"We’ll be glad to come"

Every day, the telephone brings happiness and cheer to many a home. Someone thinks of someone, reaches for the telephone, and all is well.

Telephone service is exceptionally good in this country—and it’s cheap. Nowhere else do people get so much service, and such good and courteous service, at such low cost.
GREETINGS at the dawn of another Alumni Association year. May it not only duplicate but surpass our last few phenomenally-successful years. Unborn by divergent factions, the Alumni Association has been built until it now occupies an enviable position in the group of similar organizations of other American colleges. Why? Because of cooperation and hard work.

As you know, there are two ways of running an alumni association. We could, like many other alumni groups not much larger than ours, hire a full-time Alumni Director and leave largely to him the management and execution of alumni affairs.

The other way, our way, is to maintain your Alumni Association in the immediate control of its Directors, each member actively assuming as his responsibility some phase of the large amount of work necessarily involved. We prefer this way as it gives you a 'custom made' program designed and executed by men who have an intimate knowledge of the interests of Tech men. While the Board is willing to and does spend a very large amount of time in their individual alumni tasks, the amount of work is so large that enlistment of other members is necessary.

However, every member can serve in this common cause. Here are a few suggestions for those of you who are not called upon to assume specific tasks:

1. Drop a card to the Alumni Association (Campus Office) giving any news items of interest for the Alumni Review, whether they concern yourself or other Tech men.

2. Send in promptly your meeting reservations.

3. If you know of a job for a Tech man, or if you want to procure a job or better your position by a shift, contact the Placement Service at the Institute.

4. Give any suggestions you have as to how the Alumni Association can better serve you. This is your Association and we want you to get more from it.

5. Remember that we must live within our income, and that our income is derived from our nominal dues of $2.50 per member. This issue of the Alumni Review goes to all alumni whether or not their dues are paid. Later issues, and all further announcements, go only to paid members. We're cocky enough to think that we're giving you more for your money than any similar organization, but we can't prove it unless you join and give us a chance. How about it?

CLARENCE F. KIECH, '26
President, Alumni Assn.
NEW BOARD

The newly elected members and the hold over members of the Board of Directors met on the evening of July 14, 1939, to discuss policy and to divide the committee chairmanships amongst themselves. The choices as described below can produce nothing but a highly successful year both in greater development of comradeship and service.

Kiech President

The selection of Clarence F. Kiech, '26, as president, was an outstanding choice. Clarence Kiech served as chairman of the first Alumni Seminar Week-End and acted as social chairman in preparing the fine programs of the past year.

William H. Mohr, '29, who is vice-president and last year's social chairman in preparing the fine programs of the past year, is highly successful as well.)

One of the most difficult tasks, that of membership chairman, is filled by Paul C. Schaffner, '37, who has proven highly capable in any tasks previously assigned to him, notably the Annual Alumni Dance at the Biltmore Hotel last February.

Alumni Review

The ALUMNI REVIEW wishes to correct a statement appearing in the last issue that Louis H. Erb, '22, had accepted a position as Deputy Registrar of Contractors for California. Erb is still much employed by the Pacific Telephone and Telegraph Company, and the Staff regrets any embarrassment caused him by the erroneous statement.

ASOCIATION GROWS

FOOTBALL

We are beginning the Alumni Activities for 1938-1940. You are reading the first book of the series of four articles which will bring you news of old classmates, technical articles of interest, book reviews by members of the Institute faculty and articles by all our members. This issue of the magazine is being sent to all Alumni. Next copies of the Review and notices of Alumni meetings will be sent only to paid members of the Association.

Last year was a banner year for the Association, membership reaching a total of 1025 members, 160 more members than ever before. You will recall the many fine events and meetings held last year, such as the Seminar Week-End, the Annual Stag and Field Day, the dance at the Biltmore Hotel, the Technicolor lecture, and the Annual Commencement Day Banquet. Other 1938-1939 highlights were the publication of the Alumni Directory, excellent results of the Alumni Placement Service, and the publication of four excellent issues of the Alumni Review.

What has made the activities and events possible this year? The Association has grown. Why hesitate and lose out on part of this?

Annual dues are $2.50. Life memberships are available for $50.00 cash, or on a 5 year plan with payment of $11.00 annually, or on a 10 year plan with payments of $6.00 annually. If you have not paid your dues as yet, send them at once to take advantage of:

1. Alumni Placement Service which aids members in securing better positions, as well as work for the unemployed.
2. The Alumni Review.
3. Monthly educational and social meetings.
4. Fourth annual Alumni dance.
5. Third annual Seminar Week-End.
6. Annual Stag and Field Day.
7. Alumni Directory of which there is a limited supply available for new members, as long as it lasts.

Paul C. Schaffner, '37, Chairman, Membership Comm.

ASSOCIATION GROWS

John E. Shield, '22, is to function as social chairman for this year, a position which he is especially fitted for. He has had the Annual Field Day. He has scheduled outstanding meetings for the coming year as listed on page one.

Theodore C. Coleman, '26, who was in charge of the annual Seminar Week-End, is to head a new committee on Campus Relations, which will further contacts between Alumni and students for their mutual advantage.

CONTRIBUTOR

O. Franklin Zahn, better known as "Ozzie," was graduated from the Institute in 1930, and then was a graduate assistant at the Pennsylvania State College and then in the Oil Spray Laboratory. He received the degree of Master of Science in 1932 from Penn State, and was also elected a member of Tau Beta Pi. In 1932 "Ozzie" went to work for the ExCellO Corporation at Detroit, Michigan, which was the first American Company to manufacture a stock fuel injection pump for diesel engines, while the pump was in the development stages. He has worked on improvements in the pump and on approval of the "Alkheim" builders' laboratories in Detroit, Milwaukee and other Wisconsin plants, Chicago, and also at New York, New Jersey, and Ohio diesel plants. In 1936 he visited several diesel laboratories in Europe. At the present time he is in San Diego doing technical writing.
“The amazingly rapid development of the light, high-speed engine is the most outstanding single achievement in the development of the internal combustion engine”... this from a celebrated British mechanical engineer. However far we go in agreeing with this statement, we must admit that this progress “is a development... almost of the last ten years.”

For a comparatively long period, from 1897 when a diesel first ran in one piece, until 1925, the diesel was a purely capital goods product, and applied as a large, heavy, slow speed unit to motorships, oil pumping stations, generating plants, submarines, and a few switching engines, etc. Then about ten years ago a small, lightweight, high speed diesel appeared in large quantities in Germany and England, and showed its face elsewhere, including this country.

Diesels were being applied to automotive applications such as trucks, tractors, and small motor boats where previously only a few experimental models existed. Since 1931 one American company alone has produced 2,500,000 horsepower in small diesels where previously it produced none. Almost all of the diesel streamliners have been put into service in the last five years.

CHANGE IN THINKING

The interesting thing about this tremendous growth is that it has come about because of a change in thinking rather than because of any changed economic condition, a change in thinking on the part of engineers the world over who dealt with the internal combustion engine. Formerly, an engineer was not considered well educated unless he “knew” that a diesel engine was inherently an efficient but slow-speed, heavy and expensive engine, practical only in large sizes. Until about 1925 the diesel remained exactly that, but today we realize that those were qualities in our thinking and not inherent in the diesel itself.

Today diesels whose top speed is 6,000 R.P.M. are sold in France, whereas one-fifth that speed was considered high ten years ago. This same engine has a displacement of only 27 cubic inches per cylinder, which is less than that of any American six cylinder passenger car engine. Germany has for several years used diesels in commercial airline operation weighing two pounds per horsepower. It is true these examples are the superlatives to date, but at least they are commercial realities and not sporadic laboratory performances.

When Americans first realized about a decade ago that the theretofore sedate diesel was capable of far more than the inhibitions which chaperoned it in the past had permitted, there was naturally a wave of enthusiastic reaction. The ballyhoo that swept over the diesel industry at the start of the present decade was hardly more conducive to level headed, orderly development than were the previous prejudices. Today, however, the diesel is being evaluated more from middle ground. We know the diesel has certain capabilities and certain limitations, not necessarily “inherent,” but definitely present.

HIGH EFFICIENCY

The primary advantage of the diesel has been and still is its operating efficiency. Fig. 1 shows a comparison of fuel consumption of typical diesel and gasoline motors. Not only has the diesel a lower curve but it has a flatter curve over the load range. In a truck application where the engine operates over a wide load range the diesel shows the greatest advantage, operators finding that the diesel truck gets 80 per cent more miles per gallon than the gasoline truck, in addition to the fact that the fuel costs less. The second most important advantage of the diesel is its reduced fire hazard, a factor which was mainly responsible for the U. S. Navy converting its shore boat fleet from gasoline to diesel. Other items, as the reduced carbon monoxide in the exhaust are advantages in special applications as mines, are not important generally.

The chief disadvantage of the present diesel is its first cost. In spite of all our progress the diesel is still more expensive to build than either the large steam plant or the small gasoline engine. For this reason it is necessary for the diesel to run a minimum number of hours per year to show economy over other power. For example in England, where there is the American equivalent of a tax of 13 cents per gallon on both fuel oil and gasoline, a London omnibus must run at least 22,000 miles per year to pay a diesel. Diesels still weigh more than the equivalent gasoline engine, be it aircraft, truck, tractor, or marine service.
In the small diesel the starting problem is quite a disadvantage. A diesel of say 75 horsepower needs about one-fourth that power to crank it at low temperatures, necessitating either a huge 24 volt starting system or a small gasoline motor with a clutch which is engaged after the gasoline motor has been started by hand.

Diesels are not only noisy, but rough, due mainly to the fast rate of combustion. This gives a big torque fluctuation, especially at low speeds, and a 75 H.P. diesel in a truck will usually require a heavier clutch, transmission, and rear axle than a 75 H.P. gasoline engine. In most cases, but not all, the servicing costs of the diesel are higher than those of the power it replaces. On streamlineders running between Chicago and the Pacific Coast it is customary to shut off one engine while going down grade from the Rockies to remove all its pistons, clean the carbon, and inspect the rings. It is only by such servicing that these trains maintain their high availability and annual mileage.

The big field for the technician today is in attacking these very problems, most of which are tied in with the injection and burning of the fuel. In fact, nearly all of the important progress in getting diesels to their present usefulness has come of work on injection systems and combustion chambers. The study of this problem is somewhat new; it may be an art, but it is certainly far from a science. Most of the laboratories have been engaged in a cut-and-try search rather than a research, but even so their results are of interest.

A diesel engine is, by definition, one in which combustion starts by compression-ignition. A full charge of air is compressed to about 1,000 F., or nearly a dull red heat in metal, into which fuel oil is sprayed at a velocity of several hundred miles per hour. The amount of this fuel oil is very small by volume, being a maximum of about 1/14,000 of the cylinder displacement which in a passenger car sized engine amounts to a cube about 1/7 of an inch on a side. More than this small amount of fuel will not burn completely but will cause the exhaust gases and the engine parts to become black with carbon, and lowers the efficiency. Even to burn all of that little charge we have to break up the fuel into millions of droplets whose combined surface is several hundred times that of the hypothetical cube, hence the high spray velocity, and hence injection pressures of often over a ton per square inch.

**INJECTORS EXPENSIVE**

Parts to handle such small volumes and big pressures are expensive. Injection equipment for a diesel costs more than a complete gasoline engine of the same power, and it is this equipment that is largely responsible for the high first cost of the diesel engine. The situation has been rather unfortunate for the consumer; engine builders could not sell in quantities until they could buy cheaper injection pumps and nozzles, and the makers of this equipment could not sell cheaper until the engine builders bought in quantities. The net result has been that many engine builders, even though not well equipped to make parts accurate to within 20 millionths of an inch, began making their own pumps and nozzles, compromising by saving selling and handling costs. In many cases this saving was small compared to the possible saving that could be effected by having a very few companies produce in large quantities injection equipment designed for mass production. However, with production on all sides increasing, this situation is being constantly improved.

The newly announced General Motors small diesel is of interest from a cost viewpoint since this engine, while not new in a technical way, is unique in a manufacturing way. Mass production will be achieved by the high interchangeability of parts. One single cylinder injection system and one cylinder size only will be made, but these will be made into 3, 4, and 6 cylinder model engines. Thus the principal variation among all models will be length, offering big possibilities for low production costs.

**COMBUSTION PROBLEM**

The problem of good combustion has been one of intimately mixing the fuel and air at the proper time. Some combustion chambers are designed so that the fuel must find the air, others so that the air meets the fuel more than halfway. In the first case the nozzle must direct the fuel to all parts of the combustion space, as shown in Fig. 2. This type of chamber is used by Cummings and General Motors. Several spray orifices of only a few thousandths of an inch in diameter are used. Since their cross-sectional area is naturally fixed, the injection pressure goes up as the square of the engine speed, and it is interesting to note that pressures well over 25,000 pounds per square inch have been recorded in the G. M. nozzle.

(Continued on page 10)
ALUMNI ACTIVITIES

SEPTEMBER MEETING
The first meeting of the year is scheduled for September 22nd, and will be interesting and enlightening, as well as being somewhat out of the ordinary for most Alumni. The subject of the meeting is “Geophysical Prospecting,” about which most of us could know considerably more than we do. Speakers are Herbert Hoover, Jr., head of the Geophysical Co., and Dr. Raymond A. Peterson, ’31, who is associated with him.

It will be held at the Mary Louise Tea Room, located on the top floor of Barker Bros. Building, Seventh and Figueroa Sts., Los Angeles. Free parking is available on the lot adjoining Barker Bros., on the south. The auditorium adjoining the tea room, in which the meeting will take place, will seat 250, so don’t be bashful about attending.

OXY GAME
Following a custom instituted in recent years, there will be a gathering of Alumni, their wives, sweethearts, and families immediately following the Oxy game which will be held at Rose Bowl on Saturday night, October 21st. Detailed plans are as yet incomplete, but the gathering will probably take the form of a dance. Arrangements are in the capable hands and fertile brain of past President Ed Kinsey, ’26 who may spring anything.

This occasion is a “home coming” to many Alumni, so all that is necessary is to advise them where to get together. When the arrangements are completed you will be advised,—in ample time. In the meantime save the date, October 21st.

JUNE BANQUET
The annual Commencement Day Banquet of the Alumni Association was held at the Athenaeum on June Ninth and was attended by over two hundred alumni, especially honoring the reunion classes of 1914, 1919, 1924, and 1934.

The results of the annual election of officers for the coming year were announced and the retiring officers were given a huge ovation for the successful program accomplished. Guests of honor included Mr. Allan C. Balch, President of the Board of Trustees, Dr. Robert A. Millikan, Lloyd Goodmanson, student body president and basketball captain, and the captains of the football, baseball, track and tennis teams. Professor Franklin Thomas delivered a talk on the “Report to Engineering Committee of Institute Associates” covering the status of the engineering department which is reported more fully elsewhere in this issue.

Dr. Henry Borsook, professor of biochemistry, addressed the assembly on “Social Consequences of Biological Engineering.” Doctor Borsook described the present status of knowledge in the biological sciences and the implications of the use of such knowledge, especially of nutritional needs and vitamins.

SAN FRANCISCO
The San Francisco chapter has inaugurated the policy of holding regular weekly luncheon meetings held on Mondays at the Fraternity Club in the Palace Hotel in San Francisco, which all visiting alumni are cordially invited to attend.


The San Francisco chapter held its annual Field Picnic at the Berkeley Country Club, the day being featured by a golf tournament followed by dinner in the evening, and card games.

WASHINGTON
The Washington group of the Alumni Association met on May Ninth last and were addressed by Lieut. Robert M. Losey, M.S. (My.), ’35, M.S. (Ae.), ’37, who is now assigned to the office of the Chief of Staff of the U. S. Army Air Corps.

Lieutenant Losey’s topic was “Air Power,” in which he traced the history of armament until the development of the modern high speed bomber which he said ranks with the invention of gunpowder in changing the character of warfare. After finishing his talk, a round table discussion was held.

Those in attendance at the dinner meeting were C. A. Bercauw, ’18, W. Bleakney, Ph.D., ’32, R. P. Bryson, M.S., ’37, P. Harney, M.S., ’35, and T. Southwick, ’27, in addition to Lieutenant Losey.

The Washington group is planning to hold several meetings during the coming months, and any alumni near Washington or contemplating a visit there should contact Patrick Harney, 3717 Warren St., N.W., Washington, D. C.

NEW YORK
The New York group held its Annual Stag meeting at the Western University Club on the evening of June Ninth, the day after the famous Long Island exercise. The meeting was well attended and greetings were forwarded to the Institute, where the Alumni Banquet was being held at the Athenaum.

Any alumni in the vicinity of New York are requested to contact Rea Axline, ’31, The Metallizing Co., 21-07 41st Ave., Long Island City, as the group is planning a full program of interesting meetings throughout the year.

ALUMNI PROMINENT IN GOVT. INSTITUTE
Each year the University of Southern California sponsors an Institute of Government which was held during the week of June 12th to 16th of this year. Its objective is to furnish new information to those engaged in governmental service as well as to help stimulate and improve the administration. Alumni of the California Institute of Technology have always played a prominent part in the proceedings, especially in the technical sections of governmental work.

In the Building Inspection Section, John E. Shield, ’22 and Ernst Maag, ’26 played a prominent part. Grant V. Jenkins, ’24 served as a member of the committee for the Group Work and Recreation Sections. Markham E. Salsbury, ’25 and Maxwell F. Burke, ’27 were on the program of the Public Engineering Section. While A. P. Banta, M.S., ’28 and Richard Pomeroy, ’26 were on the program of the Water and Sewage Works Operators’ Short Course.

In addition to above named sections, other fields of governmental operation and administration were covered such as Housing, Power Supply and Distribution, Personnel Administration, and Planning. The Institute of Government provided an opportunity for those in public service to improve their work technique, and next year’s session is being awaited by those who attended this year.

In Memoriam
GRINNELL
Prof. Joseph Grinnell, ’97, director of the University of California Museum of Vertebrate Zoology, died on May 28, 1939, at Berkeley, California, at the age of 62.

Professor Grinnell was one of the world’s most eminent ecologists, specializing in the birds and mammals of California and Alaska. He was professor of biology at Throop for five years, and had been professor of zoology at the University of California since 1908.

At the time of his death he was editor of The Condor and fellow of the American Ornithologists’ Union, American Academy of Arts and Sciences, and of the California Academy of Sciences.

STORMS
Charles A. Storms, ’23, died of cancer on August 22, 1939, at Rogers City, Michigan, at the age of 51. He was survived by his widow and four children. Until his illness, he was electrical engineer for the Michigan Limestone and Chemical Co. at Rogers City.

Mr. Storms was acquainted with his condition for some time before his passing and faced his destiny with courage as evidenced by a letter disclosing his reactions published in Time magazine for August 21, 1939.
PARTIAL RESULTS OF THE 1937 ALUMNI SURVEY

By Donald S. Clark, '29, M.S., '30, Ph.D., '34
Director of Placement

In April, 1937, a questionnaire was sent to all men who had received degrees from the California Institute of Technology during the period 1911 to 1936 inclusive. Within this period, 1,872 individuals received degrees. Of these, 1,274 men received the B.S. degree without pursuing graduate work; 329 men received the M.S. degree subsequent to their Baccalaureate degree; and 269 Ph.D. degrees were conferred. Some of these men were deceased, and the whereabouts of others was not known. Therefore, a total of 1,730 questionnaires were mailed. The statistics on the response to this survey are given in the following table:

<table>
<thead>
<tr>
<th>Degree</th>
<th>Sent</th>
<th>Returned</th>
<th>% Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.S.</td>
<td>1190</td>
<td>667</td>
<td>55.5%</td>
</tr>
<tr>
<td>M.S.</td>
<td>293</td>
<td>154</td>
<td>52.7%</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>247</td>
<td>132</td>
<td>53.2%</td>
</tr>
<tr>
<td>Total</td>
<td>1730</td>
<td>947</td>
<td>54.6%</td>
</tr>
</tbody>
</table>

The purpose of this survey was to determine what fields of endeavor the graduates had entered and how well they were doing. The questionnaire included 21 questions. For this survey each individual has been classified according to the highest degree he received from the Institute.

As a result of the survey much information has been accumulated, all of which it is impossible to set forth in these pages. The Editor of the Alumni Review has therefore selected certain charts and graphs which he believes will be of greatest interest to the Alumni.

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Relation of Job to Training

Many may wonder what proportion of the graduates stay with the type of work for which they were trained in school. This question is considered in the first chart. Of those who stopped their academic training with the B.S. degree, in 1937, 63 per cent were doing work in the field for which they were trained. The detailed record shows, as may be expected, that a larger proportion of the more recent graduates are in the field for which they received training, while the proportion for the earlier classes is less (actually about 50%). The group referred to as "Technical not Same" includes those men who were doing technical work, but in a field other than that for which they received their academic training. The same type of information is given for the M.S. and Ph.D. men. As might be expected, men who receive the higher degrees remain in the technical field.

(Continued on page 9)
ALUMNI YOU SHOULD KNOW

PHYSICIST

Carl David Anderson, '27, Ph.D., '30, is the most outstanding product of the California Institute of Technology in the scientific world. His work in the study of nuclear physics was climaxed by the discovery of the free positive electron on August 2, 1932, for which he was awarded the Nobel Prize in Physics in 1936. According to Dr. Millikan, himself a Nobel Laureate, "Dr. Anderson, too, though a very young man, has had other notable accomplishments in addition to the discovery of the positive electron. He is largely responsible for the initiation of the whole group of researches, now of world wide extent, by which the energies of cosmic rays were made directly and accurately measurable. He and Neddermeyer were the first to prove by direct photography that a gamma ray photon impinging upon the nucleus of an atom produces through that impact a positive-negative electron pair. He and Neddermeyer have also been the first to demonstrate that pair formation is not the sole mechanism determining the absorption by the nucleus of an atom of high energy photons or electrons." In addition to the award of the Nobel Prize in Physics, Dr. Carl Anderson has received the honorary degree of Doctor of Science from Colgate University, the gold medal of the American Institute of the City of New York and the Elliot Cresson medal of the Franklin Institute. His entire career has been at the California Institute of Technology where he now is Associate Professor of Physics. He is a member of the National Academy of Sciences and of the American Philosophical Society.

INVESTMENT EXECUTIVE

After a brief period of valuable experience in the commercial and engineering world, Theodore C. Coleman, '26, entered his chosen field, finance. Following receipt of his degree in Engineering and Economics, Ted served in the commercial department of Pacific Telephone and Telegraph Company, then was junior and later senior draftsman with the Los Angeles Road Department.

In the spring of 1929, with the security business at a peak, he became a bond salesman for Blyth and Company in Pasadena. Just a year later came the well-remembered nadir. Offices were closed and only a few veteran executives were retained. But Ted, building for the future, took a brave step in arranging to open a Pasadena office for Banks, Huntley and Company. During depression years he developed the business, built an organization and served for one year as president of the Pasadena Bond Club. His success is evidenced by a series of scintillating accomplishments.

Today, Ted is vice-president in charge of sales and is a partner in the firm of Banks, Huntley and Company. Eight offices are maintained in California, two in New Mexico. Some 45 men are under his direction. He is currently director for California of the Investment Bankers Association of America, and is a director of the Cal Tech Alumni Association. At the Valley Hunt Club he finds time to enjoy tennis.

September, 1939
Two hundred and thirty-eight students were awarded degrees at the annual commencement exercises held on June ninth on the campus lawn beside the Athenaeum. Thirty-two degrees of doctor of philosophy were given, fourteen of the candidates having been recipients of earlier degrees from the Institute, seventy-eight received degrees as masters of science, thirteen became members of science in the five courses in aeronautics and meteorology, and one hundred and fifteen received bachelor's degrees.

Of the graduating seniors, eleven were awarded Honor Keys for participation in student activities, and nine were graduated with honor by vote of the Faculty. Roderick C. McClung was the only graduate honored by both Faculty and the Student Body.

William C. Mullendore, Executive Vice-President of the Southern California Edison Company, delivered the commencement address entitled, “Opportunity in the Forties,” in which he touched on the American system of freedom and current trends. Dr. Most Reverend John J. Cantwell, Archbishop of Los Angeles, delivered the Invocation and Benediction.

The degrees were conferred by Dr. Robert A. Millikan, who also delivered a report on the progress of the Institute and elaborated on the purposes of the new labor relations department.

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**Grand Coulee Pumps**

One of the most important engineering research projects now under way on the campus are the pump testing investigations being made for the pumping installations at the Grand Coulee Dam in Washington. The project is sponsored by the U. S. Bureau of Reclamation and is directed by Robert T. Keppel, Ph.D., 29, professor of hydraulic engineering, with Donald P. Barnes, M.S., 30, as resident engineer for the Bureau.

The tests were undertaken as a consequence of the successful results of the investigations made for the Metropolitan Water District of Southern California, whereas the Water District has eight pumping plants of 200 c.f.s. capacity for a total of 1,600 c.f.s., each of the Grand Coulee pumps will have a capacity of 1,600 c.f.s., and 12 units are to be constructed ultimately.

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**Sorensen Honored**

Dr. R. W. Sorensen, professor of electrical engineering, received the award for the outstanding contribution in the field of public relations and education of the American Institute of Electrical Engineers at its annual meeting in June held in San Francisco. The award, which has not been made since 1935, was for his paper, “The Economic Status of the Engineer,” published in Electrical Engineering.

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**Cosmic Ray Ray**

Dr. Robert A. Millikan, accompanied by H. Victor Neher, Ph.D., 31, and William Pickering, '32, Ph.D., '36, sailed for Australia and New Zealand last month to make an extended series of researches on the total cosmic energy brought to the earth at different latitudes, especially near the equator. In addition to work in Australia, tests will be carried on in Tasmania, Dutch East Indies, and India.

In these experiments a new type of instrument, developed by Neher and Pickering, will be used which transmits by radio signals to a ground station data gathered during the balloon flight, making unnecessary the return of the instrument. The principle involved is not new, but the method is expected to improve the accuracy of the results attained.

While in Australia, Doctor Millikan will deliver a series of twelve broadcasts for the New Zealand and Australian Broadcasting Commissions. In addition he will act in an advisory capacity on the development of industrial research.

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**ENGINEERING OBJECTIVES**

The Engineering Committee appointed by the Board of Trustees last January, as reported in the March issue of the Alumni Review, is making a study of engineering requirements and curricular needs. The Committee has for its consideration a report from the members of the engineering staff, obtained mainly through questionnaires. The basic engineering research are the aims of the Institute as reiterated by the engineering staff in its report to the Engineering Committee of the Institute.

The present excellent standing which the engineering course has attained, notwithstanding its relative youth, rather meager equipment, and small engineering faculty, is due to a consistent adherence to high scholastic standards and to the fortunate association with distinguished departments in the fundamental sciences, according to the report.

In order that the engineering course, undertaken by 65% of the undergraduates, 75% of the candidates for the master’s degree and 25% of the candidates for the doctorate, may remain favorable with the science courses and with other engineering colleges, the instruction staff should be strengthened, especially by the engagement of visiting lecturers pre-eminent in their fields.

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**PLACEMENT REPORT**

The Alumni Placement Service during the year ending July 1, 1939, placed 166 men in positions, as compared to 146 the previous year, according to the annual report of Dr. Donald S. Clark, 29, Director of Placements. However, while the total number of placements is greater, the number of requests for applicants is less. A greater number of individuals registered as unemployed in the past year as compared to 1937-1938.

The Placement Service received 277 requests for applicants for full time positions. Men were sent to 242 of these requests, and 22% of the requests were filled by men supplied from the Placement Service. During the past year 205 men were registered as unemployed, as compared with 138 for the previous year, while 41 were listed as unemployed as of July 1, 1939, against 31 on July 1, 1938, exclusive of the classes of 1938 and 1939.

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**CAMPBELL ELECTED**

Dr. Ian Campbell, who is associate professor of petrology, has been elected to serve a five year term on the Executive Council of the Pacific Division of the American Association for the Advancement of Science, succeeding Dr. W. V. Houston.

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**VITAMIN B-1**

John B. Hatcher, '37, is doing research at the Institute on the tracing of the course of vitamin B-1 in the living system. In order to follow the vitamin it was made "visible" by producing Vitamin B-1 from synthetic radio-active by the cyclotron at the University of California, which was done by Dr. Edwin McMillan, '28. Hatcher uses himself as a "guinea pig," taking approximately two or three grams of the radioactive Vitamin B-1, and tracing the course through his body by means of Geiger counters.
The next item of interest is the type of work in which the graduates were engaged at the time the survey was made. This information is given collectively in the second chart, which is self-explanatory. It is of interest to note that 14 per cent of the men who received the B.S. degree were in administrative positions. With the higher degrees a larger proportion of the men were found in teaching and research.

The General Course, which was discontinued several years ago, contributed most heavily to the fields of accounting and statistics. Men in administrative positions pursued the courses in Mechanical, Electrical and Civil Engineering while attending the Institute. Those engaged in construction came principally from Civil Engineering. The principal source of men with the B.S. degree who were in research was Chemical Engineering. Graduates of the Mechanical and Electrical Engineering courses make up a large portion of those who were in the teaching field. Most of the B.S. men who were in the field of teaching took their work in Physics and Electrical Engineering.

Starting Salaries

It is of considerable interest to study the variation of starting salaries from year to year. This information is given in the second graph. The results are given insofar as there was sufficient data. The medians were obtained from the distribution curves for each class. The effect of depression is easily recognized, and it may be significant to note that up to 1936 starting salaries had not returned to pre-depression values.

Each member of a particular class is interested to see how his salary compares with the median salary of his classmates. The median salary for each class is presented in the first graph. The range of salaries is from less than $1,000 per annum to more than $5,000 per annum. About 10 per cent of the men reporting were receiving in excess of $5,000 per annum.

The results of this survey seem to indicate that graduates of the California Institute of Technology are in as good positions as graduates of other institutions. When considering these results it must be remembered that the data is only a sample of each class, and whether it is representative is a matter of some speculation.

Consideration should also be given to the fact that the California Institute of Technology is relatively young, and since 1911 many changes have occurred in curriculum and policy. The Institute has been and still is growing, and its reputation has been and is in the process of being made by its graduates. A survey several years from now may be more illuminating and a more accurate representation of progress.

Appreciation is extended to the alumni who so willingly filled out and returned the questionnaires, thus making this survey possible.
DIESEL SITUATION

(Continued from page 4)

The type of chamber in which the air also seeks out the unburned fuel droplets is called the "divided chamber" as distinguished from the "direct" type just mentioned. Fig. 3 is a divided chamber of the ante-chamber or precombustion chamber design, and is similar to that manufactured by Caterpillar and International Harvester. More of these engines have been built in this country by these companies than all others combined. Here we have a chamber in which the object is to provide a high air velocity through the throat connecting the two halves to mix the fuel and air before and during combustion. A single orifice nozzle is used. Fig. 4 shows a form of the rotational swirl type of chamber, similar to the designs made by Fairbanks-Morse, Hercules, and Waukesha in this country. As the piston rises, the air rushing through the throat into the spherical chamber gives itself a high rotational swirl, into which a single spray is injected. It has been found that the R.P.M. of the air should be about 25 times that of the engine. Over 2,000,000 horsepower of the swirl type are in use today throughout the world.

Fig. 5 shows the energy-cell chamber and is the design built by Buda, and by Chrysler and Mack Truck in their recently announced diesel trucks. Here a very narrow spray shoots across a gap over the center of the piston into a cell which contains only a small part of the total air of the chamber. High air velocities begin after combustion first starts, and a jet of burning gas meets the rest of the spray from the nozzle and mixes it with the remaining air. Pressures well over 1,000 pounds per square inch occur in the cell before the combustion chamber. The direct injection chamber has the advantage of a lower heat loss from the gas to the cooling water, since the ratio of surface to volume is lower than in the divided chamber and the turbulence is less. Because of this the economy of the direct type is usually higher and cold starting is easier. To assist starting in the divided type a "glow plug" is often used. This is a small loop of resistance wire which is placed near the spray and heated electrically red hot before the starter button is pushed. Most diesels running over 2,000 R.P.M. are of the divided type, since that design provides an air turbulence that increases with speed, thus keeping the combustion period somewhat constant in terms of crank angle. The divided chamber is thus a more "flexible" engine, but more than that, it is often the quieter and smoother of the two since the mixing of air and fuel can be better controlled. Where the entire burden of mixing is not put on the injection system, injection pressures can be lower and the system made cheaper. Also, the single orifice nozzle usually used with such chambers can be made in the variable area type, so that as the speed increases excessive pressures do not result.

On the other hand, the direct injection type lends itself to 2 stroke design very well, and by this means rather than by mere high speed more power can also be obtained per unit weight of the engine. Several manufacturers of large diesels, and General Motors in the small field, make use of the 2 stroke principle, adding a blower to the engine to scavange out the exhaust gases and in some cases to give a supercharge. Since in the diesel we are scavenging with pure air the problem is greatly simplified over that of the 2 stroke gasoline engine where much of the incoming mixture was lost in the exhaust with the burnt gasses it was attempting to push out.

DIESEL FUTURE

What of the future of the high speed diesel? In the railroad field it seems destined to supplant the reciprocating steam engine, now that it is a lightweight power-plant, as surely as it has this engine in the marine field. However, we have given it every known advantage in the form of a special lightweight, streamlined train, and it competes against locomotives that are our most inefficient prime movers thermodynamically in use today. Shortly we are to see how it stacks up against really modern steam railroad equipment.

For aircraft use, the spark ignited engine has so far been two jumps ahead of the diesel on specific weight. In the laboratory it is using "safety fuels" which compare well with diesel fuel oil for fire safety. In the laboratory it is also ahead in efficiency; a standard aircraft engine, using 100 octane fuel instead of gasoline, and special pistons and supercharger gears has shown an economy of 0.35 pounds per brake horsepower hour. As to specific output, spark ignition test engines have produced 540 lb./sq. in. brake mean effective pressure. In the face of such spectacular performances there is little incentive for diesel aircraft development, although a number of excellent engines have been built commercially the world over that a few years ago would have been satisfactory for American aircraft use.

As for passenger car applications, at present the diesel is too expensive in first cost to be economical, even with the present price differential between gasoline and fuel oil. Possible economy would seem to be its sole advantage for such use. Some years ago an American automobile manufacturer offered diesel power as an option, but apparently without success for the option was soon withdrawn. In Europe such cars are available, five manufacturers are offering diesels suitable, by European standards, for passenger cars. The advantages for taxi service in Europe, where gasoline costs several times what it does here, seem excellent. Americans have been spoiled by fine gasoline motors, and even the best of diesels when installed in a passenger car seems at low speeds rather rough and noisy, though at high speeds it is impossible to detect the difference.

The next big field for the American diesel would seem to be the light truck. The engines for these may not be more efficient than the diesels available in the past, but they will be cheaper. Until the diesel is satisfactory for this field it probably will not be so for passenger cars.

Besides becoming cheaper, the diesel will continue to become cleaner burning, more flexible, smoother, lighter, and easier to start. American ingenuity will continue to "make it better and cheaper." Some men today say we know too many facts about effects, too few about causes. Others say we know all the facts we need but don't know how to use them. The improved diesel of tomorrow will probably be indebted to both these groups.

ALL SOUTHERN CALIFORNIA MEMBERS

"LIFTING MOTHER EARTH'S SKIRTS"

HERBERT HOOVER, JR. and DR. RAYMOND A. PETERSON. '31

of United Geophysical Company

will talk on

"GEOPHYSICAL PROSPECTING"

SEPTEMBER 22, 1939

Mary Louise Tea Room

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Free Parking South of Building

7th and Figueroa Streets

Los Angeles, Calif.

Alumni Review
BOOKS

REFUGEES FROM THE DUST BOWL
THE GRAPES OF WRATH
By JOHN STEINBECK

FACTORIES IN THE FIELD
By CAREY McWILLIAMS

Reviewed by Prof. William Huse

It is a fortunate coincidence that these two books were published within a few weeks of each other. Dealing with the same general material—migratory farm labor in California—they furnish an interesting contrast between the method of the novelist and the factual analyst. Furthermore, they supplement each other. Mr. Steinbeck is concerned with the human values of a single family, while Mr. McWilliams supplies the background which makes the vicissitudes of that family understandable in terms of social and economic forces.

Perhaps it is more than coincidence that is responsible for the almost simultaneous appearance of both these books. They may be symptomatic of a rapidly increasing awareness of the migratory labor situation as one of the most urgent problems which confronts the state of California, and a concern over finding a real solution.

Whoever has seen on the highway an ancient automobile stalled or wheezing uncertainly along, its sides hung with battered household effects, and an incredible number of people stowed among bedding-rolls, has seen the subject of Mr. Steinbeck's novel. He introduces us to the Joad family while they are still in Oklahoma. Unpossessed by drought and mud, they join the horde of westward migrants. Three generations of them load their meager possessions into an ancient truck and start for California. They look forward to a promised land where there will be plenty of work in the orchards or in the cotton or vegetable fields, and where they will be able eventually to realize their modest utopia of a cottage with screens and land of their own to work.

The first section of the story, which describes their preparations for leaving Oklahoma and the start of their westward trek, has a grotesque, earthy humor which is reminiscent of Erskine Caldwell's Tobacco Road and God's Little Acre. But as the family proceeds westward, the tone becomes more somber; and their story is one of increasing tragedy as their hopes are cruelly disappointed and the family group disintegrates.

The values that Mr. Steinbeck finds in them are first of all courage, and next to courage a common humanity which unites them in sympathy and generosity with others as unfortunately as they. Their courage is best exemplified in Ma Joad, who refuses to give up hope even in the face of the most staggering disappointments; their humanity, in their willingness to share whatever they have, however meager, with anyone in distress.

As brief a review as this cannot convey the power of individual scenes, the range and vividness of characterisation and the passionate sincerity with which Mr. Steinbeck unfolds this saga of social injustice. But in spite of the unquestionable power of the story, it has, to my mind, the defect which is almost inevitable in propaganda fiction. Such fiction, if it is to engage our sympathies, must present its problems in terms of specific human beings. But at the same time, the activities through which its characters move must be sufficiently representative so that they convey a whole general situation. The result is that the characters tend often to lose their reality as individuals and become symbols of larger forces or relationships. This defect appears most strikingly, I think, in the preacher who accompanies the Joads on their hegira; and it certainly is responsible for the pathos of the last episode.

Complex Forces

The complex of social and economic forces which is to blame for the plight of the Joads and their thousands of fellow-refugees from the dust-bowl is the subject of Mr. McWilliams' analysis in Factories in the Field. A long interest in the problem of migratory labor in California, and his experience as California Commissioner of Immigration and Housing give weight and authority to his analysis. His fundamental thesis is that the migrant hordes from the Dust Bowl present only a further and more acute manifestation of a problem which has been a characteristic of California economy since the middle of the 19th century. The problem is caused, he believes, by large-scale land-holding in the state, which has made farming essentially an industrial enterprise, with a labor problem like that of any other large industry, only more difficult because of the seasonal nature of the work.

Hitherto, the problem has never been really acute because it has mainly involved aliens — Chinese, Japanese, Filipinos, Hindus — who were relatively powerless to resist repression and exploitation. But with the coming of the dust-bowl emigres, Mr. McWilliams points out that the expediencies of the past will no longer suffice. For one thing, there are far larger numbers of people to be dealt with. But more important, they are Americans. Trying to ignore them by asserting that they are of inferior stock is as futile as trying to dispose of them by denying them relief. And they are not likely to submit indefinitely to the terror of local vigilantes and the denial of their constitutional rights. In Mr. McWilliams' view, the only solution must come through eliminating the cause of the whole migratory labor problem — that is, by breaking up large landholdings and de-industrializing California agriculture.

Whatever the ultimate solution, both of these books under discussion perform a valuable service. Mr. Steinbeck's Wrath has already had, at a very conservative estimate, over half a million readers; he has made them aware, in a dramatic and forceful fashion, of an urgent problem exists. With public opinion thus mobilized, the way is prepared for such analyses as Factories in the Field, which are essential if a humane, equitable solution is ever to be found.
Conducted by George Langsner, '31
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.

1918
M. J. Dowd, Chief Engineer and General Superintendent of the Imperial Irrigation District, addressed the annual convention of the American Society of Civil Engineers in San Francisco last July on "Silt Problems of the Imperial Irrigation District Resulting from the Completion of Hoover Dam."

Frank Capra has organized Frank Capra Productions, Inc., in association with Robert Riskin. Capra and Riskin teamed together for six years turning out such successes as "It Happened One Night, Mr. Deeds Goes to Town, Lost Horizon, You Can't Take It With You."

1920
Harry P. St. Clair, who is with the American Gas and Electric Service Corporation, has been elected a member of the executive committee of the American Institute of Electrical Engineers in San Francisco in June on "The Use of Multi-Winding Transformers for System Voltage Regulation."

1921
Dr. Arthur L. Klein, who is associate chief engineer of the American Cyanamid Corporation, has been appointed assistant resident manager of the Azusa Chemical Company.

1922
Kellogg Krebs, x22, has been appointed assistant resident manager of Akuza, Calif., office of the American Cyanamid Chemical Corporation.

1924
Oliver W. Kilham has been appointed chief engineer of the American Pipe and Steel Corporation at Alhambra, California.

1925
Neal D. Smith has been appointed City Manager of Ontario, California, and he will also act as City Engineer, head of the Water Department, and Superintendent of Streets.

1926
J. Edward Kinsey has been named as a member of the executive committee of the Los Angeles Community Chest, and will again head the Business Division in the forthcoming campaign.

1927
Dr. John H. Maxson, who is assistant professor of geology at the Institute, was married to Miss Helen Ward in Pasadena on September 5th.

Dr. Carl D. Anderson spoke over the Columbia Broadcasting System network on June 5th on a Science Service program from Washington, D.C., discussing cosmic rays and the positron.

Dr. Frank A. Nickell, geologist for the U.S. Bureau of Reclamation, discussed the geology of dam sites at the recent convention of the American Society of Civil Engineers in San Francisco.

Florent H. Bailey, who is with the Paintec Oil Company at Caracas, Venezuela, Day Engineering and visited the Institute to interview civil engineering and geology graduates for his company.

Borice Z. Boris is the father of twins, Alan and Barbara, born on August 7th in Los Angeles.

1928
Arnold O. Beckman, Ph.D., has been elected a councilor of the Southern California Section of the American Chemical Society.

Carlos L. Corcuera, x28, is manager of refineries for the Mexican government, and as such was mentioned in the recent Saturday Evening Post article, "What Has Happened to Mexico's Oil." One of his assistants at the Agila refineries is Alfonso C. Bulnes.


G. Austin Schroter, x28, manager of Mines and Exploration of the Filtor Corporation, presented a paper on recent trends in absorbent clay technology at the Golden Gate meeting of the American Ceramic Society in San Francisco, August 12th.

Edward Joujon-Roche is the father of a daughter, Ann, born on July 21, 1939.

Philip Durfee is on active duty with the U.S. Army Air Corps as a first lieutenant and stationed at Hamilton Field, near San Francisco.

Albert E. Lombard, Jr., received his doctor's degree from the Institute in June, and he has been appointed assistant professor of aeronautics at the Institute.

1929
Samuel Olman is now on the engineering staff of C. F. Braun and Company at Alhambra, Calif.

Harlan Asquith has accepted a position in the design department of the Vega Aircraft Corporation at Burbank, Calif.

William H. Mohr has been promoted to a captaincy in the Engineer Reserve, and recently completed a tour of duty at March Field, California.

Robert T. Knapp, Ph.D., professor of hydraulic engineering at the Institute, delivered a paper on "Design of Curves for High Velocity Open Channels" at the annual convention of the American Society of Civil Engineers.

1930
Lawrence J. Grunder has been elected councilor of the Southern California section of the Society of Automotive Engineers for the coming year.

Willard A. Findlay sailed early this month for Karachi, India, where he will be geologist for the Standard Oil Co. of California and is previously seen duty in Australia and Portuguese East Africa.

1931
Francis D. Bode has returned to his duties as instructor in geology at the Institute after being on leave for two years doing geological mapping and exploration in North Africa. The greater part of his work was in Ethiopia, following the Italian occupation, with the last six months being spent in Egypt.

Robert W. Wilson is now an instructor in geology at the University of Colorado, and was in charge of classifying fossils uncovered in the vicinity of Lake Mead for the National Park Service during the summer.

R. Stanley Lord, assistant hydraulic engineer for the Water Resources Branch of the U.S. Geological Survey, has been transferred to the Washington headquarters of the Survey.

Donald P. Barnes, M.S., of the U.S. Bureau of Reclamation, discussed hydraulic testing at the recent convention of the American Society of Civil Engineers.

Robert Remye, x30, was married to Miss Muriel Rolls in San Francisco on June 3rd.

September, 1939
1931
Sam Eastman wishes to announce that the firm of Dozier Graham Eastman, specializing in advertising and merchandising counsel on industrial and technical products, has moved its offices to the Bendix Building in Los Angeles.

George Rice, III, was married to Miss Onis Danielson in Los Angeles on June 18th.

1932
Brian Sparks, who is a co-pilot for Pan-American Airways, on the Transpacific route, addressed the student body of the Institute last May on "Flying the Pacific."

J. H. A. Brahzt, Ph.D., engineer of the U.S. Bureau of Reclamation, delivered a paper on "Determination of Stress by the Use of Indirect and Mathematical Methods" in the Symposium on Masonry Dams at the recent convention of the American Society of Civil Engineers, and discussion on his paper was led by Carl H. Heilbron, associate engineer, U. S. Engineer Office, Los Angeles.

William H. Clausen is the proud father of a daughter, Jane, born on July 27th.

1933
William Bergren is assistant conductor of the Pasadena Musical Festival Chorus which presented a performance of Handel's oratorio, "Jeptha," at the Pasadena Civic Auditorium last June.

Louis A. Pipes, who is a member of the engineering faculty at Harvard, presented a paper on "Transformation Theory of General Static Polyphase Network" at the annual convention of the American Institute of Electrical Engineers.

Gregory K. Hartmann received his doctor's degree from Brown University last June.

1934
Robert P. Sharp has been doing research work in the Ruby Mountains of Nevada during the summer under a grant from the Geological Society of America.

Robert Escherich married Miss Jeanne Cottner on July 21, 1939. He is a member of the firm of Escherich Bros., who are the contractors on a $2000000 group of buildings for the U. S. Army Air Corps at March Field, California.

Ray E. Kidd was married to Miss Dorothy Ingalls in Scotia, N. Y., on July 6, 1939.

Walter Howland and Gilbert McCann received their doctor's degrees from the Institute in June.

Wallace Johnson is now machinery sales engineer for the Moore Machinery Co. in Los Angeles.

Robert John Hallanger was married to Miss Virginia Van Arsdale in Riverside, California, on September 9th.

Claude T. Scott was married to Miss Hahn Hargrett in Yuma, Arizona, on June 23rd.

1936
Everette E. Griffith was married to Miss Dorothy Doig Donaldson in Pasadena on June 30th.

Thomas Lauritsen, who received his doctor's degree from the Institute in June, has been awarded a traveling fellowship and is doing advanced study at Copenhagen under Dr. Nils Bohr, one of Europe's most brilliant theoretical physicists.

Paul H. Hammond was married to Miss Olena Estella Beardsley in Visalia, Calif., on April 9, 1939.

Wilson H. Bucknell was married to Miss Jean Snow of Lynnwood, Calif., on April 22, 1939.

Peter Serrell was married to Miss Kathleen Ainslie Macleish of Santa Barbara, on August 19, 1939.

Bruce L. Hicks received his doctor's degree in June at the Institute and is now on the physics staff of the University of Wyoming.

Robert Dilworth and Reuben Wood received their doctor's degrees at the Institute last June.

1937
Robert M. Dreyer, M.S., who received his doctorate at the Institute in June, is now an instructor in geology at the University of Kansas.

Bruce McKee was married to Miss Evelyn Bean of South Pasadena, in Dallas, Texas, on May 3rd.

A. E. Harrison, M.S., delivered a paper on "Ionization Time of Thryptons" at the recent American Institute of Electrical Engineers convention in San Francisco.

Carl Johnson is now a junior engineer in the Rivers and Harbors Section of the U. S. Engineer Office at San Francisco.

Robert Park is working on the Gulf Coast as a geophysicist for the Standard Oil Company of California.

Martin J. Poggi is now with the Consolidated Aircraft Corporation at San Diego.

Robert Mahoney, who is employed by the U. S. Vanadium Corporation, has been assigned to the newly established publicity relations department to do safety work, and is now visiting various plants to familiarize himself with operations.

Joseph J. Peterson was married to Miss Shirley Martin of Pasadena, on August 19th. The couple are on a honeymoon trip to the Philippine Islands to visit Peterson's parents, and will return to Peoria, Illinois, where he is employed by the Caterpillar Tractor Company.

J. Ridgeley Leggett, who is a party chief for the Mott-Smith Corporation, has been transferred from Egypt and is now working at Ramadi, Iraq.

Jack George is a graduate student in geology at the University of California at Berkeley.

John R. Austen was married to Miss Helen Elizabeth Taylor at Easton, Pennsylvania, on August 19th.

1938
Robert Davidson was married to Miss Ruth Gwin in the Chapel at Occidental College on June 23rd.

John R. Baker is now on the engineering staff of the Baker Oil Tool Company.

Philip F. Shepherd is with the Shell Development Co. at Berkeley.

George H. Osborn is working for the Signal Oil Co. engineering staff at Long Beach.

George B. Holmes is now a student at the Harvard Graduate School of Business Administration.

Eugene Oyster, Ph.D., has been awarded a National Research fellowship at the University of Michigan.

Saul Weinstein, Ph.D., is at Harvard under a National Research Council fellowship.

Carl F. Friend was married to Miss Jane Lou Hare in Glendale, Calif., on May 23rd.

Herbert Bailey Elia was married to Miss Ellen Hutchinson of West Orange, N. J., in Los Angeles on June 23rd.

Daniel L. Gerlough was married to Miss Jean Claire Shearer in San Francisco on August 3rd.

Albert Jurs and William Freed are now bachelor's degrees in electrical engineering at Stanford and the Hopkins Marine Laboratory.

Richard H. Hopper, Ph.D., is a geologist in Sumatra for the N. V. Nederlandsche Pacific Petroleum Matschaps, a joint subsidiary of the Standard Oil of California and of the Texas Company.

Homer Smith Youngs was married to Miss Ann Ellwood Lewis in Pasadena on July 21st.

Kenneth Macleish has a physics fellowship at the University of California.

Josiah Smith, Robert Tangren and James Braithwaite are continuing studies in aeronautics at the Institute.

Charles Pettingall is working for the Lockheed Aircraft Company at Burbank, California.

Paul Smith is with the Douglas Aircraft Company at Santa Monica.

Roderick McClung is a research assistant in mechanical engineering at Iowa State College.

Paul Engelder is under contract with the St. Louis Browns and has been playing with the Albuquerque baseball team.

Marcus Hall is a student at the Harvard Graduate School of Business Administration.

Jack Goedell is taking the test course of the General Electric Company at Schenectady.

Francis Robertson is working for the American Potash and Chemical Corporation at Trona, Calif.

Charles Bauer is a chemist for the Proc- tor and Gamble Company at Long Beach, Calif.
TECH GEOLOGIST REACHES SUMATRA

Tech geologists continue to spread to the four corners of the Earth, and Richard Hopper, Ph.D., '39, in a recent letter cleverly details a typical experience.

Hopper, who is now in Medan, Sumatra, N.E.I., after Commencement, has perhaps been more fortunate than some, in that he had an opportunity to inspect the conditions prevalent in that island, much talked about by the 'China incident.' He found the buildings in Tokio, Kobe, Osaka, and other Japanese cities plastered with anti-British slogans, the British Colony of Hongkong teeming with Chinese refugees.

According to Hopper, over 300,000 undernourished and filthy refugees are in Hongkong. At night these wretched people sleep on sidewalks and in gutters, and each night takes heavy toll in victims of starvation and cholera.

In Medan, located on the northeastern coast of Sumatra, conditions are in startling contrast. Under the benevolent rule of the Dutch, the natives are clean, happy, and prosperous. Buildings are modern, markets are numerous, and the climate delightful. In fact, says Hopper, Medan is about the size of Pasadena, and perhaps just as modern. Bicycles and bullock carts are the favorite modes of transportation, with a few three-wheeled Dutch and German cars.

Professional, Dick's first job is in the jungle two hundred miles South of Medan, and he feels that his first geological map will be characterized by a large black line, running from left to right, labeled Equator. The approved method for the geologist to traverse the bush, is to follow the numerous elephant trails and streams, after a preliminary aerial reconnaissance.

The Dutch frown upon guns, and since Sumatra ivory is the most valuable in the world, Dick feels that he may be able to strangle one of the small native elephants, and recover the ivory by way of a slight bonus.

Jungle Immunity

In regard to jungle denizens, it appears that tigers are not hesitant about some natives, but the smell of the white man renders him relatively immune. Hopper feels that because of this, it may pay to wear the same shirt for the entire duration of any field trip . . . as anti-tiger bait.

With the exception of the king-cobra, the most poisonous reptile known, the other animals are quite tolerant of white geologists. Dick writes, "the orang utans are of the type that will give you a pat on the back, and an encouraging smile, while you examine them and put them into your pockets for peanuts while you are taking dip-and-stripe. Leopards rub against your legs and purr. Rhinoceroses maintain a hands-off policy, and pythons scarcely look up from their work as you pass."

Communications with base camps or mountain outposts is maintained by short wave radio, but Dick feels that by the time this story is in press, his feeble cries may not carry over his field radio, except as a low "belch" from deep within some gurgle of nature. Dick has managed to eat his first white meat by holding his nose . . . "

Carleton Hotel
Amsterdam
June 29, 1939

Dear Editor:
My Cal Tech class ring is noticed quite frequently here in Europe, and I am always glad to tell people where I received it. Most aviation people know Cal Tech well by name, if they haven't been there personally.

The weather here cannot compare with that in California . . . However, there are occasionally days without clouds and rain, and I am able to get sunburned while sailing on one of the many lakes or canals in Holland.

Preparations for war are in evidence everywhere, but the people in general are about by the same as before. Around most airports you will find gun emplacements, if not the actual guns, while in London the air is being dug up for the installation of bombproof shelters. Many of the downtown buildings in all cities here are converting their basements into bombproof shelters. With it all, the flowers are as lovely, and the canals and buildings are as picturesque as ever, and I have enjoyed my duties as Technical Advisor to the Factory Representative of the Lockheed Aircraft Corp. very much.

With best personal regards,
Charles F. Thomas, '35.

% The Caribbean Petroleum Co.
Maracaibo, Venezuela
July 10, 1939

Hello Everybody!
I was glad to receive your letter about commencement activities, even if I could not take advantage of them, and containing a bill for dues as it did. If you can give me credit on the latter for a short time, I shall be glad to join. My desire for credit comes not from lack of money, but from lack of facilities for exchange in the particular part of the jungle in which I am stationed.

In the meantime, I would appreciate very much your sending me whatever publica tions you may have with news of my old friends and school. I am somewhat out of touch with the association as this was the first letter forwarded to me in my two years of isolation.

Sincerely,
R. A. McRae, '35.

Union Oil Co. of Calif.
Singapore, S. S.
August 4th, 1939

Dear Association:
Thank you for your letter which, I regret to say, arrived too late to enable me to make the necessary arrangements to attend the Commencement Day Banquet this year. I would have received it during July instead of August, had I not been travelling in that wilds of Siam at the time. However, I am pulling things together here and hope to be able to make the banquet next year, which I note is a "Re-Union Year" for the class of 1934.

Work out here is interesting, since it takes me to India, Burma, Ceylon, Sumatra, Java, Bali, the Celebes, Siam (just renamed "Thailand"), French Indo-China, North Borneo, the Philippines, and Hongkong as well as British Malaya (where I have my headquarters). It's no place for a person who cannot live reasonably happily in a continual bath of perspiration. However, and if you are prejudiced against insects and bugs in general, this is a good place to stay away from. The thongs, pythons, cobras, etc. are overrated as menaces, but the ubiquitous mosquito and cockroach make life a trifle burdensome at times.

If you have any other Tech men on your mailing lists anywhere in the oriental tropics, I would like to have their addresses and might look them up if the occasion presented.

Sincerely,

Northwood,
Middlesex,
England.
July 10, 1939.

Dear Editor:
From time to time I have received letters regarding the Cal Tech Alumni Association, and have felt rather guilty that I have not responded. I am afraid 8,000 miles separation has reinforced my natural laziness so that I have never made sufficient effort.

However, as I recently acquired three one dollar notes which cannot so easily be spent in this country I have decided to restrain my inclination to spend them and send them along herewith as a subscription to the Alumni Association. Very best wishes for its future prosperity and should any members visit England I shall be happy to meet them.

Sincerely,
John Read, Ph.D., '34.

1939—Contd.

Perry Brown is working in the engineering department of the Pomona Pump Company at Pomona, Calif.

Fred Hoff and Harry O. Davis are employed by the Sterling Motors Company.

V. K. Crawford is now an applied chemist for the General Petroleum Corporation.

James McKinlay is working for the Douglas Aircraft Corporation.

Howard Craft and Ray V. Gerhart are employed by the Gilmore Oil Company.

Kenneth Collins was married to Miss Billie Crain of Altradena on September 16th in Pasadena, and the couple will make their home in Pittsburgh, Pennsylvania.

STUDENTS TO BE FLIERS

The Civil Aeronautics Authority announced on Sept. 10th that students at the California Institute of Technology would be eligible to participate in the government's civilian pilot training program, the Institute being one of the 60 educational institutions certified to help with the campaign to instruct 11,000 young men in flying during the coming school year.
EARTH LIKE GLASS

At the meeting of the Geological Society of America early in August, Doctors Beno Gutenberg and Charles F. Richter, Ph.D., 28, announced that the earth is like glass fifty miles down. From their seismological studies they have determined that the layered structure is continued to the depths of the earth, and that seismograph records show that vibrations reaching a depth of about fifty miles had a decrease in speed, rather than the expected increase in speed with depth. This disturbance would result if the vibration had encountered a zone of sudden change from crystalline to a glassy structure.

GEOLOGISTS ON MINING COMMITTEE

J. Clark Sutherland, '29, geologist for the Pacific Clay Products Company, and G. Austin Schroter, '28, manager of Mines and Exploration, Filtrol Corporation, have both been appointed to the Mining Committee of the Los Angeles Chamber of Commerce.

Sutherland is serving on the Non-Metallic Sub-Committee, and Schroter is on the Legislative Sub-Committee for the Study of Labor and General Regulatory Legislation.

The Committee is made up of leading mining and oil executives of Southern California, in order to study and recommend on State and National legislation which may affect the mining industry, matters of taxation and regulation of engineers, non-metallic and strategic minerals, public lands, gold and silver, reciprocal trade and excises, and other matters pertaining to the mining and oil industries of the Western states.

COMBS ON TOUR

Theodore C. Combs, Jr., '27, who is a member of the Board of Directors of the Alumni Association, left Los Angeles this month on a business tour of the Atlantic Seaboard in the interest of the West Coast Lumbermen's Association for which he is field engineer at Los Angeles. Combs will promote the use of pre-cut framing for wood dwellings, a recent major development in housing for which he is largely responsible.

While he is on tour, Combs will attend meetings of Alumni groups in the interests of the Association discussing the problems and desires of the groups and their relationship with the main body of the membership in Southern California.

WIND TUNNEL GRADES SOILS

The use of a wind tunnel to classify soils and sand according to particle size has been accomplished by the United States Soil Conservation Service working at the Institute. The procedure is to suck a stream of air through a 12 foot tunnel, with the soil and sand mixture flowing into the air stream at the intake end and carried by the air current. Heavy particles fall first, the fine particles being carried furthest before deposition in trays.

Twenty different trays are used to catch the particles, the smallest of which corresponds to those passing a 250 mesh screen, equivalent to an average diameter of 27 ten-thousandths of an inch. The study of particle size and distribution is important in soil erosion and conservation work, and also in the silting of dams and lakes.
RESERVE ENGINEER OFFICERS' CAMP

At the annual Reserve Engineer Officers Camp held at Camp Ord, Presidio of Monterey, from August 14th to 20th, Cal-Tech alumni were prominently represented. Captain Theodore C. Combs, Jr., '27, delivered one of the most interesting lectures at the camp on "Aerial Photography and Mapping."

The following alumni in the Engineer Reserves attended Camp Ord this year:

49th Engineers
Capt. J. W. Dunham, '29
Capt. J. E. Shield, '22
1st Lieut. W. H. Krelle, '27

349th Engineers
Capt. T. C. Combs, '27
Capt. J. C. Krouser, '25
1st Lieut. R. A. Philpeo, '27
1st Lieut. O. F. Reinen, '29
1st Lieut. E. H. Ross, '28

444th Engineers
1st Lieut. A. W. Dunn, '29
2nd Lieut. J. C. Monning, '33

589th Engineers
2nd Lieut. R. Creveling, '27

FOG ASSISTS RAY RESEARCH

Production of fog in scientific instruments enables scientists to study cosmic rays, according to Robert M. Langer, Ph.D., '27, in a paper presented at the Stanford University meeting of the American Physical Society last July.

"There may be excess moisture in the atmosphere and rain may threaten for a long time before droplets begin to fall," said Doctor Langer. "The condensation of water vapor from the air on to the drops happens rapidly enough at first; but so much heat is given out in the process that the droplet warms up until the evaporation from it just about equals the condensation upon it. Unless this heat of condensation is dissipated the droplet will stop growing before it can be seen. The best way to dispose of the heat is to pass it into the surrounding air."

Cosmic rays are studied by making the rays visible through the creation of paths of artificial rain drops by the rays in the Wilson cloud chamber. The idea, said Doctor Langer, is to produce a fog along the path of the cosmic ray, and it takes a full second for fog drops in a cloud chamber to attain full growth.

ICE FORECASTS

Development of a new forecasting technique that warns of approaching ice, thunder, and lightning storms was described by Irving Krick, Ph.D., '34, associate professor of meteorology at the Institute, before the recent convention of the Pacific Coast Electrical Association meeting in Pasadena.

Predictions can be furnished two days in advance, with a definite warning 12 hours before the arrival of an ice storm, with the exact area of the storm determined. Ice storms are particularly prevalent in the East during the spring, according to Doctor Krick. Thunder and lightning storms, which often disrupt communication systems, can now be predicted by the "air-mass" analysis data secured from instruments at the Institute correlated with that of other stations, he said.

Average forecasting at the California Institute of Technology is better than 95% correct, said Krick, which is the highest attained, and government forecasts do not include ice, thunder, and lightning service.

ARE YOU A MEMBER OF THE ASSOCIATION?

(Cut out this line and paste in your 1939 Alumni Directory.)
"But, Grandpa...."

"YOU never had to go to a luncheon, then to a bridge party, and then rush home to press a dress so you could go to the movies. Times have changed since you courted grandma. Things are more—more—"

"COMPLICATED'S the word you want, Bet. You do seem to do a lot of running around. But then, you don't have to pump and tote water, or churn butter, or bake bread, or clean a lot of oil lamps, or stoke the stove for that iron you're using. Why, when your grandmother wanted to go to town, I used to spend a half a day taking her. And you drive in for a movie! Most of the things you do, we didn't have time for."

IF LIFE seems more complicated today, it's because we have time to undertake more things we want to do—because the routine duties of life have been made simpler and easier. Meals cooked at the turn of a switch, water available at the turn of a faucet, washboard and carpet beater banished—these are some of electricity's contributions to progress. General Electric scientists and engineers, by finding still more ways for electricity to shoulder the routine and unpleasant duties, help provide for the people of America still more time to enjoy a richer, happier, and fuller life.

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MAZATLAN, a “South Sea Island” village drowsing beside the blue Gulf of California. Here on warm, tropical nights, wandering musicians serenade you with Mexican folk songs.

GUADALAJARA, high on the Mexican plateau, overnight from Mexico City. In its busy street markets you’ll find rare bargains in pottery, sarapes and the famous bubble glass.