiments. An exhaust fan is provided to evacuate toxic vapors.

In the laboratory are other rocker-bombs for lower pressure, nonhazardous reactions.



## **Staff writings**

The Institute's Public Relations Office has the following new listings available to BULLETIN readers who apply by letter:

**"Tapping the Energy Sources . . . a Wide Open Field for Chemical Engineers,"** by Merritt L. Kastens, assistant director; reprinted from *Chemical Engineering*, November 1955.

Two addresses by Dr. Bertrand Klass, manager of applied social science research: **"Evaluating the Effectiveness of Advertising: A Problem Orientation,"** presented at the Minnesota Chapter of the American Marketing Association, Minneapolis, Minnesota, October 13, 1955; **"Motivation and the Retail Food Business,"** given at the 56th annual convention of the California Grocers Association at Coronado, California, September 21, 1955.

**"Progress Is a Matter of Planning,"** an address by Paul J. Lovewell, assistant director of economics research, before the 53rd annual convention of the National Lime Association, Del Monte Lodge, Pebble Beach, California.

**"Data Processing Systems: How They Function,"** by Dr. Jerre D. Noe, assistant director of engineering research; reprinted from *Control Engineering*, October 1955.

**"A Practical Program for Fighting Corrosion in Fabrication Processes,"** by Emo D. Porro, engineering assistant to the director; reprinted from *Pacific Factory*, October 1955.

**"An Inventory of Automobile Gases,"** by Dale H. Hutchison, assistant to the director of physical sciences research, and Francis R. Holden, senior physical chemist; reprinted from *The Journal of the Air Pollution Control Association*, August 1955.

**"Effects of Attenuating Materials on Detonation Induction Distances in Gases,"** by Dr. Marjorie W. Evans, senior physical chemist, Frank I. Given, research engineer, and William E. Richeson, Jr., assistant engineer; reprinted from *Journal of Applied Physics*, September 1955.

**"A Single Quartz Crystal Point Focusing X-Ray Monochromator,"** a paper presented by Dr. Dwight Berreman, physicist, to the National Academy of Sciences, California Institute of Technology, November 3, 1955.

**"Blocking Oscillator Transformer Design,"** by Dr. P. Roger Gillette, group head, magnetic components and circuits group, and Keith W. Henderson and Kazu Oshima, research engineers.

Also available:

**"Research Costs,"** a summary report on the third research management tour of four San Francisco Bay Area host companies' facilities.

The following paid publications are available:

**"Proceedings of the Second Annual Western Area Development Conference,"** held September 8-9, 1955, Portland, Oregon; 104 pages, illustrated; \$4.00.

**"Atomic Energy—The New Industrial Frontier,"** a forum report from a meeting held under the joint auspices of the Atomic Industrial Forum, Inc., and SRI, April 4-5, 1955, San Francisco; 254 pages, illustrated; \$5.00.