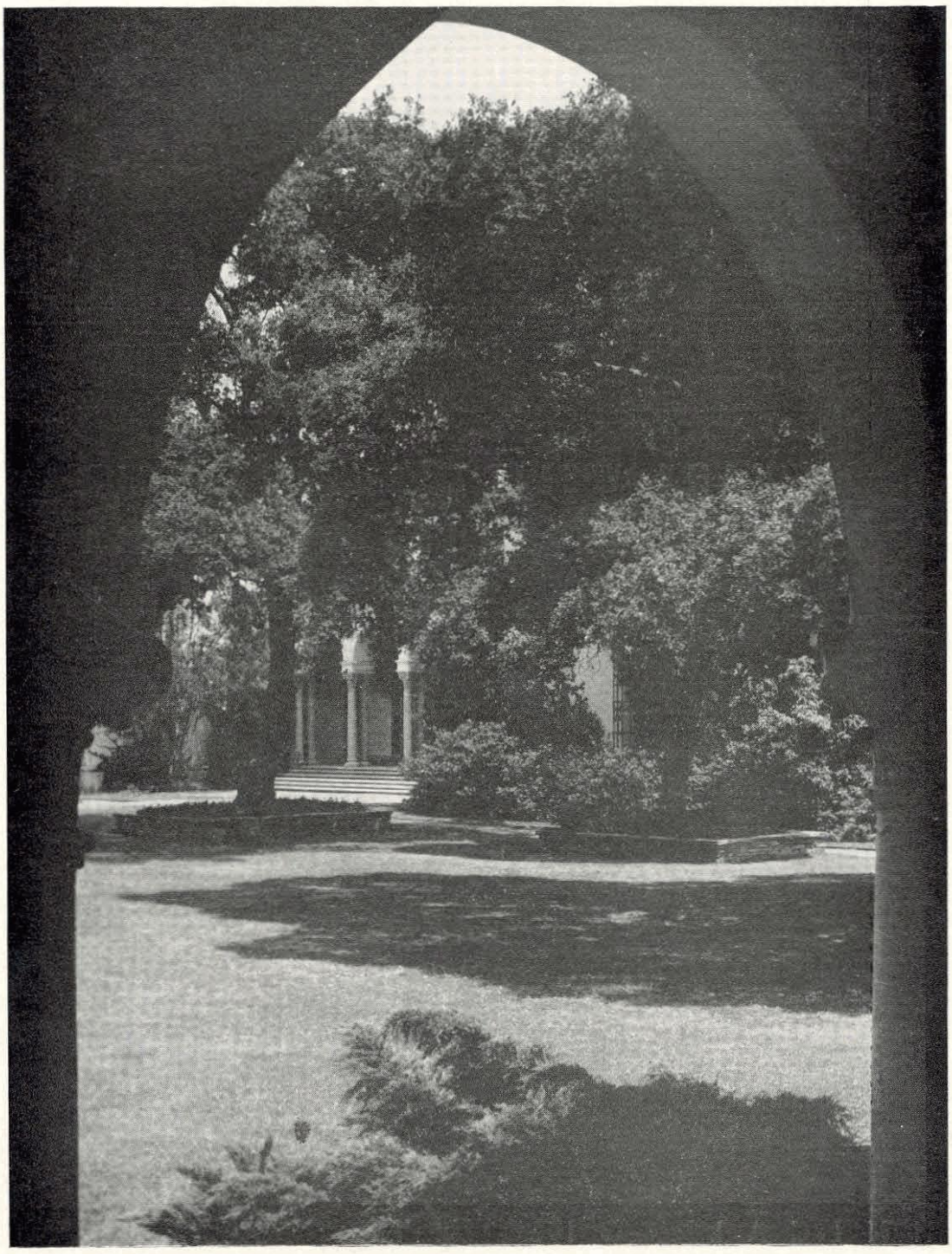
ALUMNI REVIEW

CALIFORNIA INSTITUTE OF TECHNOLOGY



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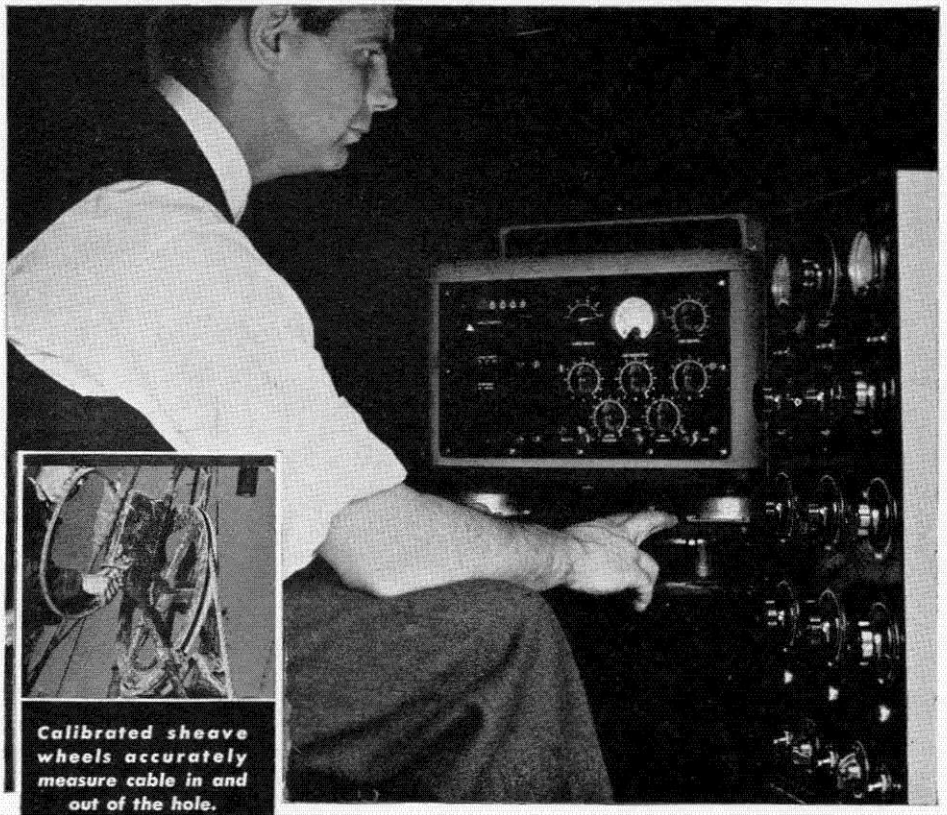
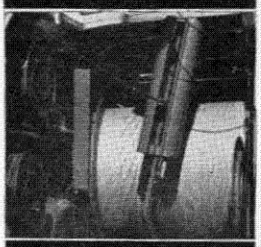
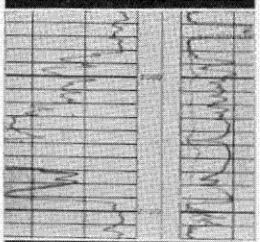


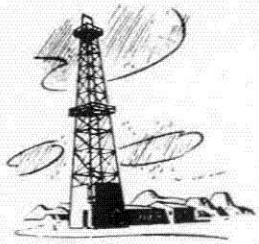
Calibrated sheave wheels accurately measure cable in and out of the hole.



15,000 feet of five-conductor cable enables Electrolog to reach the bottom of any hole drilled.



Electrolog Multicurve Records show Natural Potential, Shallow and Deep Resistivity of all formations.



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ALUMNI REVIEW

ALUMNI ASSOCIATION, INC.
CALIFORNIA INSTITUTE OF TECHNOLOGY

VOL. 3, NO. 4 PASADENA, CALIFORNIA JUNE, 1940

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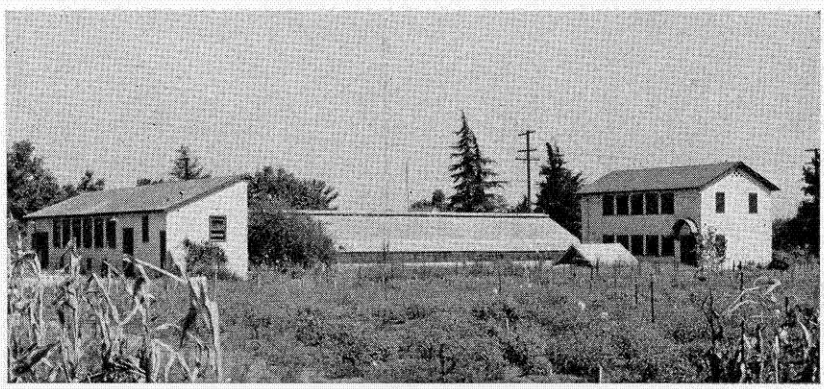


EXPERIMENTAL STATION OF THE DIVISION OF BIOLOGY

PRESIDENT'S MESSAGE

IN BRINGING to a close another Alumni year, we see in retrospect continued growth of our Alumni Association, both in numbers and in activities. Our membership is now 1,035, including life members—the largest in our history. The year has produced numerous dinner meetings with outstanding speakers, a widely-acclaimed dance, an amplified Stag and Field Day, and a very successful Seminar Week-end program, attended by over 400. The Alumni Review has been enlarged, and our Placement Service has secured jobs for a large number of Tech men.

Throughout the year, it has been the endeavor of our Association to hold out a helping hand to the student body and to establish closer ties with the men on the campus. Encouragement for intercollegiate sports has been given, as evidenced by the Interhouse Varsity Competition trophy presented by the Association, and by the new Baseball Trophy which was made possible by contributions of individual alumni. In addition, we have initiated a program which will be carried forward next year, endeavoring to be of direct help to the student houses and to the students.

The Institute, as ever, has been one of our best friends. This year an Alumni Relations Committee of the Faculty was appointed, which has been most helpful in our contacts with our alma mater. On behalf of the Institute personnel, we have found a uniform interest in our affairs and a degree of cooperation which could hardly have been exceeded.

We are proud to turn over to next year's Board a showing of a healthy financial condition, some new plans for making membership even more attractive next year, and, in general, an Alumni Association which prides itself on doing more for its members than any other non-subsidized organization in the country.

For all of our Board members and the heads of our various committees, your President has the highest of praise. They have worked together in perfect harmony and each has done well the task allotted him.

Next year's Board of Directors will contain men of exceptional ability and experience and we look forward with confidence to the future.

Clarence F. Kiech.

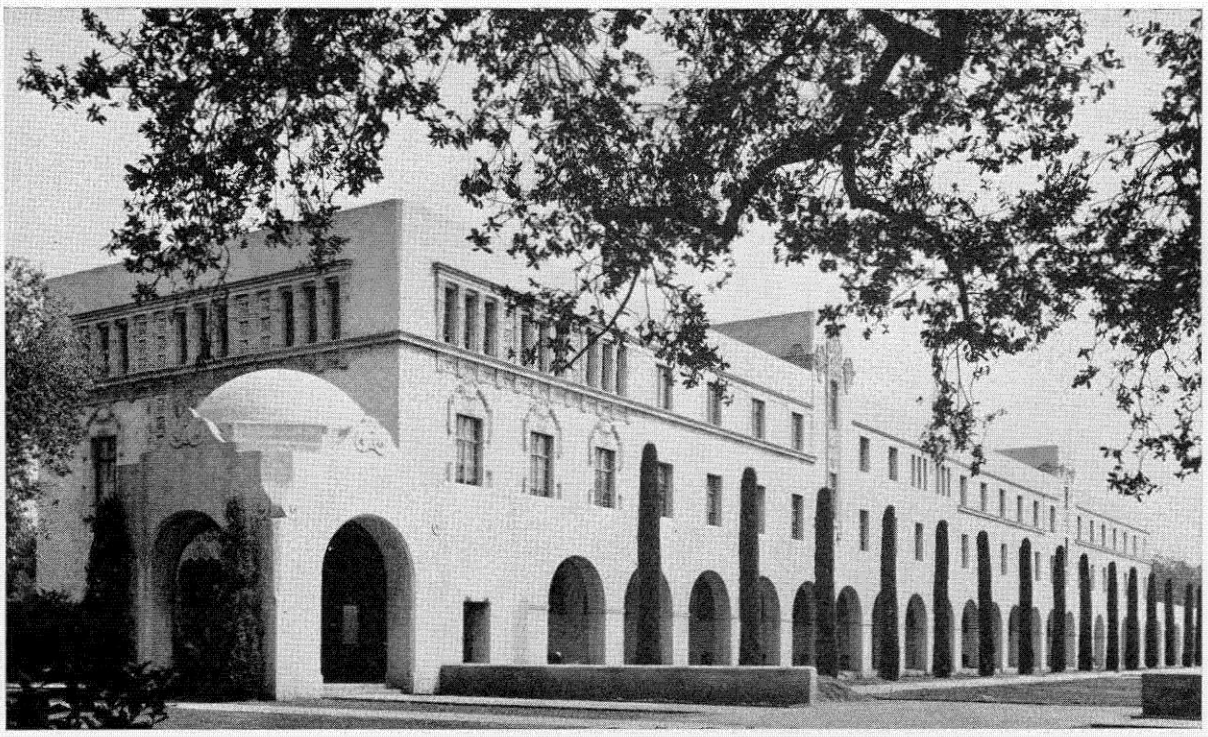
FORTHCOMING EVENTS *

San Francisco Chapter—Every Mon. Noon Fraternity Club in Palace Hotel.

New York Chapter - - - June 7, 1940
Western Universities Club, New York City. Dinner Meeting and election of officers.

C.I.T. Commencement - - June 7, 1940

Annual Meeting and Homecoming June 7th Dinner meeting at the Athaneum Honoring Classes of 1915, 1920, 1925, 1930 and 1935.



THE WILLIAM G. KERCKHOFF LABORATORIES OF THE BIOLOGICAL SCIENCES

"My! How Handy!"

"A pump right in the kitchen! What'll they think of next? You're a lucky woman, Josephine."

LUCKY? Yes—compared with toting heavy pails of water from an outside well. But if Josephine was lucky, what about her granddaughter of today, with her modern electrified kitchen?

With electric lights, granddaughter doesn't have to fill and clean lamps. With her electric refrigerator, she doesn't have to keep the butter and milk in the cellar in warm weather. Her electric cleaner makes it unnecessary to tear up the carpets every spring and lug them out and beat them. With her electric range, she doesn't have to cook over a hot stove. And the furnace keeps the house at the right temperature without her going near the cellar.

Even if electricity's contributions to better living had stopped here, we'd still recognize it as one of the greatest benefits of our century. But electricity goes much further. In every branch of industry it helps to make manufactured articles available at such low prices and in such quantity and variety that more millions of people can enjoy them.

For more than 60 years General Electric scientists, engineers, and workmen have been making electricity more useful—creating for all of us hundreds of comforts unknown to any former generation. Their efforts today are producing More Goods for More People at Less Cost.

G-E research and engineering have saved the public from ten to one hundred dollars for every dollar they have earned for General Electric

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BIOLOGICAL ENGINEERING AND THE BETTER LIFE — MORE OR LESS

HENRY M. BORSOOK
Professor of Biochemistry

It is a commonplace that engineering — mechanical, electrical and chemical — has changed our world. These changes have consisted essentially in the breaking down of the spatial and temporal barriers which confined our forefathers, of providing us with an enormously greater diversity of materials and of many more possibilities of diversion and distraction. Within our homes we can turn night into day, summer into winter, talk and see across continents.

A great invention induces disturbances in the established balance between ourselves and time, space and materials. In a successful society the reaction to this disturbance is the quick attainment of a new steady state in which we are better off; that is, we obtain more happiness than misery from the new invention. Walter Lippmann after a visit to the New York World's Fair wrote:

> "The human race is a collection of the most marvellous, ingenious and engaging idiots that ever got possession of a noble planet."

The fantastic facility of transport and communication we possess today should have knit the world into more and more of an organized unit. Someone with his head in the nineteenth century wrote that:

> "the provision of facilities for the free and prompt interchange of ideas will slowly but surely destroy those misunderstandings between men and nations upon which conflicts are built."

It would be flogging a dead horse to set out in detail the course of the World War which has been raging with continually increasing intensity since 1932. It may not be utterly futile yet to point out that within the United States barriers to trade between the states are now being wilfully multiplied.

Biological inventions have been, I think, even more important than those based on chemistry and physics. An important biological invention can go much deeper; it can affect our conventions regarding "right" and "wrong"; it may change one of the taboos which give society its character.

A biological invention is a change which disturbs the relations between human beings and plants and animals or among human beings themselves. Everyday examples are the domestication of animals, plants and fungi (for fermented liquors), the manufacture and wide use of bactericidal agents, the artificial regulation of the human birth rate, the manufacture of food materials, sex hormones, vitamins, textiles and dyes instead of growing them, the use of caffeine, alcohol and tobacco.

There is the same implication in biological as in the other forms of engineering that Nature's uneducated biological ways are not perfect. We can improve on her. We now have more desirable plants and animals as a result of crossing and breeding; better nutrition, hygiene and preventive medicine have made us taller, healthier and longer lived. Immunity to mortal disease is sold in bottles. Someday let us hope we may be able to induce immunity against the neurosis of original sin.

The great advances in biological research have had an additional effect which comparable advances in chemistry and physics have not had; they have repelled superstition and lead us toward rational, if deflated, views of ourselves. Darwin demonstrated man's proper place in nature; the physiologists and psychologists are removing illusions regarding the mystic wellsprings of our emotions. It will be interesting to see what the teachers of ethics and morality make of such facts as that the maternal instinct depends on the presence in the blood of a hormone (a protein) secreted by the anterior pituitary gland.

Present biological engineering may be subdivided into three classes: the improvement of physical health and the prolongation of life; the provision of better, more abundant and varied food; and the discovery of the causes of unhappiness and how to reduce its incidence.

PROGRESS OF MEDICINE

The Progress of Medicine has had as deep an effect on the Occidental world as the Industrial Revolution. If African sleeping sickness could be eradicated it would be the equivalent to the discovery of a new continent, so large would be the new territory opened to human habitation. Four hundred years ago most human beings died in childhood. The infantile death rate in English slums today is one one-third of what it was in the English royal family in the Middle Ages. In the last thirty years alone the expectation of life has been increased by more than ten years. The students in American colleges today are one to two inches taller than thirty years ago. Animal experiments indicate that an increase in size obtained through improved nutrition is accompanied by improved vigor and longer life.

The most important medical advance, so far, in this century has been in the field of nutrition. More than a hundred million human beings are crippled with diseases which we now know to be nutritional deficiency diseases.

One of the latest findings in nutritional studies is that health is more than the absence of disease which shows itself in striking signs and symptoms: For example, three to five times as much of the vitamin B complex is required for satisfactory gastro-intestinal function as for the prevention of beriberi. When good health is used as a criterion about half the population of England, it was found, is malnourished. This is one of the reasons

The library in memory of William G. Kerckhoff in the building of the biological laboratories.

that an incompetent but well fed governing class can hold on to office in that country. A nutrition survey in Pasadena indicated, and the findings here are probably typical if not better than for the country as a whole, that nearly half our population is obtaining insufficient vitamin A and one-third insufficient calcium and vitamin B. Nearly half our children under five show some of the stigmata of rickets, although vitamin D, which cures and prevents this disease, was discovered more than twenty years ago. It is now quite cheap and easily available.

The English survey showed that as income increases disease and the death rate (among the young) decrease, children grow better and taller, adult stature is greater and adult health is better. Improvement of the diet of the low income groups is accompanied by improvement in their health and growth, and their mental attitude approximates that of the higher income groups.

In order to give a child born in a poor family the same chance of good health and physique as in a well-to-do family it would be necessary, according to Orr, to increase by only twelve to twenty-five per cent the consumption of milk, eggs, butter, fruit, vegetables and meat. It could be done more cheaply by the distribution of synthetic vitamins, concentrates and mineral salts.

There are some items in the red in this section of the ledger in addition to the consequences of negligence and lost opportunities. One is that the population as a whole is getting too old. There are now relatively more old and fewer young people than a generation ago. Medical discoveries and preventive medicine have prolonged life and health; the spread of contraceptive practice has reduced the size of families. This reduction is not equally distributed. There are more children in the poorest classes. Inevitably these children are less well educated and in general less fit. This population trend would be rational in a totalitarian state; for democracy it is suicidal. The alternative is, of course, for democracy to see to it that the children of the poor are as well fed, and given equal opportunity for development, as the well-to-do.

The unprecedented rise in the European population at the end of the nineteenth century was necessarily accompanied by a similar increase in the demand for meat and cereals. Agriculture became in vast regions not a way of life but an industry for profit. With tractors and combines the soil was opened to the forces of wind and rain until it was blown away. The story of soil erosion in America is being repeated now in the native communities of Africa and in India.

Society rightly applauds a Pasteur, a Koch, a Banting, or a Minot. Their discoveries are important for the health of the individual and they prolong his life. For the continuance of a healthy society there should have been some intelligent protection against the social unbalance which arises from the uncontrolled operation of the forces loosed by scientific discoveries. Medical discoveries are not different from others in their potentialities for causing social trouble.

Turning now to the second category of biological inventions, the biologist, the chemist and the mechanic have taught us to grow more food on the same amount of land with less labor. In 1913 the world consumption of fixed nitrogen was about 540,000 tons, of which the Chilean deposits supplied 477,000

tons. In 1934 the total was 1,500,000 tons, of which 140,000 tons came from Chile. The use of tractors, combines, new and better varieties of plants (for example, Marquis and Garnet wheat which can be grown in the Arctic circle), are the salient features of the best agricultural technique up to about 1930.

These were the first steps of a toddling infant compared with strides which could be made with the discoveries made in the next decade. The Russians discovered that by a judicious preliminary freezing the subsequent growth of a number of seeds can be greatly accelerated. Plant hormones (rather simple substances made synthetically and now commercially available) added to the soil with the water or mixed in powder form with the seeds before sowing increase significantly the size of common crops.

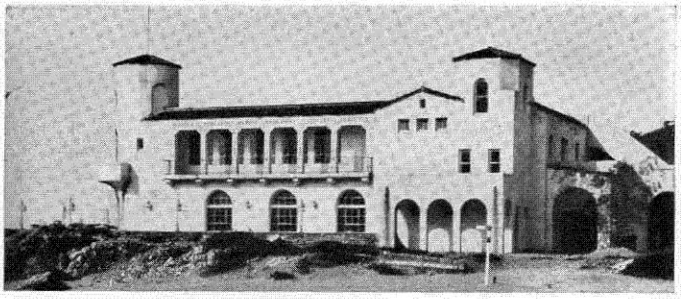
SOIL-LESS PLANT GROWTH

The soil-less growth of plants for the most part is still in the laboratory stage. But it need not be long before a city could grow much of its food, probably all of its fruit and vegetables, on its roofs. Now tomatoes are grown for market in tanks containing a salt solution of known and controlled composition. By controlling the climate (temperature and humidity), the CO_2 tension, the spectrum of the light, by adding hormones and changing the salt composition, we can be freed of the thralldom of the seasons and of the limitations of uncontrolled natural conditions.

The organic chemists of the last half of the nineteenth century took the manufacture of dyes away from the field to the factory. The chemists of this century are doing the same with our food, textiles and fabricating materials. Seven vitamins are now more cheaply synthesized in factories than grown in the field. Sex hormones are made from extracts of soy bean. Will the history of wheat growing run the same course as that of the Indian indigo dye agriculture? The handwriting is on the wall for our large-scale commercial growth of cotton, rubber and silk.

The forms of applied biology discussed so far take no account of the mental and emotional condition of man. It has been assumed that less work, more comfort and diversion have made him happier. Have they? Half the hospital beds in the United States are occupied by mental patients. Prolonged emotional tension, conscious and subconscious, is one of the frequent causes of such common organic diseases as essential hypertension and peptic ulcer. Psychiatrists, Christian Scientists and faith healers of many dogmas are now as numerous as practitioners of any other branch of the healing professions.

The advance in neurology and psychiatry has been less than in any other division of medicine. Some promising leads have been opened up in the last few years. Ten per cent of the inmates of our mental hospitals are pellagrins. Pellagra is now a curable vitamin deficiency disease. The "hill-billy" mentality, which is chronic pellagra, is more difficult to get at. The shock treatment for schizophrenia with insulin, metrazol or anoxia



William G. Kerckhoff Marine Laboratory of the Division of Biology at Corona del Mar.

has returned to a useful if not quite normal life many individuals who were apparently hopelessly insane.

It is possible now to produce neuroses in experimental animals. In a susceptible animal a neurosis is induced by forcing on it repeatedly a problem which it must solve and yet cannot. One of the important attending conditions in the production of this neurosis is that the animal's freedom of movement must be restricted. It is interesting in this connection that every social order in Europe has derived the sanction of its authority from the promise it offered of freedom — religious, intellectual, political, or economic — and equality, if not in this world in the next. The anthropologists may be able to tell us to what extent congregation in cities predisposes one to a neurotic breakdown.

Some years ago the Bishop of Birmingham (England) called for a ten year holiday in scientific research. Presumably he was in favor of paying scientists for not doing research. His argument was that no one can keep informed of all the new discoveries and that too many discoveries exert an unhealthy disturbing influence. We need time to catch up and take stock.

There are some good points in the Bishop of Birmingham's case. Harm has come from the failure of social and political development to keep abreast of technological developments. But what is needed is not a holiday in scientific research, but more and better social and political inventions. We now accept the use of checks for currency as a commonplace; it was a great invention. Familiar inventions of our day are the T.V.A., the Food-Stamps Plan, the British Broadcasting Corporation.

Sir William Bragg has complained of the exclusion of the scientist from the council chamber, that he is kept in the anteroom and is called in only as a technical expert, that he has no voice in the framing of policy. Most of us will agree with Bragg. But it is well for the scientist as well as the politician not to forget that although the natural sciences have created the opportunity for a more abundant and better life, the advantageous use of this opportunity for the benefit of the whole of society is as much a matter of mind as of materials and forces. When the philosopher is king it will be well if among his ministers are a biologist and psychologist as well as physicists and chemists. The psychologist especially can be a force for health and happiness in a good society or he can be like Mr. Goebbels. The psychologist, as any scientist, is useful in any constellation of cultural taboos.

CALTECH'S NEW INDUSTRIAL RELATIONS SECTION

ARTHUR H. YOUNG
Visiting Lecturer on Industrial Relations

With the beginning of the current academic year, the Institute included in its curriculum, for the first time, a course in labor problems open as an elective to seniors and graduate students.

The principal reason for this expansion is the fact that to a steadily increasing extent graduates of the Institute, in its various engineering departments, have been moving into positions of general administrative responsibility. And as industry is now demonstrating a definite trend toward the selection of scientifically-trained men for such administrative posts, the young engineer of today is likely to find himself the business executive of tomorrow. He should fit himself to be something more than an engineer.

Accordingly, it has become important that graduates of the Institute be made familiar with the fundamental concepts and the developing technique of personnel administration, collective bargaining, and the constant interplay of those social, economic and political forces which operate within the area of human relationships in industry. As the whole problem of establishing and maintaining "right" human relationships in industry has grown enormously in significance during recent years, the need for appropriate academic training in this field has become clearly manifest. Virtually all the engineering graduates of the California Institute go into positions where they are almost immediately brought into contact with this problem of employer-employee relationship in some of its manifold phases.

Labor relations have increasingly become the subject of state and federal regulation and the effects of recent legislative acts, to mention only the National Labor Relations Act, the Fair Labor Standards Act, and the Social Security Act, have made the subject one of prime importance from a social and a political standpoint. In other words, the whole matter of industrial labor relations has moved to a position of such importance as to merit, if not actually require, inclusion in the Institute curriculum.

SIXTH COLLEGE

The California Institute of Technology is the sixth of the North American universities and colleges to create a specialized Industrial Relations Section. Some fifteen years ago Princeton University organized such a section along relatively modest lines which have since expanded. Within the past five years Massachusetts Institute of Technology, University of Michigan, Stanford University and Queen's University, Toronto, have likewise organized an Industrial Relations Section. Wisconsin University plans the inclusion of such a course next year and doubtless other universities will in a similar manner, adopt courses for a specialized study of this very signicant problem.

The inauguration of the Industrial Relations Section at Caltech was the result of a recommendation following a special study by the following committee: Dr. R. A. Millikan, Dr. Edwin F. Gay, Mr. William C. McDuffie, Dr. Max Mason, Mr. Arthur H. Young, and Dr. William B. Munro, Chairman.

The work during the current year has embraced four major activities: the development of the curriculum; the building up of a library; the development of contacts with major industrial executives, and industrial relations technicians in the Los Angeles area; and the undertaking of research and field studies in labor problems.

The instructional activities of the Industrial Relations Section include, first of all, a general course (listed as Economics 48 a, b, c) which is open to senior undergraduates; this course offers a general introduction to the study of industrial relations, with stress laid on those aspects of the subject most essential to the engineer's understanding of industrial labor.

A further course (listed as Economics 110a, b) which is designed for graduates, is limited to twelve students chosen from the Business Economics Course on the basis of demonstrated interest and ability in the special field of industrial relations. Conducted by the seminar method, it encourages individual investigation of special problems and provides training in research methods and the use of pamphlet material. In addition to these specific courses, occasional lectures on various phases of industrial relations are included in Economics 100, Professor H. N. Gilbert's graduate course in Business Economics.

It will be seen from the foregoing that the courses might well be regarded as adjuncts to a modern engineering course rather than as a specific preparation for the profession of industrial relations management. Instruction during the current year has been in charge of Dr. Dwight L. Palmer, loaned during the first half year through the courtesy of Massachusetts Institute of Technology's Industrial Relations Section, and Dr. Everett D. Hawkins, likewise on leave of absence through the courtesy of Mount Holyoke College, and Mr. Arthur H. Young, who has recently become a resident of California after his retirement from more than thirty years of active service in industrial personnel work. It is expected that prior to the opening of the next academic year, the instructional staff will be reorganized on a permanent basis and a later announcement of the arrangments in this respect will be made on completion thereof.

OUTSIDE LECTURERS

The instructional work of the regular staff members has been supplemented by special lectures of outstanding industrial executives, personnel managers, labor leaders and public officials. Although called Visiting Lecturers as a convenient appellation, these men have not been asked merely to give lectures; the

main purpose of their coming is to afford the students the opportunity to meet them and obtain sidelights on many matters which lecturers would not give.

A special library of materials relating to industrial relations may be regarded as absolutely necessary equipment for the teaching of the subject. The changes in concept and techniques in labor management evolve so rapidly as to make it extremely difficult, if not impossible, to develop adequate textbook material. Reliance must therefore be had on the more useful and timely books in various phases of labor relations, the accumulation of labor and trade periodicals, reports, bulletins and pamphlets published by the federal and state departments of labor, by the International Labour Office, as well as by labor unions, employers' associations, industrial research institutions, and by technical and trade groups.

The library is rapidly collecting a file of collective bargaining contracts which are classified and indexed for ready reference by those who desire to consult them. Included in the library files are such publications as employee rule books, manuals for safety, job analysis studies, employee rating plans, house organs, materials relating to profit sharing, unemployment insurance, thrift and home-owning plans, and special statistical studies furnished by employers. Also included are copies of the constitutions, by-laws, contracts, convention proceedings, labor journals, pamphlets and reports furnished by trade unions in every branch of industry.

All of this material, rapidly growing in volume, is catalogued and cross-indexed to make it quickly and easily accessible, not only to students and research workers but to industrial relations executives, labor leaders, or any others who may be desirous of obtaining first-hand and authoritative information.

DINNER-DISCUSSION

As a means of establishing and maintaining contacts with major industrial executives, a series of dinner-discussion meetings has been inaugurated. To these meetings the Institute invites a nationally known authority on some particular phase of labor problems, which, after the presentation to the invited guests, is subject to frank and thorough discussion. At the first of these meetings, Mr. L. A. Appley of Socony-Vacuum presented the topic, "The Administrative Functions of the Industrial Relations Executive." Subsequently, Dr. Leo Wolman of Columbia University presented the topic, "The Future of Trade Unionism in the United States." In each case the guest list approximated 100 persons and it is expected that the series will be continued as a regular feature of the Section.

Partly as a result of suggestion and aid of the Section, the industrial relations executives and personnel managers in the Los Angeles area have formed an association with approximately 100 members for the discussion of a practical plan of their intimate problems. While the new Association is not directly sponsored by the Institute, it nevertheless provides a valuable organized contact medium which seemingly is proving mutually advantageous to the members of the Association and to the California Institute of Technology.

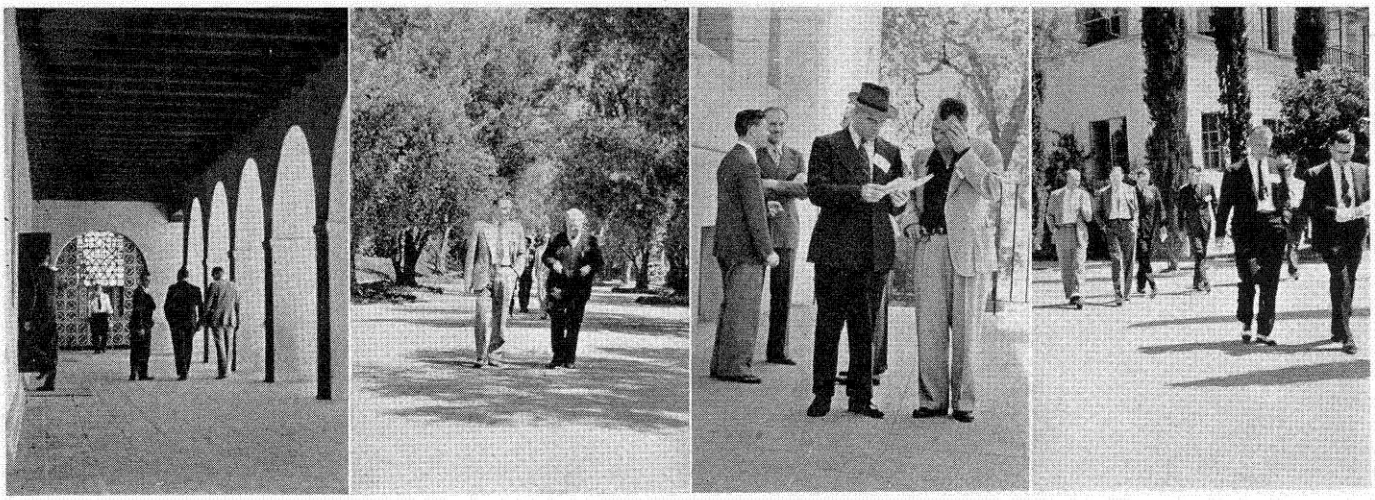
While the giving of instruction, the establishment of contacts and the accumulation of timely material are obviously important activities of the Industrial Relations Section, it may well be that in the long run the research activities and the field studies will prove, by their value, to be the best measure of success in this new enterprise at the Institute. While much pioneer work in research in the field of industrial relations has already been done by eminent scholars, there remain many areas awaiting the approach of well-trained, vitally interested research workers. There are many indications that discoveries in various other branches of the social sciences (economics, political science, history, sociology, psychology, etc.) can be correlated to good advantage with researches in the more restricted field of labor relations.

It is expected that subsequent enlargement of the initial staff of the Section will permit of specialized studies of Southern California's major industries and its economic situation as regards the development of certain industries. The relative racial homogeneity of the industrial population, and the closeness of this region to a pioneer epoch are factors which give the labor relations of this area a distinctive local coloring. The opportunity for realistic research for impartial, trained scholars is one to which the California Institute's interest in scientific fact-finding may well be directed.

POSSIBLE ENLARGEMENT

During the short interval in which the Industrial Relations Section has been functioning, there have been numerous inquiries concerning its availability to business and professional men, as well as to employers of small groups who would like to acquire some knowledge in the field of personnel administration by attending lectures on the subject, or by enrolling in seminars, or even by following a program of reading. Several groups of junior employees in the personnel departments of Los Angeles business concerns have made a definite request for an extension course in personnel administration. While extension work, available to persons engaged in industry, was not contemplated in the original plan of industrial relations work at the California Institute, some such enlargement of the program will be given consideration if there appears to be sufficient demand for it.

Financial support for this new enterprise at the Institute has been provided in part by a generous grant from the Earhart Foundation but in larger part by contributions from some fifty industrial concerns and labor organizations in California. The contributors are widely diversified; their range includes public utilities, oil companies, aircraft manufacturers, building contractors, banks, newspapers, as well as representatives of the steel, cement, automobile, electrical, rubber, textile, hardware and various other industries. These pledges of support, which amount to more than $20,000 per year over a five-year period, have been given without any restrictive conditions whatever. They have all been motivated by the sole purpose of helping the Institute to carry forward, through its new Industrial Relations Section, the activities which have thus briefly been described.



—photos by Schroter '28

SEMINAR WEEK-END, 1940

ANNUAL ALUMNI SEMINAR

A record-breaking April heat wave which sent the Pasadena thermometer over the 94-degree mark apparently only served to boost attendance at the Third Annual Alumni Seminar Week-End held on the campus of the Institute April 13 and 14. Over 100 Alumni and guests were registered in the first hour, and total registration for the two-day conference approximated 500.

Enthusiasm and interest in the events, arranged under the supervision of Chairman Sid Bamberger '33, were about evenly divided between the keynote speeches and the departmental seminars held Saturday afternoon. Of particular interest to Seminar goers were Professor Horace N. Gilbert's discussion of "The Bankruptcy of Europe," Professor Theodore G. Soares' analysis of "Shall America Lead the Way?" and the Industrial Relations Seminar led by Mr. Arthur H. Young and Dr. Everett D. Hawkins.

DINNER DRAWS CROWD

Dinner at the Annandale Golf Club Saturday evening was attended by over 150 alumni and guests, who enjoyed the entertainment provided by strolling Mexican troubadors and a vigorous and enlightening address on "The Contemporary Foreign Policy of the United States" by Dr. Claude A. Buss of the University of Southern California.

Great credit for the success of the Seminar Week-End, which is almost without a duplicate in American colleges and universities, should go to the members of the committee of Alumni who sponsored and supervised this year's meeting, and to the faculty and teaching associates of the Institute for their cooperation in arranging facilities, leading discussions, and preparing addresses.

The general Week-End Committee was composed of Sid Bamberger '33, Chairman, H. Phillips Henderson '26, Jack Shield '27, Carl Anderson '27, and George Rice III '31. The Program Committee comprised Fred Peterson '27, Chairman; Wesley Hertenstein '25, Campus Contacts; William Aultman '27, Introductory Speakers; Mark Serrurier '26, Apparatus; and Karl Hegardt '32, Dinner and Luncheon. Departmental Seminars were organized under the direction of Fred Hough '24, Edward Tuttle '28, Fred Schell '27, Edward Cornelison '25, Mike Brunner '25, and George Schroter '28.

RECORDS MADE

An unusual feature, tried this year for the first time, was the recording of the principle speeches for permanent records and for transmission to distant groups of Alumni who were unable to attend the meeting. These transcriptions have already been presented to Alumni groups in the North and East and pronounced of great interest.

Widespread publicity in Pasadena and Los Angeles newspapers was accorded the Seminar because of the timeliness of many of the technical and general topics discussed. Industrial relations, contemporary economic problems in this country and the world in general, vitamin B_1, power through the disintegration of uranium, and the role of mineral resources in international relations proved especially large space-gainers.

. . . OF INTEREST

BROCKWAY HONORED

The American Chemical Society $1,000 Prize in Pure Chemistry has been awarded for 1940 to Lawrence Olin Brockway, Ph.D. '33, assistant professor of chemistry at the University of Michigan, for his outstanding contributions in the determination of molecular structure by electron diffraction methods. Presentation of the award will take place at the Society's 100th meeting, to be held in Detroit in September; the prize is given annually to a scientist under thirty-five years of age who has shown unusual promise in original research.

Dr. Brockway received his B.S. and M.S. degrees from the University of Nebraska, and was appointed duPont Fellow at the Institute in 1932 after having served as a teaching fellow since 1930. After receiving his Ph.D. in 1933 he was appointed a research fellow from 1933 to 1935, and a senior fellow in research from 1935 to 1937. In 1937-38 he held a fellowship of the Guggenheim Memorial Foundation and worked at the Dyson-Perrins Laboratory at Oxford University.

The official announcement of the prize award stated, "The structures of over 100 inorganic and organic molecules have been determined with an accuracy of 1 per cent in inter-atomic distances and a few degrees in bond angles. The results have been extremely valuable in collating molecular structure with physical and chemical properties of substances. Dr. Brockway's work has been recognized not only by graduate students in this country but by students and investigators from many foreign countries who have come to his laboratories to assist in these studies."

Dr. Brockway is the third Institute chemist to win the coveted award. Dr. Linus Pauling, present head of the chemistry department, won it in 1931; and Dr. E. Bright Wilson, now at Harvard, received it in 1934. At that time the award was known as the Langmuir Prize, but a change in financing resulted in altering the name and raising the age limit from 32 to 35.

ALLSTAR NINE

Three Tech horsehiders, Hank Roese, Bob Myers, and Jim Kemp, were placed on the 1940 All-Conference first nine, and shortstop LeFevre won a spot on the second nine, as a result of their standout play during the season just completed. Roese, who won the catching berth, led the Conference in batting all season; and Jim Kemp captained the Beaver nine, which after a fast start finished only third in the loop standings.

MEMBERSHIP

An early renewal of your Alumni Association membership will enable the incoming Board to better plan the new year's activities.

SWIMMING TEAM SCORES

Cal Tech's brilliant varsity swimming team, undefeated in Conference competition and victorious in the All-Conference meet, climaxed its season by tying the powerful Trojans of U.S.C. in the 1940 Santa Monica invitational open water meet staged in Santa Monica Bay. The Beavers and Trojans each scored 15 points, U.C.L.A. 4, and Oxy 1.

During the season, Bob Merrick set three new Conference records in the 100-yard and 200-yard breaststroke events, Rube Snodgrass proved unbeatable in the diving events, and Vic Sturdevant, Jack Dixon, Jim Harlan, Gordon Woods, and Dick Cox piled up points in other events. The victory over Oxy in the All-Conference meet was the first time the Tigers had been dethroned in ten years.

— IN MEMORIAM —

LOSEY

Captain Robert M. Losey, M.S. '37, became the first American casualty in the recent fighting in Norway, and as far as is known the first graduate to fall in the current European conflict, when he was killed by a bomb splinter near Dombas, Norway, on April 21 while serving as assistant American military attache for air. Captain Losey had been in the trouble zone since February, when he was sent to Helsinki to observe the Russo-Finnish war for the Army Air Service. He was next sent to Sweden and then to Norway when the Germans invaded that country, his principal duty being to assist American officials and civilians to evacuate the fighting area. The day before his death he had been photographed by a newsreel cameraman while aiding Mrs. J. Borden Harriman, American Minister to Norway, in the transfer of documents and personal property.

Captain Losey, who was 31 at the time of his death, graduated from West Point in 1929, and trained at Brooks Field and Kelly Field in Texas. In 1934 he was ordered to the Institute for graduate training in meteorology and aeronautical engineering, and obtained his M.S. degree in 1937. From then until sent to Europe, he was on duty wih the training and operation section of the office of the Chief of Air Corps in Washington.

MacLELLAN

Donald D. MacLellan, Ph.D. '36, and former teaching fellow in geology, died on February 5 in Brisbane, Australia, after a lingering illness. Dr. MacLellan graduated from the Montana School of Mines in 1922, spent a year at Columbia in post-graduate study, and then joined the geological staff of the Anaconda Copper Company for work in South America and in the Salt Lake City office. Before coming to the Institute in 1934, he had been superintendent of the Walker Mine, largest copper mine in California.

MacLellan received his Doctor's degree in June, 1936, with a dissertation on the geology of the East Coachella Tunnels of the Metropolitan Aqueduct. Late that year he went to Manila to serve as chief geologist for the Union Management Company. A year and a half ago he became severely ill and moved to Australia, hoping that the climate would prove beneficial, but failed to regain his health.

PIPER

Lieutenant Clark Neil Piper, U.S.A., who received his Master's degree in Aeronautical Engineering at the Institute in 1939, was killed recently in an airplane crash at Wright Field, Akron, Ohio. Details of the accident are not available.

ALUMNI ACTIVITIES

CANDIDATES

The Board of Directors has nominated four men to fill the vacancies occurring on the Board whom it feels are the most capable men available for carrying on the work of the Alumni Association as shown by their interest and participation in alumni affairs.

Allen W. Dunn, '29, has served as Assistant Treasurer and member of the Finance Committee for the past year. Dunn is on the engineering staff of the Southern California Telephone Company.

Herbert B. Holt, '15, has long played a prominent part in the affairs of the Institute, being a member of the California Institute Associates, and a member of the committee studying the engineering needs of the Institute. Holt is Southern California manager of the Bekins Van and Storage Company.

Alfred W. Knight, '22, has participated actively in many functions of the Association, being a member of several committees doing the essential work. Knight is a patent attorney in Los Angeles.

George Langsner, '31, has taken an active interest in alumni publications, for the past year being Editor of the ALUMNI REVIEW. He is an engineer with the California Division of Highways in Los Angeles.

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SAN DIEGO

Many alumni from San Diego gathered last April sixth for a delightful dinner dance at the Emerald Hills Country Club. The affair was under the chairmanship of *Lee Pratt,* '31, who with his wife decorated the tables with orange and white T's. The dance was very successful, really allowing an opportunity for the older members to become acquainted with the more recent graduates of the Institute.

In the near future the chapter plans to charter a fishing boat for a trip to the Coronado Islands.

O. Franklin Zahn, '30, and *Martin Poggi,* '37, have been instrumental in founding a sub-chapter of the A.S.M.E. in San Diego. They held their first meeting during April with Zahn acting as chairman and Poggi as secretary. An engineer from the Consolidated Aircraft delivered the main address on Hydraulic Controls on Consolidated Planes. *Perry Boothe,* '31, gave a short talk on the Hydraulic Torque Converter used on diesel busses. After the meeting a demonstration was given on one of the busses of the San Diego Electric Railway.

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SAN FRANCISCO

San Francisco alumni have held quite a number of meetings this spring and one of the most enjoyable features on their program are the Monday luncheons at the Fraternity Club Dining Room of the famed Palace Hotel. All alumni who happen to be in San Francisco are most cordially invited to attend.

On March 22 *Larry Henderson,* '25, gave an interesting and instructive talk on "Arc Welding and its Present Uses." Slides were used to illustrate the various processes and applications which play an important part in engineering construction today.

Doug Keech, '26, spoke on "Fire Insurance" which was well received and eliminated a lot of mystery concerning some of these complicated insurance policies. Doug is a special agent for the Republic Insurance Company. This meting was held on April 26 at the Coit Hotel in Oakland with a group of 20 present to heckle Doug with numerous questions concerning his subject.

On May 18 the San Francisco chapter hung up a record for attendance when 73 turned out for the outdoor party at Howard Vesper's lovely home in Oakland. It was ladies' day and most of the fellows brought their wives or sweethearts along to enjoy the fun.

The soft ball game was the main athletic event of the day. The Old Timers played the Youngsters. Those of the class of '26 or before composed the Old Timers and those of the class of '27 or after were the Youngsters. *Paul Scherer,* '18, was umpire and also represented the earliest class present. *John Parker,* '38, was the infant of the day. The Youngsters won 12 to 11.

The ladies entertained themselves during the softball game by playing various games including bridge, ping-pong, badminton, deck tennis, etc. After a fine supper which was served both in the patio and living and dining rooms due to the number present, the film taken during the Seminar week-end was shown and the recorded talk of Prof. Sorensen's was presented.

NEW YORK

The California Tech Club of New York has had several interesting and enjoyable meetings during the spring months.

The annual co-ed party to which wives and/or girl friends were invited was held at the Vivel Restaurant where dancing and entertainment were featured along with the Swedish smorgasbord. *Rea Axline* '31, furnished informal vocal advertisements for the Institute and for dear old Annapolis.

Fourteen members met on April 18 for luncheon with *Dr. Donald Clark* '29, Director of Placements at the Institute, who was in New York on Institute business.

An evening dinner meeting was held on Thursday, May 9th, upon which occasion movies of the campus and sound recordings made at the Institute during the seminar week-end were thoroughly enjoyed. *Chas. F. Thomas* '35, aero engineer with Lockheed Aircraft Corp., who has been in Amsterdam, Holland, and other European centers for the past year arrived from Europe on the Italian Liner, Rex, at about 6 p.m. and after struggling through customs inspection arrived at the meeting and gave the group some interesting comments on what he had seen of recent events in Europe.

ELECTRICAL LOGGING OF OIL WELLS

JOHN C. STICK, JR. '35

Research Engineer

Lane-Wells Company

In recent years the part science has played in the oil industry can best be realized by those who have been fortunate enough to have had a first hand view of them. From the "boom" days of the cable tool, the reckless fever to reach oil sand at any cost, and wide open production, has come, in vigorous contrast, the modern rotary rig with its thoroughly organized drilling and production program.

In the fields of geological and petroleum engineering careful studies of each and every formation traversed by the hole, analysis of structure and fluid content, and correlation with surrounding wells has replaced the careless "high-pressure" drilling methods of the past. Today's methods demand the working out of the subsurface of oil fields with as much care and exactness as in the engineering of a complicated machine. The knowledge gained in these studies has not only greatly improved the total oil recovery of wells but has facilitated in the location and drilling of "wildcat" wells for the discovery of new fields.

The problems brought about by the steadily increasing depth of wells have turned petroleum engineers and geologists wholeheartedly toward every available means of gaining knowledge of the subsurface. Mechanical coring of formations, the long reliable method by which small samples of cores are drilled and brought to the surface for analysis, was no longer infallible. In addition its cost, caused by extreme slowness of drilling, became excessively high when used for complete holes from the surface to the oil producing horizons. The advent of electrical open-hole logging provided just the information so ardently desired. By means of this device, a continuous log of the complete hole is obtained from which all of the data necessary for correlation as well as interpretation of formations is recorded with only one to three hours of time occupying the well. So vital has this service become to all well operators that, in a few short years, electrical logging has grown into an industry whose services are performed on over 95% of all oil wells drilled in the United States.

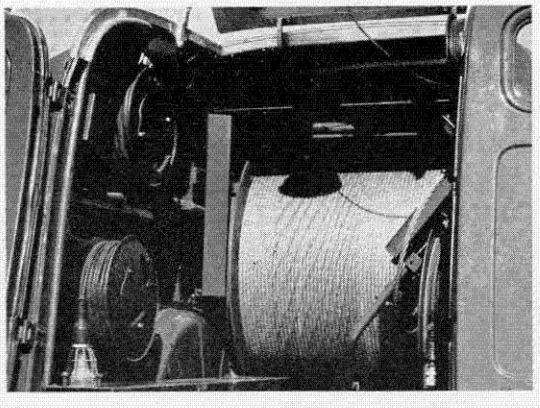


Fig. 1—Hoist truck equipped with 12,000 feet of five conductor cable.

EARLY HISTORY

Even prior to the year 1900 electrical measurements were being investigated as a means of locating conductive minerals or ore bodies lying under the surface of the earth. All such methods were based upon the changes of voltage or current at the earth's surface caused by, and thus indicating, the resistance of different subsurface formations to the passage of electrical current. Oil, having a relatively high electrical resistance, immediately became the object of many surface investigations which were only partially successful because of the depths involved.

It was not until the "twenties" that Conrad and Marcel Schlumberger conceived the idea of running electrical resistance methods in a bore-hole. By passing current from an insulated electrode out into the formation surrounding a bore-hole and picking up the impressed voltage on other suitably spaced electrodes, they were able to read the resistance of the fluid contained in these formations. Early trials were very discouraging from a practical viewpoint. But little by little it was found that false readings caused by measuring formation resistance close to the bore-hole were caused by drilling mud infiltration into the permeable formations. Measurements further back from the bore-hole were developed and comparisons of the shallow and deep values of resistance proved that formations might be closely identified by their electrical characteristics. By the use of these two curves in combination, not only could all sands and dense formations be distinguished from shales, but interpretations could be made to differentiate between the sand formations themselves. For the first time the electrical log could be used to differentiate between the oil sands, and the salt water sands usually associated with them.

NATURAL POTENTIAL

Along with the earliest developments in bore-hole resistance measurements came the discovery of a natural potential or voltage existing in the bore-hole opposite permeable formations such as sands. Immediate investigation into the cause of this voltage proved that it was the result of two phenomena. The first and foremost was that of electro-chemical or battery action between the bore-hole fluid and the natural fluid in the formations. The second cause proved to the result of the bore-hole fluid infiltrating into the permeable formation. Thus the Natural Potential Curve was found to be a valuable indication of the formation fluid content and, to some degree, its relative permeability. The modern electrical log is a compilation of two or more resistance or resistivity curves of different depth of formation pentration and the Natural Potential Curve. A

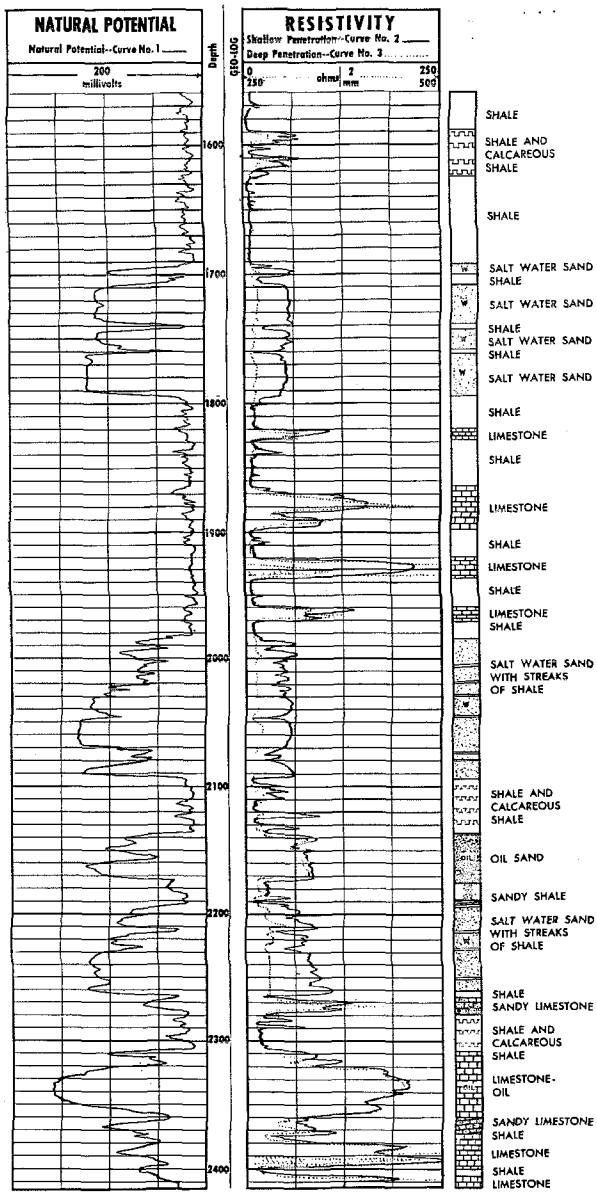


Fig. 2—Typical electrical log showing characteristic formation responses and method of presentation.

typical example, showing the electrical response of many of the most comomn formations and the manner of presentation is illustrated in Figure 2.

MANY USES

The uses of the electrical log are many. From it the geologist or petroleum engineer can determine the exact depth and thickness of all formations. From the depth, thickness, and the characteristic response of key formations correlations may be made to adjacent wells, faults located, and the general structure of whole oil fields worked out. Such extensive studies, now commonplace in all oil fields, have proved invaluable in the spacing of wells and determining drilling and production programs. From the response of all curves in combination, accurate interpretations of the nature of the fluid in the sands are made. The exact extent of the oil producing zones and the location of the undesirable salt water sands can be determined allowing the water to be cleanly shut out of the producing well. Other less important uses include the accurate location of lost or broken tools, lost strings of casing, and checking of the bottom of the casing set in the hole. The electrical log has not entirely replaced the older and more costly mechanical coring methods. It has, however, completely supplanted the older method for the long stretches above the oil horizons, and is carefully studied in comparison with the cores from producing horizons. In proven fields it often entirely replaces mechanical coring. Numerous instances could be recited wherein new producing zones, missed oil sands, or unexpected oil sands have been picked up by means of the electrical log often resulting in the discovery of new fields.

DESIGN PROBLEMS

The design and operation of the mechanical and electrical equipment necessary to carry on extensive electrical logging operations has presented many problems. Advanced drilling practices have resulted in greater average as well as extreme well depths. In 1939 the unheard of depth of 15,004 feet was attained and 12,000 to 13,000 foot wells are, at present, not at all uncommon. The development of electrical logging cables to withstand the high fluid pressures and temperatures encountered at such depths has required years of experimentation and involved great expense.*

To accommodate the higher recording speeds, as well as to eliminate the "human errors" involved in the extensively used but older hand-traced recording methods, all modern equipment utilizes photographic recording. The photo-recorder, illustrated in Figure 3, is a sensitive device which records as many as three curves continuously by means of mirror galvanometers reflecting beams of light on special photographic film. Simultaneously with galvanometer traces the ten-foot depth lines, depth numbers, and vertical scale lines are automatically exposed on the film, the operator having before him a visual screen continuously indicating all operations. Convenient controls on the photo-recorder govern all lamp intensities and allow for the selecting between any of three depth scales, one of which is a detail or "blown-up" scale used for increased accuracy over vital parts of the bore-hole. The films from these recorders, ranging in length from six inches to twenty feet, are developed on the job and become the master logs from which any desired number of prints are made. For added convenience a special portable printer allows a field print to be made and left with the company field personnel.

* Pressures greater than 6,000 pounds per square inch and temperatures in excess of 320°F. have been recorded at extreme depths. At present cables having as many as five insulated conductors and breaking strengths of 17,000 pounds are being used commercially. In addition to good electrical properties such cables must be designed to provide acurate depth measurements. Depth accuracies to within a foot are demanded for most oil horizons necessitating the careful study of cable behavior under operating loads. To this end the cable tension as well as the cable speed are continuously indicating during runs. The recent improvement in cables and cable performance studies have increased running speed *from fifty feet per minute to upwards of 200 feet per* minute, materially reducing the time necessary to record a complete log.

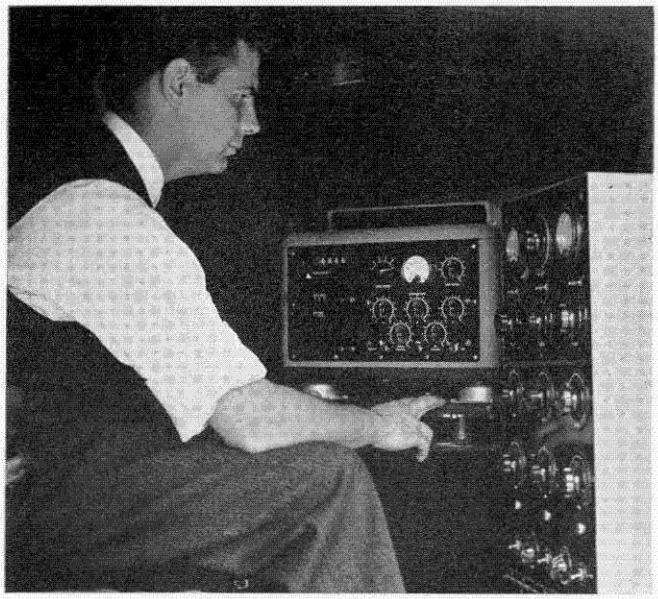


Fig. 3—Photo-recorder which continuously transfers the electrical responses onto a permanent photographic film.

CARRIED IN TRUCKS

The apparatus is carried in two trucks. A heavy duty hoist unit contains up to 15,000 feet of logging cable, electrode assembly, additional electrode weights, and associated apparatus. The main electrical power supply, consisting of a 1,000 watt gasoline driven generator is also on this unit. Power from this unit supplies the lighting loads as well as the Selsyn or self-synchronizing motors by which the cable measuring sheave wheel drives the measuring odometers and the photo-recorder. When operating two multi-conductor cables connect the instrument truck with this hoist unit. The instrument truck carries all of the electrical control apparatus including the control panel, photo-recorder, recording power supply, and is convertible into a complete photographic darkroom.

The adaptation for field use of laboratory equipment capable of measuring accurately sensitivities to fractions of a millivolt has required careful design. Electrical logging apparatus is subjected to the very worst atmospheric temperature and humidity variations, being in daily use from the extremes of Canada to the swamps of the Gulf Coast region. The maintaining of overall sensitivity standards varying by only a very few percent, requires frequent check tests utilizing special test apparatus. To this end each field office has become a self-sufficient laboratory in itself. As a result the logs obtained from well to well and from area to area are entirely comparable and contain only the variations present within the well bores themselves.

RECENT EXPERIMENTS

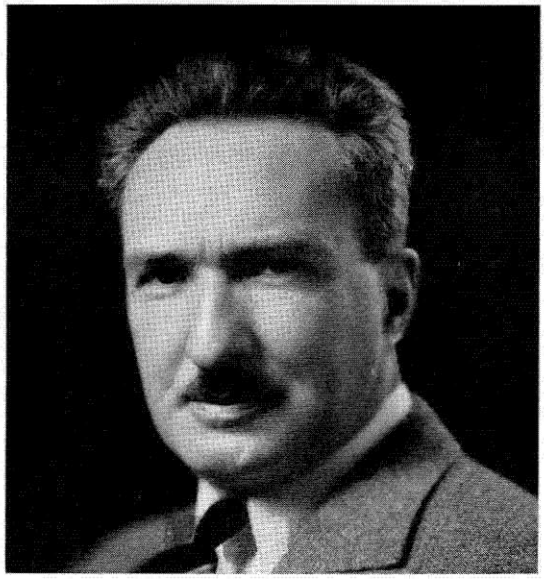
Interesting variations from routine electrical logging are continually arising. Recent experimental drlling with oil base mud to eliminate drilling mud invastion of oil sands, has necessitated the design of special electrodes capable of continuously contacting the formations to allow the electrical current to enter the strata in spite of the highly non-conductive oil within the bore-hole. High angle drilling, developed to allow closer surface spacing of wells, often produces holes with a deflection from the vertical of over 45°. The added friction to the passage of electrodes down such a hole often cannot be overcome by just adding weight and a practice has been devveloped by which a special small electrode is run inside of the drill pipe, the latter being raised to just above the portion of the hole to be logged. This type of logging is finding increasing use, also, in the deeper wells where excessive caving, bridging, etc., of the hole are present.

Personnel for field operations are carefully chosen. Recording operators must not only be entirely familiar with the intricacies of their apparatus, but must have a substantial knowledge of the geology of the region in which they work. Thorough studies of the methods used in electrical logging have only recently been instituted by many oil companies. Accordingly the burden of analysis and interpretation has often fallen on the individual logging operators and district field personnel.

FUTURE BRIGHT

The future of electrical logging looks as bright as its past. Studies of the effects of logging under varying fluid pressures and depths of penetration have opened the possibilities of predicting total and daily well production. The quest for methods to successfully accomplish logging through casings continues. Recently commercial methods have been made available which show promise in this direction. There appears to be no end to the possibilities of adapting science to the oil well. Thanks to the ever increasing cooperation between the outstanding oil companies and the independent service companies on whose shoulders falls a large portion of the burden of research and development electrical logging will continue to offer new benefits to the industry.

ALUMNI YOU SHOULD KNOW



HAROLD R. HARRIS

Air Transport Executive

HAROLD R. HARRIS

On the wall of a busy executive office on the 59th floor of the Chrysler Building far above most of New York City hangs a worn, pencil-marked map of South America. That little white map is as important to South American air transportation as the Magna Charta was to England's political economy.

Behind that map is the story of Captain Harold R. Harris '22. In the days when California Tech was known as Throop Polytechnic Institute, "Husky" Harris was the mainstay of the school football team. Many games were brought through to victory through the hard fighting and intelligent leadership of Harris.

In 1917 Harold Harris left the Institute to join the U. S. Army Air Corps. By 1918 he was flying the Alps with the A.E.F. under Major Fiorello La Guardia, now Mayor of New York City. While in the A.E.F. Captain Harris commanded the first American flight across the Alps, Milan to Paris.

After a period in which he instructed pilots in the flying of Caproni Bombers in Italy Captain Harris returned to this country. From 1921 to 1925 he was with the Army Air Corps test station at Dayton, Ohio, where he tested all types of experimental planes from Barling Bombers to Helicopters. When he left the army in 1925 Captain Harris held ten world's records in aviation.

In view of the unusual situation presented by the First World War and because of Captain Harris' engineering achievements in the Air Corps the Institute awarded him the degree of B.S. in Mechanical Engineering in 1922.

After leaving the army, resourceful Harold Harris entered a new venture, the spraying and dusting of cotton plants with insecticides from the air. The process proved so effective and successful in the South that Harris was soon called to Peru to introduce the process there.

Here's where the little white map enters our story. For many-sided Harold R. Harris is also a dreamer, a planner, an engineer. He was impressed with the magnitude of distances in South America and the slowness of available transportation. Deserts which would make Arizona and Nevada look like dense forests in comparison stretch for thousands of miles. But due to the rugged terrain and sparse population few good roads exist.

Day after day Harris' pilots clattered back and forth over the cotton fields of Peru while at night planner Harris sat sunk back in an old chair on the stone porch of a little hotel figuring, measuring distances, plotting courses on the little map.

Harold Harris is a modest talking man. You wangle from the Captain only a few quiet but powerful words of his story. But when he has an idea to put across his persuasive abilities are ample. Soon he was talking brass-tacks with South American banks and commercial houses. That was fourteen years ago. That year the French established their first limping airmail line from Buenos Aires to Natal. That started the skipper moving. Always a thorough man, he travelled completely around South America down the west coast to Mollendo, overland to La Paz, down through the interior to Buenos Aires. He continued up the east coast with various stops to get his feet on local soil,—Sao Paulo, Santos, Rio, Recife and on around the big hump to Trinidad and on to New York. When Captain Harris made a survey he made a survey.

He landed in New York in October, 1927. Next morning with his little white map and his old brown brief case full of facts he visited banker Richard Hoyt, of the banking house of Hayden-Stone which had financed the cotton dusting company. He spread out the map before him and revealed his dreams of a commercial airline for the Pacific coast of South America. Hoyt soon called in Juan Trippe, who was just then busy establishing his newly assembled Pan American Airways. Pan American was focusing its attention on bridging the gap between Key West and Cuba and was toying with the idea of later extension to South America. Harris was two years ahead of them.

Hoyt also called in the owner of the old and honorable Grace Steamship Company which had for years operated a line of steamers down the Pacific coast to Peru. Between them Peruvian Airways Corporation was formed, which later became Pan American-Grace Airways.

(Continued on Page 18)

PLANT PHYSIOLOGY AT THE INSTITUTE

JAMES F. BONNER, PH.D., '34

Assistant Professor of Plant Physiology

Many of our alumni are probably unaware of the existence of a plant physiology research group at the Institute, in part because this type of research is relatively new to Cal Tech, and in part because plant physiology has seemed somewhat far removed from engineering, physics, and even from chemistry. Research on plant growth is, however, well established in the biology division and in the following pages I will attempt to give you a resumé of the past accomplishments and present aims of this work.

The study of plant physiology was initiated in 1930, when Dr. Herman Dolk came to the Institute from Utrecht, Holland. Dr. Dolk was a specialist in the study (new to this country) of the plant "growth hormone," a substance which regulates and controls the growth of the stems of plants. He supervised the construction of a laboratory (on the corner of San Pasqual and Michigan Avenues) suitable for the growth of plants under conditions of controlled temperature, humidity, and light, and he began, with K. V. Thimann, an investigation of the chemical nature of the stem growth regulating hormone. Although Doctors Dolk and Thimann contributed significantly to this study, still the isolation and structure determination of "auxin," as the new substance was called, was left to Doctors Kogl and Haagen-Smit, of the University of Utrecht. Doctor Haagen-Smit, parenthetically, is now a member of the staff of the Institute. In the spring of 1932 Doctor Dolk lost his life in an automobile accident, and Dr. F. W. Went, also from the University of Utrecht, was asked to fill his place. Doctor Went earlier had done extensive work on the plant growth hormone, and in fact the first extraction of the active substance from the plant as well as the accurate biological method of assaying for it are due to him. With this assay method it was established, first, that auxin is formed in the uppermost tips of plants, and, second, that the substance travels from the tip downward (in very minute amounts) to the growing regions of the plant. If the auxin producing tip is removed, no auxin reaches the lower portions of the stem and growth accordingly stops.

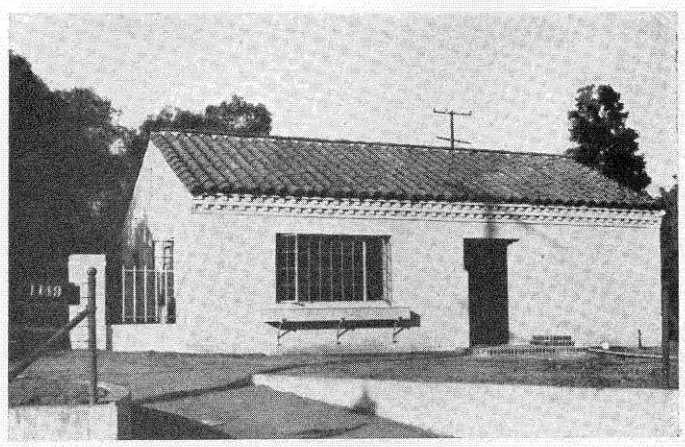
In 1933 Doctor Thimann and his student, Folke Skoog, '32, found that the auxin produced by the tip of the plant is not only essential for the growth of the side (or "auxillary") buds. We all know that in a normal plant most of the side buds do not grow out into branches. This is because the auxin produced by the tip of the normal shoot travels downward and prevents the side shoots from growing out. If we cut off the tip of the shoot, however, new side branches do grow out. If we cut off the tip but supply the cut surface with pure auxin, the pure auxin is able to substitute for the auxin normally made by the tip and the side branches do not grow out. This is, in short, a scientific explanation for the result of pruning. Doctor Thimann, to whom much of the early work in auxin must be credited, left the Institute for Harvard University in 1935.

One of the accomplishments of the plant physiology department, which has been of considerable practical value, has been the elucidation of the chemical nature of the substances which cause the formation of roots on stem cuttings (slips). It was found that indole acetic acid, a relatively simple substance readily obtainable by synthesis, possesses the power of initiating roots on cuttings. Thus if cuttings of lemon (or of many other species of plants) are allowed to soak for a few hours in a dilute solution of indole acetic acid, many roots are formed on the treated portions within a few days. This finding has been of immense practical value to nurseries, which frequently must propagate plants by cuttings.

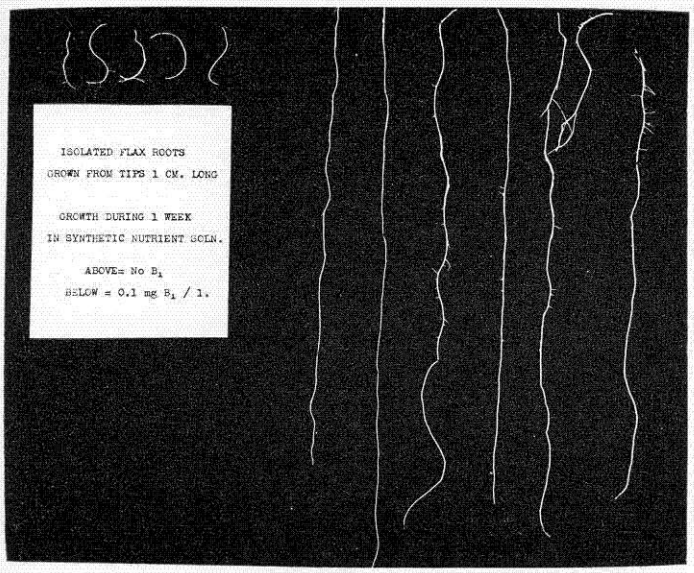
Dr. J. van Overbeek, of the University of Utrecht, joined the department in 1934. One of his many investigations on auxin has been a study of why dwarf plants are dwarfed. He has worked primarily with a pygmy race of corn, a race whose dwarf stature is inherited and is determined by a single genetic factor. Doctor van Overbeek found that although the dwarf plants manufacture plenty of auxin or "growth hormone," still they differ from normal plants in that they oxidize the substance rapidly. Since oxidized auxin does not promote growth, the plants remain dwarf. The genetic factor for dwarfing in this case is a genetic factor for production of an enzyme which speeds up the oxidation of auxin.

VITAMIN B_1

In 1935 a program was initiated for finding still other hormones involved in the regulation of different phases of plant growth. As a result of this work it was found that vitamin B_1 is an essential factor in the growth of roots. In the normal plant vitamin B_1 is synthesized in the green leaves and is then



THE PLANT PHYSIOLOGY LABORATORY



transported downward to the roots, where it is used in root growth. Hence in the experimental work use was made of "isolated roots," that is roots severed from the top of the plant and grown under bacteria free conditions in nutrient solution containing the necessary inorganic salts, sugar (which is supplied to the roots by the leaves in the normal plant), and vitamin B_1. If the vitamin B_1 is omitted, such isolated roots do not grow. If it is present in amounts as little as 0.001 mg. per liter, growth of the roots may continue at a rate almost as great as that found on the normal plant. Other growth substances for roots have been found by using this same technique. Thus some kinds of roots need only vitamin B_1 as an added growth substances, other kinds of roots need vitamin B_1 and nicotinic acid, and still other kinds need vitamin B_1, nicotinic acid, and vitamin B_6.

Although the leaves of many kinds of plants make all of the vitamin B_1 which the plants need, still there are some species in which the leaves do not make as much of the vitamin as the roots can utilize, and it has been found that root growth of these kinds of plants can be speeded up by feeding the plants vitamin B_1. Since increased root growth generally brings about increased top growth, the application of vitamin B_1 has caused an increase in general growth over the growth of untreated control plants with certain species under experimental conditions. This finding has unfortunately been subjected to greatly exaggerated publicity with the result that vitamin B_1 is now offered for sale as a plant "stimulant" even though there is as yet no experimental evidence that applications of the vitamin have value under practical conditions. It is, however, well established that vitamin B_1 applications (and in some cases application of nicotinic acid and vitamin B_6 as well) bring about increased growth of roots on cuttings, particularly when the cuttings have first been treated with indole acetic acid for the formation of embryonic roots. It seems probable that vitamin B_1 will find a definite place in agricultural and horticultural practice.

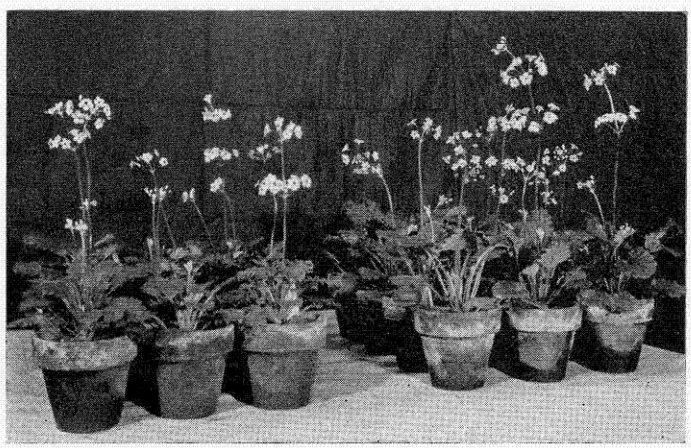
WOUND HORMONES

Another group of plant growth substances which has been studied at the Institute is the group of the "wound hormones" which, as has been known for 25 years, are liberated by wounded plant cells and which promote healing of the wound. The isolation and synthesis of a plant wound hormone was first accomplished at the Institute by Dr. James English, Jr., of the Chemistry division, in close collaboration with the plant physiology group. This substance has been called "traumatic acid" but its isolation is so recent it has not been possible as yet to find out whether or not it will have practical applications.

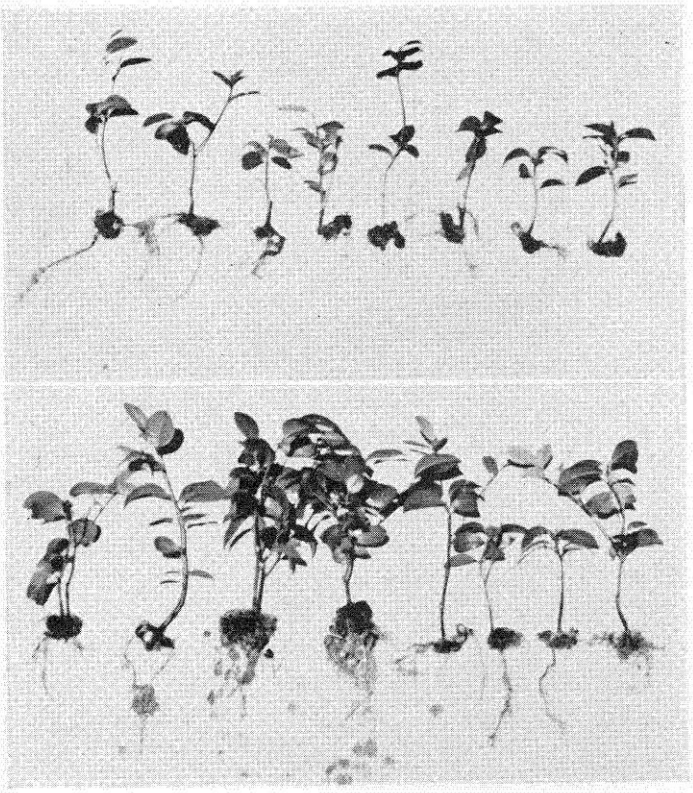
Dr. A. J. Haagen-Smit, organic chemist of the University of Utrecht, joined the staff of the Institute in 1937, and the isolation and identification of further plant hormones are being prosecuted under his direction and in collaboration with the plant physiology group. The investigation of the special growth substances which regulate the growth of leaves has been particularly successful. It is known that mature leaves make substances that are required for the growth of the younger leaves. It seems probable that adenine (a purine related to uric acid) is one of these factors and that adenine is to be regarded as just as much a "leaf growth hormone" as vitamin B_1 is a "root growth hormone."

The gift of a new greenhouse in 1939 now permits a much more exact investigation than heretofore of the effect of external factors on plant growth. In this air conditioned greenhouse it is possible to maintain in four separate rooms different combinations of temperature, humidity and light intensity or quality. It is hence possible to study the interaction of these different environmental factors as they influence plants. It has already been possible to demonstrate the very considerable effect which high atmospheric humidity exerts in promoting plant growth.

It may seem from the preceding that work in plant physiology at the Institute has centered on subjects capable of immediate practical application. It is indeed true that practical uses have



Primula malacoides with and without Vitamin B_1 after 6 weeks.



Camellias grown in sand without and with Vitamin B_1.

been found for the discoveries which have been made concerning the plant growth hormones. It also is true, however, that investigation of the more theoretical aspects of this subject has been prosecuted. Thus an answer to the question of how auxin promotes growth has been sought since 1932. With the cooperation of Dr. J. Koepfli, of the Chemistry Division, the exact atomic configuration essential to growth activity in the auxin molecule has been determined. Studies of the movement of auxin within the plant have been made particularly by W. G. Clark. The atomic configuration essential for vitamin B_1 activity has been determined in collaboration with Dr. E. R. Buchman, of the Chemistry Division, and the relation of vitamin B_1 to enzymatic activity in the plant has been elucidated. In fact the practical uses for plant hormones are a by-product of the more theoretical studies.

Another activity of the plant physiology group has been the training of students capable of carrying on independent growth hormone research and of spreading the growth hormone lore to other institutions. Much of the work mentioned above is associated with one or another of the students who have obtained the Ph.D. degree in plant physiology at the Institute.

I hope that I have made it clear that plant physiology as it is understood at the Institute is the study of the plant with the object of determining the chemical substances or processes related to each individual plant activity. This "chemical plant physiology" requires the cooperation of chemists, physiologists and hybrid chemical physiologists, and such cooperation is abundantly realized at the Institute. Despite the considerable progress made during the past ten years, there is no danger of an immediate scarcity of new problems, for it is now clear that there are hormones for the regulation of the different phases of plant growth from the germination of the seed to the falling of the fruit.

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The Author—James F. Bonner did his undergraduate work at the University of Utah. He came to the California Institute in 1931 as the first graduate student in plant physiology. He obtained his Doctor's degree in 1934 and then spent a year in Holland and Zurich as a National Research Council Fellow. Since 1935 he has been at the Institute as, successively, Research Assistant, Instructor, and, now, Assistant Professor of Plant Physiology. The work on vitamins and wound hormone mentioned in the article has been done by him in conjunction with the various people mentioned.

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Alumni You Should Know

(Continued from Page 15)

The first little four-passenger Fairchild plane lifted its rubber feet from the sand of a racetrack in Lima, Peru, on September 13, 1928. The little ship buzzed its way from Lima to Talara inaugurating the first scheduled air service on the South American west coast. Harris was general manager of the line as well as chief pilot.

For the most part of the succeeding ten years Harris has lived in Lima, Peru, directing the extension of "Panagra" up and down the west coast until now it extends from the Panama Canal to Valparaiso, Chile, and then makes a spectacular hop over the high Andes to Buenos Aires on the east coast, connecting with other parts of the Pan American system at both ends.

Recently Harris has moved to the New York headquarters of the system where, when not away on a flying trip over the far-flung lines of the System he occupies the lofty office with the little white map on the wall as Executive Vice-President of Pan American-Grace. Besides the little white map, among the prominent furnishings of his office is a History of Latin America, a globe and a map of the commercial air lines of the world, perhaps evidence of plans for further conquest.

— Chester F. Carlson, '30.

THE BALLAD OF SERGEANT O'LEARY

by G. AUSTIN SCHROTER, '28

Dedicated to Master Sergeant Joseph Laracy, Corps of Engineers, U.S.A. Retired,
formerly Instructor—Military Science and Tactics, C.I.T.

I'm more adept at lashin' spars or riggin' Kapok bridge
Than tellin' tales or spinnin' yarns, that you could best abridge.
For forty years, in blue and drab, I've served the Engineers
In Oahu and Cristobal I have slung their bandoliers.
From Manila to Alaska (where you change from ducks to wool)—
I have packed a service pistol for a mem'ry more than full.
The chevrons of a non-com have been here on my blouse—
And bein' broken back-to-ranks has never made me grouse.
In service-life, it's men you meet, a lifetime to enrich—
Regardless of your station or your last and final hitch.
From raw-recruit to soldier-man, and so on, up the grade,
I've seen all kinds, and types of men, join up with my parade.
A few were common gold-bricks, but *their* stay was never long—
And some were broken gamblers, and a few were rich men's sons—
And taken in minority, a few were simpletons.
For such as these, I'll spare no words to have my simple say—
When I have a person close at heart I'd rather much portray.
Of all the men I've soldiered with, who really played the game,
I'll take a homely Irish mick, O'Leary was his name.
Though history tells of famous men who led through shot-and-shell—
O'Leary was the kind of man you'd follow clear to Hell.
He had a simple order, when to duty we were bid—
It went like this: "Let us go, men, there is work that should be did."
At cut-and-cover shelter, or in riggin' apron-wire—
There never was a squawk or beef, regardless of the fire.
It might be simple ponton-drill the Sergeant led us to—
Or rear-guard demolitions just to drop a span or two.
Or routine policin'-up at a sleepy peacetime post,
And maybe buildin' wharfage on some far-off, foreign coast.

But I call to mind an action, in the springtime of a year—
When Sergeant Joe O'Leary showed the World an Engineer.
His forward combat outfit wasn't on no peaceful lark—
A'layin' down a footbridge for the Doughboys to embark.
The crossin' was disputed with machine gun and grenade—
The Lampert boats were broachin' from the deadly enfilade.
When good old Joe O'Leary plunged into the bloody stream
To hold the span upon his back, and so the fight redeem.
The Top-kick had one thought in mind, which Duty under-bid—
No honor or tradition, but a job "which must be did."
And when the fight was over, and the enemy in rout—
A few of us still walkin' had to pull the Sergeant out.
They took O'Leary back to base, and on his shoulder-straps
They stuck a pair of silver bars. They made *us* feel like saps
A'standin' there in pourin' rain, and tryin' hard to miss
The blushin' on O'Leary's face that grew with every kiss.
The Sergeant took their medals, and he hid them in his pack
For fear a man, among his men, would voice a clever crack.
And when that War was over, and O'Leary drop't in rank
There never was a mention of the bridge that damn-near sank.
And that is why we loved him so, a kindly, modest man,
Who never had to raise his voice to carry out a plan.
I can't forget the feelin' that can choke a man all up—
That clutched at every man of us who quaffed that bitter cup
With O'Leary at attention, as we passed in smart review
To honor his retirement . . . when retirement day fell due.
So here's to you, O'Leary, you modest Irish mick—
And to the day that soon must come, when I have served *my* trick—
And if beyond the last Retreat I hear your gentle bid,
I'll only ask to serve with you, on work "that should be did."

—Taken from an incident of the World War. O'Leary is a fictitious name. The events and conversation are based on fact.

SORENSEN SPEAKS

Prof. Royal W. Sorensen, President-elect of the A.I.E.E., addressed a meeting of the San Diego Section last month on "Engineering Developments and Their Influence Upon Our Work." In attendance were Walter Bryant '25, vice-chairman of the Section, Bruce Gravitt '35, who is with General Electric, and Ozzy Zahn '30.

MUSSELMAN NEW PREXY

Hal Musselman, Baseball Coach and Athletic Manager at the Institute, received a signal honor last month when he was elected president of the Southern California Conference Coaches Association at the annual meeting held in Whittier. Coach Musselman had previously been secretary of the Association, and succeeded Cecil Cushman of Redlands to the presidency.

NEWS OF CLASSES

1898

Dr. Frank B. Jewett presided as president of the Natural Academy of Sciences at its meeting in Washington last month.

1922

Frank Clough assumed office as City Manager of South Pasadena on May 1, after serving as City Engineer since 1926. Clough, who is South Pasadena's fifth City Manager, has served two terms as president of the Pacific Coast Building Officials Conference. He joined the engineering department of the city in 1923.

1924

Max Moody, now in the general contracting business in Honolulu, recently spent several weeks in California on a combined business and pleasure trip.

Holly Moyse successfully defended the golf championship of the Bel Air Country Club recently.

1925

Mike Brunner, of the Engineering Department of Shell Oil Company, was recently transferred from San Francisco to Los Angeles.

1926

Dick Pomeroy recently resigned his position as research chemist and bacteriologist for the Los Angeles County Sanitation District, which he had held since 1932. During his eight years with that organization he was chief problem-solver in matters of odor control, industrial wastes, sewage treatment, and ocean pollution. Among his contributions were several new methods of analysis, more efficient methods of odor control, and successful patents on chlorination control equipment.

Theodore Coleman, Chairman of the Education Committee of the California Group, Investment Bankers Association of America, presided at the forum held by the group at the California Club in Los Angeles on April 23. Several noted economists and business leaders of the Nation addressed the forum.

C. Hawley Cartwright, along with his associates at the Massachusetts Institute of Technology, announced the results of studies of the healing power of infra-red rays at the recent meeting of the National Academy of Sciences.

1927

Vernon P. Jaeger, Chaplain, U. S. Army, has been transferred from Fort Riley, Kansas, to the Panama Canal Department with headquarters at Quarry Heights, C. Z.

James Boyd, now on the faculty of the Colorado School of Mines, spoke over a nation-wide radio broadcast on March 10 on the subject of "Mining in Colorado."

Ray Copeland has returned to Los Angeles and is now affiliated with Columbia Steel Co. For the last ten years he has been in Chicago with the U. S. Steel Corp.

1928

Alex Clark, geologist with the Shell Oil Company, has returned to the Coast after extensive field work in the Rocky Mountain area. Alex has been permanently transferred to the Los Angeles office of Shell.

Francis Noel announces the birth of a son, Thomas Lawrence Noel, on March 16 in Los Angeles.

Clark B. Millikan, Ph.D., was the principal speaker at the recent forum of the California Group, Investment Bankers Association of America, on aircraft manufacturing. The presidents of Vultee and Northrop Aircraft Companies participated in the forum which was held at the California Club in Los Angeles.

Frederick C. Lindvall, Ph.D., was mentioned in the May 20th issue of "Life" which pictured the new railroad car sponsored by Cortland Hill; and which Doctor Lindvall described in his article in the ALUMNI REVIEW for June 1939.

Gunnar Gramatky is in the contracting business in Los Angeles, having recently secured his contractor's license.

1929

William G. Young, Ph.D., was recently appointed Chairman of the Chemistry Department at U.C.L.A. to fill the vacancy created by the death of Dr. William Morgan. Young has been associate professor

of chemistry at U.C.L.A. for several years. He is now traveling in the East, but will return to Westwood in time for the summer session.

George Lufkin is the father of a bouncing baby girl, Diane Louise Lufkin, born in New York City on March 15.

William H. Mohr is the author of an article in "California Highways and Public Works" for April, describing the construction on the coast highway north of Santa Monica.

Tom Evans is chairman of the committee on uniform surveying specifications of the Virginia section of the American Society of Civil Engineers.

1930

Sid Zipser, formerly with Technicolor, has resigned his position and is now on an extended tour through the Dutch East Indies on professional work.

Wendell Humphreys is the proud father of an 8 pound, 15 ounce boy, Donald Lewis Humphreys, born at the Hollywood Hospital on March 15.

R. Stanley Lord was recently promoted to the position of associate engineer in the U. S. Geological Survey, with headquarters at Harrisburg, Pennsylvania. Lord has lived in Los Angeles since graduation with the exception of several months of special work in Washington, D. C. Last year he was president of the Los Angeles County Christian Endeavor Society.

Roscoe Downs is field engineer for Jahn & Bressi and Bevanda, contractors on the Sepulveda Dam near Los Angeles.

Donald Barnes, M.S., was recently appointed editor of "Civil Engineering," official organ of the A.S.C.E. and one of the country's outstanding engineering journals.

NEWS

Have you any bit of news about yourself or fellow Tech men? Marriages, births, promotions, job changes, papers published, honors received are all items of interest to the rest of us so write your information on a penny postcard and address it to the Editor,

CALTECH ALUMNI REVIEW
Pasadena, California

In recent years Barnes has contributed several articles to the publication and has aided in the translation of foreign articles. A graduate of Oregon State College in 1928, he took his Master's degree at the Institute in 1930 and was later an instructor in the Missouri School of Mines and an A.S.C.E. Freeman Scholar. Recently he worked on the Morris Dam and Colorado River Aqueduct, and at the time of his new appointment was contact man for the Bureau of Reclamation on the Grand Coulee Dam pump model tests at the Institute. His new offices will be in New York City.

Bob Stroud is back at the Institute this year and will receive his bachelor's degree with the class of 1940.

1931

Maynard Anderson and **Byron Johnson** are now working in the Hydraulics Section of the U. S. Engineer's Office at Los Angeles.

Perry Booth has been made Master Mechanic for the San Diego Electric Railway in charge of maintenance on all rolling stock.

C. K. Lewis swelled up his chest on April 28 when he became the proud father of a baby girl.

1932

Clark Goodman was recently awarded Honorable Mention in the annual competition for the Walker Prizes in Natural History held by the Boston Society of Natural History. Goodman's paper was entitled "Radioactivity in Terrestrial Materials."

Jack Chambers, now employed by Lybrand, Ross Brothers, and Montgomery, passed the recent C.P.A. exam with the highest score in the state.

William Pickering, Ph.D. '36, returned from a seven-month research trip to India with Dr. and Mrs. Millikan and Dr. Victor Neher in April. The expedition was for the purpose of studying cosmic radiation in equatorial regions.

C. Philip Schoeller is in charge of construction of a five-story warehouse for the Bekins Van and Storage Company on Wilshire Blvd. in Santa Monica. **Herbert B. Holt '15** is manager of the Bekins Company.

Bill Shuler, who obtained his Master's Degree in Civil Engineering at the University of California, Berkeley, this year, left on May 21 for Kentucky. With him are his wife and their four and one-half months old son, and they are traveling by way of the Panama Canal. Bill is a second lieutenant in the U.S. Engineers and will

June 7th

Annual Commencement Day Banquet

ATHENAEUM - 7:00 P.M.

Speaker: Captain Paul Perigord

"The Destiny of American Civilization"

RESERVATIONS MUST BE MADE IN ADVANCE

New York meets at Western Universities Club

continue his studies at Throop School in Kentucky, after which his education will be completed, and he will be assigned to active duty. Incidentally, Bill had **Dick Folsom,** '28, for a professor for the second time, and he says he is the same old Dick that we used to know at Tech.

1933

Kenneth Warren was married on February 23 to Miss Vivian Held of Anaheim. Both Mr. and Mrs. Warren are employed as chemists by the Mutual Citrus Products Company of Anaheim and are making their home in that city.

John Mendenhall, now employed by the Pacific Electric Railway Co., and his wife are both active members of the Sierra Club. At present John is president of the Rock Climbing Section of the Club; and Mrs. Mendenhall, who majored in journalism at the University of Washington, is editor of *"Mugelnoos," official news bulletin* of the Ski Mountaineering and Rock Climbing Sections of the Club. They celebrated last New Year's Day by making a first ascent of Monument Peak, Arizona.

John Monning, now a Lieutenant in the Engineering Reserve Corps, spent a month on active duty at Fort Orr with regular U. S. Army troops recently.

1934

Joseph P. Carr is now employed as a pilot for T.W.A.

Irving Krick, Ph.D., founder of the Institute's nationally recognized meteorology service, was awarded the Distinguished *Service Key of the California Junior Cham*ber of Commerce as "California's leading young man of the year" at a banquet in Pasadena, April 9. This is the second year the award has been given to the young man, not over 35 years of age, who has made "the outstanding contribution for the year to the welfare of the state at large." Judges included Herbert Hoover, Dr. Robert Gordon Sproul, Governor Olson, Walter F. Dexter, and W. F. Kellogg. In 1938 he received a similar award from the Los An geles Junior Chamber of Commerce.

1935

John Ritter was married to Miss Eileen Coyle in Whittier on April 12.

Robert Stanley is now Chief Engineer for Voight-Corsair Aircraft Company in the East.

Charles Dawson, Jr., has returned from New Zealand to accept a position in the engineering department of Ryan Aeronautic Company in San Diego.

Ivan Scherb recently returned from Arabia, where he was employed by the Mott-Smith Company for the past year and a half in geophysical work for the California-Arabia Standard Oil Company. Work in Arabia has been curtailed because of the war.

Greer Ferver was recently appointed Assistant Superintendent of the National Iron Works in San Diego.

1936

Hugh Colvin is now employed in the Economics Division of the Research and Development Department, Union Oil Co. He was formerly with Wilshire Oil Company in Los Angeles.

Bob Kent has recently been transferred to the New York offices of the Dicalite Corporation.

Dick Petersen and **Dale Van Riper** are now employed by the Utility Fan Manufacturing Corporation in Vernon.

Richard Dodson, now at Johns Hopkins University, was one of seven Research scientists to receive the 1940 awards of $2,000 fellowships in chemistry granted by the National Research Council. **Darrell Osborne, Ph.D. '38,** now at the Institute, was another of the seven so honored.

1937

Paul Schaffner has announced his wedding with Miss Eunice Bergstrom will take place at Upland on June 18.

Richard Goodell has taken a position with the Brown Geophysical Company at Philadelphia, Mississippi.

William Ellery who has been working for Ingersoll-Rand in New York was recently transferred to the Los Angeles office.

John Sullwold announced the birth of a baby girl, Dianne Sullwold, in San Francisco, April 26.

1938

Ralph Jones, Jr., who since graduation had been employed by Lane-Wells Company, took up new duties May 15 as assistant to the General Manager of the St. Paul Foundry Company in Minnesota.

Bob Barry, Alumni Review business manager, became the proud father of a 7 pound 9 ounce boy, William Parke Barry, on May 11. Bob is employed by the Lane-Wells Company.

Clay Smith II, and Miss Sara Gwendolyn Austin, Occidental College Alumna, were married in Pasadena May 19. Clay has been resident associate of Ricketts House this year while engaged in work for his Doctor's degree.

Don Warren is a Lieutenant Commander in the Civil Engineer Corps of the U. S. Naval Reserve.

1939

Jack Osborn, formerly with the American Concrete and Steel Pipe Co. in South Gate, is now associated with his father in the asphalt paving business.

Carl Paul and Miss Eugenia Alice Scott, graduate of Scripps College, were married May 2 in the Hilton Memorial Chapel at the University of Chicago.

Philip Devirian, Jr. was awarded a John McMullen Scholarship in Engineering at Cornell University for 1940-41, but was unable to accept the appointment.

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BOOKS

UNION NOW, by Clarence K. Streit,
Harper & Brothers, 1938.

Reviewed by GRAHAM A. LAING,
Professor of Economics and Business Administration.

The propagation of ideas is generally a slow process, but there are times when what we may call the adolescence of an idea suddenly ceases and the idea comes into full manhood. The times become ripe for change and the full grown idea provides the form of the change. For many years a few men here and there have urged the necessity of our political world catching up with the economic world-unity, but it is only in the last two or three years that the general public has begun to be interested.

This is in part, of course, due to the nature of the history of the past two and a half decades. The world has passed through a great war that was to end all wars, but instead of peace we have had first an armed truce and then a recurrent series of crises successively more and more acute and now culminating in a new outbreak which promises to make or break our civilization. But it is also in part due to the publication of a book which has caught the interest of the more intelligent part of the citizens, not of the United States alone, but of the world.

Mr. Streit, in his book *Union Now,* has made an analysis of the essential problems of world organization, a criticism of the past attempts at solution, and has propounded a scheme for a new solution which he suggests will avoid the mistakes of the older methods and also their failures.

It is not possible, in a brief review to give a full account of a book containing three hundred pages of closely packed reasoning and abundant supporting quotations and citations. We shall here merely outline the principal ideas. Mr. Streit argues that the main difficulties that face us are due to the fact that our political development has stopped at the age of nationality. We assume that there is no further development possible and that, for some unexplained reason, the nation is the ultimate form of human union. Hence in the past we have tried to find a solution for the problem of national differences in various forms of agreements, treaties, conferences and leagues. These have all more or less failed because underlying all of them was the claim of individual sovereignty. As long as that claim persists there can be no real peace, for each party to disputes retains the right to the positions of judge, jury, prosecuting counsel and executioner.

UNION OF PEOPLES

He declares that the only real way out is to have not a league of nations, but a union of peoples and he makes great use of the analogy of the development of the United States of America. After the successful outcome of the revolutionary war, the country was faced with two possibilities. Either the individual colonies could retain their private sovereignties and amalgamate as a confederation of states, or they could abrogate part of those sovereignties and become a single union.

History shows that the former alternative was a hopeless failure and that the second has produced a sound and working system. Instead of the abrogation of sovereignty producing a reduction in freedom, it has, in fact, increased the freedom of the peoples enormously. It has made possible a broad freedom of trade between all of the states, a uniform citizenship, a uniform currency, a single defense force and a free communication system. And this has been done, not by forcing upon the citizens a restricted and controlled life, but rather by securing to all the privileges of free speech and free assembly, of the right to petition for the redress of grievances, to worship according to the dictates of conscience, in short, to all those freedoms which do not interfere with the equal freedoms of others.

Mr. Streit's proposal is that the idea which generated the United States of America should be used to propagate the Union of Democratic Peoples. He suggests, therefore, that the principal democracies of the world unite in a sort of superstate on lines similar to those upon which our Nation was formed. Mr. Streit's idea of democracy is not a rigid one. His definition is simple enough and provides merely for a form of representative government with a constitution which includes, as an absolute, a bill of rights similar to the United States Constitution. There can, he says, be no freedom of the type we regard as vital to a full life, where this bill of rights is not basic. Hence, the totalitarian regimes must be excluded until their peoples are ready for the understanding and practice of freedom as we understand it. This does not, of course, mean that all of the democracies should be exactly alike in every respect, any more than the forty-eight states of the American union are alike. Cultures, traditions, literatures, and history may be and indeed should be, different. But all matters that affect the relations of the larger groups should be in control of the larger unit. Hence the powers of this Democratic Union would include, and be confined to five, i.e., the regulation of interstate trade, of citizenship, of communication, of money, and of defense.

And Mr. Streit suggests that all of this is possible now. He points out that all the obvious difficulties and apparent impossibilities were present in the American case in 1787. But that, in the course of only two years the difficulties were essentially ironed out and the impossibilities became actualities. All that was required was a period of crisis sufficiently acute to force people to weigh the dangers of the status quo against the risks of the future. And here we have a similar situation.

This review must be regarded as a brief exposition, and not a criticism. To criticise would require a long article. Yet the present reviewer must record his belief that some such system — possibly with changed details, but in all essence the same — is the only possible hope for our survival as a free people.

What's Your Telephone Score?

EVERY DAY many pleasant voices go over the telephone. And it seems to us the number is growing. For most people realize the business and social value of "The Voice with a Smile."

Sometimes what may appear like a gruff or hasty manner is not meant that way at all, but is simply carelessness or thoughtlessness.

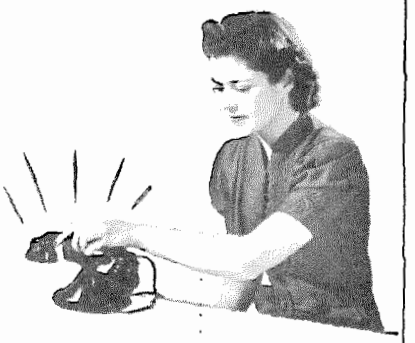
Since this is the age of quizzes, how about a short one on some points of telephone usage?

Do You Talk Directly Into the Telephone?

The proper way to use the telephone for best results is to hold the transmitter directly in front of the lips while you are talking.

Do You Speak Pleasantly?

Remember . . . it may be your best friend or best customer. Greet him as pleasantly as if you were face to face. Pleasant people get the most fun out of life anyway.



Do You Hang Up Gently?

Slamming the receiver may seem discourteous to the person to whom you have been talking. You don't mean it, of course, but it may leave the wrong impression.

Do You Talk Naturally?

Your normal tone of voice is best. Whispered words are indistinct. Shouting distorts the voice and may make it gruff and unpleasant.

Do You Answer Promptly?

Most people do. Delay in answering may mean that you miss an important call. The person calling may decide that no one is there and hang up.

"The Voice with a Smile"

can be a real asset. Haven't you often said of some one who has just telephoned — "My, but she has a pleasant voice." Or — "I like to do business with them because they are so nice over the telephone."

It's contagious too. When some one speaks pleasantly to you, it's easy to answer in the same manner.

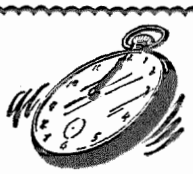
Many times you form your impression of people—and they judge you — by the sound of a voice over the telephone.

BELL TELEPHONE SYSTEM

THE BELL SYSTEM CORDIALLY INVITES YOU TO VISIT ITS EXHIBITS AT THE NEW YORK WORLD'S FAIR AND THE GOLDEN GATE INTERNATIONAL EXPOSITION, SAN FRANCISCO

NOW!

New Afternoon Streamliner to SAN FRANCISCO!



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Any day you like, travel leisurely to Los Angeles and still have plenty of time to catch the NOON "DAYLIGHT" to San Francisco!

The new noon departure of the "DAYLIGHT" offers you the most convenient afternoon schedule in history from your city to San Francisco!

San Francisco

$6 ONE WAY

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IMPORTANT: Please make reservations well in advance. Every *Daylight* seat is reserved.

Southern Pacific presents the noon "Daylight"! Swift schedule! Leaves Los Angeles at noon daily!

SOUTHERN PACIFIC is happy to announce to all its patrons throughout Southern California an afternoon streamliner to San Francisco—the NOON "DAYLIGHT"! The new train, offering particularly convenient connections from your city, leaves Los Angeles 12 noon sharp every day. With the addition of this fine new train, Southern Pacific offers

TWO "DAYLIGHTS" EVERY DAY!

MORNING "DAYLIGHT"	*Leave Los Angeles 8:15 am* *Arrive San Francisco 5:45 pm*
NEW NOON "DAYLIGHT"	*Leave Los Angeles 12 noon* *Arrive San Francisco 9:40 pm*

Southern Pacific

For information and reservations see your nearest S. P. Agent.