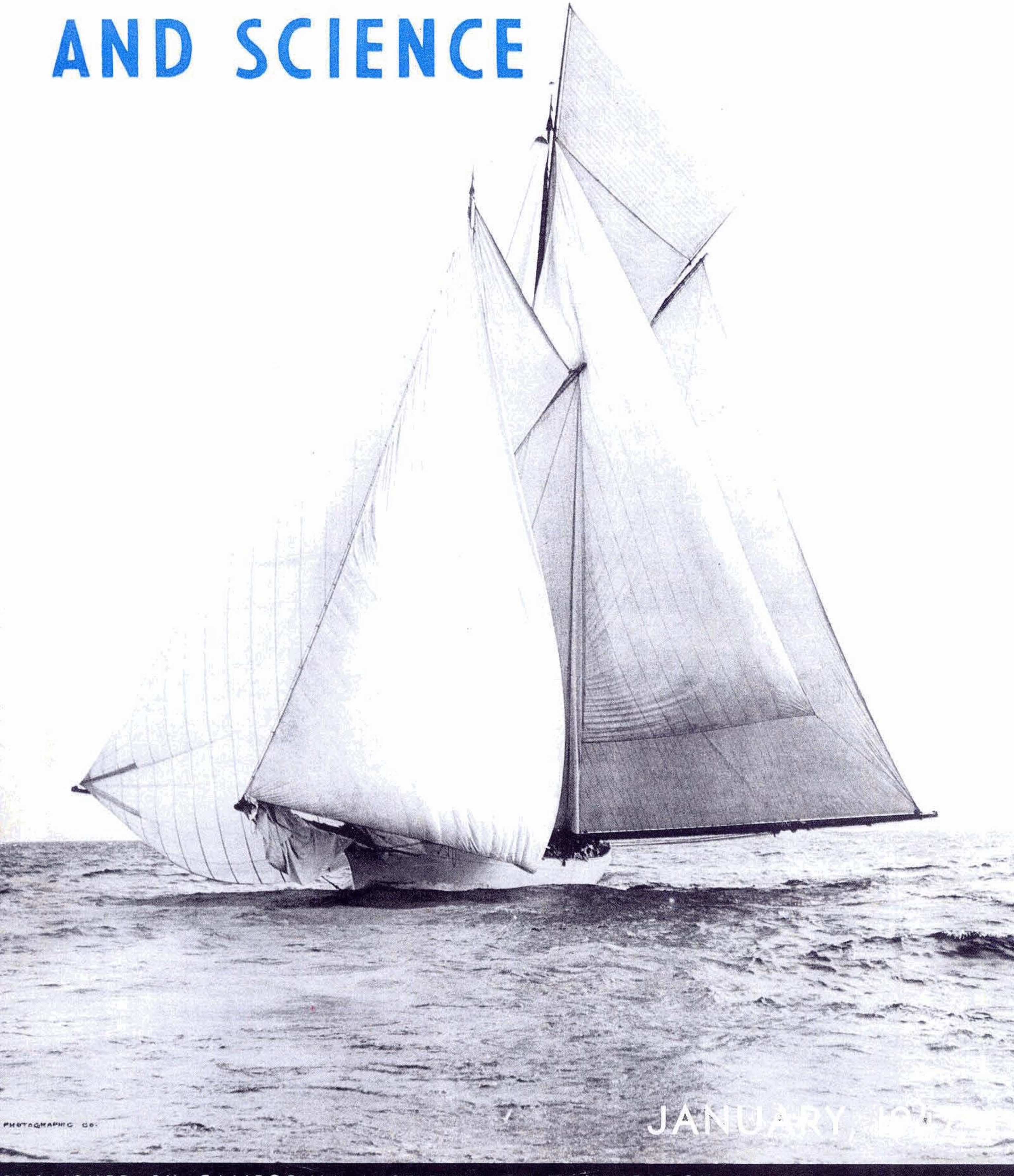
# ENGINEERING AND SCIENCE




JANUARY, 19[illegible]

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# BY-LINES

## JAMES R. BRADBURN

James R. Bradburn distinguished himself as a Tech undergraduate by winning an honor key for activities on the track team and in almost all student organizations, and by also making Tau Beta Pi. He received his B. S. in electrical engineering in 1932, then spent two years at the Harvard School of Business Administration where he obtained the M. B. A. degree. Mr. Bradburn worked for several years for the General Electric Company and for Eastman Kodak. In the Army for five years, he reached the rank of major, and the position of chief of the Artillery Division, Rochester Ordnance District. November 1945 saw him with the Consolidated Engineering Corporation of Pasadena as vice president and director. He is now in charge of Consolidated's commercial engineering department.

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## PATRICK J. HARNEY

Patrick J. Harney, who received his M. S. in meteorology from the Institute in 1935, preceded this by studies at Clarkson College, New York and M. I. T., and work for United Airlines. After obtaining his degree, Mr. Harney worked for Western Air Express (now Airlines), and the United States Weather Bureau. For a time he was on the civilian staff of the Army Aircraft Radio Laboratory at Wright Field, landed in Panama with the first radar-equipped squadron, returned to the Pentagon building, and escaped to the Air Force again by induction. First assigned to the Radiation Laboratory, Mr. Harney was a technical sergeant on a weather field project in Florida when the war ended. Returning to the Weather Bureau, he has been assigned for the last year to the Thunderstorm Project, which does field work in Florida and research in Chicago.

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## COVER CAPTION

The Marguerite, Goelet Cup Race, August 7, 1891.


# ENGINEERING AND SCIENCE

*Monthly*

The Truth Shall Make You Free


## CONTENTS FOR JANUARY, 1947



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**ENGINEERING AND SCIENCE MONTHLY**

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Student trainee at Westinghouse Electric Corporation. Large companies such as Westinghouse select graduating students through the Placement Service for further training in factory, laboratory, and classroom.

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# Placement

By JAMES R. BRADBURN

ASSISTANCE in the job finding and job betterment for the the individual, and in new personnel selection for the employer, is afforded to a more beneficial degree than commonly believed, by the Alumni Placement Service of the California Institute of Technology.

The objective of the Alumni Placement Service, like that of any properly qualified technical employment agency, is to assist both graduate and employer alike. The Service is fulfilling its real responsibility of making sure that as nearly as possible the right person is brought into contact with the right job for that person.

The subject of proper placement of engineering personnel is important to the individual and the employer. A large share of an individual's waking hours is spent at his job. He can be most happy on that job which most closely fits his needs and for which his experience most adequately qualifies him.

A good employment record is one of the most valuable assets that a man can have. It is an asset which should improve with time. Its improvement comes not only from good work on particular jobs or during particular periods of time, but also from the ability to list consecutively more important positions.

The listing of too many positions with different companies, or positions of too short duration with one company, is usually a liability. It indicates a lack of persistence on the part of the individual. Such indications are one of the first things a prospective employer looks for in considering an applicant.

## CORRECTION

**Through a proof-reader's error, one sentence of John Mills' THE INDUSTRIAL SCIENTIST AS CITIZEN in the December 1946 issue, starting with the fourth line, first column, page 11, read: "He will damn a communist, and unjustly, for following his 'party line' . .". This sentence did not follow Mr. Mills' manuscript, which read: "He will damn a communist, and justly, for following his 'party line' . .". For this typographical error the editorial staff makes due apologies.**

Proper job betterment, therefore, is a move which should be approached carefully, with the idea in mind of improving one's employment record. The Alumni Placement Service is rendering assistance to those who believe a change in jobs would be of benefit. This assistance first takes the form of counsel, when requested, and later that of actually referring the individual to jobs for which he is qualified.

On the other side of the picture is the employer who realizes the need of having properly qualified men in engineering positions and is having a hard time to find them. He attempts selection through various channels. He is frequently defeated by his own ineptitude — by insufficiently and improperly describing the job he desires to have filled and the qualifications of the man to fill it. Numerous are the employers who come to the Alumni Placement Service with the vague information that they need a "salesman" or "an electrical engineer," without definitely stating what kind of a salesman or engineer they desire to fill a particular job. The Service's efforts could be expended much more efficiently, and employers better satisfied, if complete job descriptions were furnished with each job order.

Both the job seeker and the employer can assist the Service by keeping that office currently posted on the outcome of interviews resulting from referrals by the Service. If the referral does not result in a job, it would be helpful to the Service to know why, both from the job seeker and from the employer. Such information can be of assistance in correcting the concept the Service has of the individual's qualifications and desires, and of the job that is to be filled. In addition, the Service by all means should be informed promptly if the assistance of the Service is no longer needed by the individual, or if a job order should be cancelled.

In expanding times, such as the present, proper placement is of increased importance. This is particularly true with the small company that cannot afford to carry a large force of trainees with the purpose in mind of selecting a few for the higher positions. A small company cannot expand from within to the same extent as a large one, and must therefore depend upon proper selection and placement of individuals hired. Moreover, the small company frequently can only use those who are properly qualified and does not have the opportunity to place in other positions within the company those individuals improperly placed originally.

It might be well at this point to explain briefly how the Alumni Placement Service at the California Institute of Technology operates. This Service receives from various employers requests for personnel to fill certain positions which are open at the time. These positions are described as completely as possible, although frequently the descriptions are very inadequate and much improvement can be made in this respect.

In a like manner, the Placement Service receives from those who have attended the Institute or who are about to receive a degree requests for assistance in finding suitable positions. These requests are made on detailed forms which list completely the background and experience of the individual and the nature of the position, including the salary range.

With information from employer and would-be employee, the Director of Placements is in a position to consider the referral of individuals to those job orders for which there is a coincidence of the job order, the man's qualifications, and his desires. In such circumstances, the Director of Placements not only considers the written information furnished him, but also evaluates additional personal information concerning the individual, gained by him or various faculty members during that individual's term at school.

The referral of indivduals does not always await receipt of a formal job order from a possible employer. The Director of Placements may frequently know of possible openings for experienced individuals and make arrangements for such referrals by getting in contact with various employers who he thinks might be interested.

In order to help defray the cost of the Alumni Placement Service, it is customary for those effecting placement though its assistance to pay to the Service an amount equal to 10 per cent of the first month's salary received.

It is interesting to note to what lengths the Alumni Placement Service has gone in recent years in order to assure the proper placement of Tech graduates. A report covering the placement activities from July 1, 1945 to July 1, 1946 has recently been issued by Dr. D. S. Clark, Director of Placements, which brings out many interesting statistics and facts.

The report opens by showing how the complexion of placement activities has changed since 1945, particularly as a result of the war, with its effect on college operations and the limitation on individuals in changing jobs within industry. During the war period, the report points out, no difficulty was experienced in securing employment for civilians who were not susceptible to draft. The main problem was that of ferreting out available men for industrial firms.

As would be expected, the number of men registered for job betterment, or who were unemployed, decreased each year, to a minimum in the year 1944-1945. This is shown in the following table:

| | 41-42 | 42-43 | 43-44 | 44-45 | 45-46 |
|---|---|---|---|---|---|
| Betterment | 331 | No record | 142 | 133 | 235 |
| Unemployed | 143 | Compiled | 33 | 12 | 142 |
| Total | 474 | | 175 | 145 | 377 |

During the last year, approximately 49 per cent of the applicants for job placement were veterans. Of the 377 noted above as registered for placement, referrals were given to 76 per cent. A total of some 784 referrals were made on these men, or an average of a little less than three per man. It was not possible to make referrals for all of the individuals seeking placement because of the non-coincidence between the jobs sought and the job orders received.

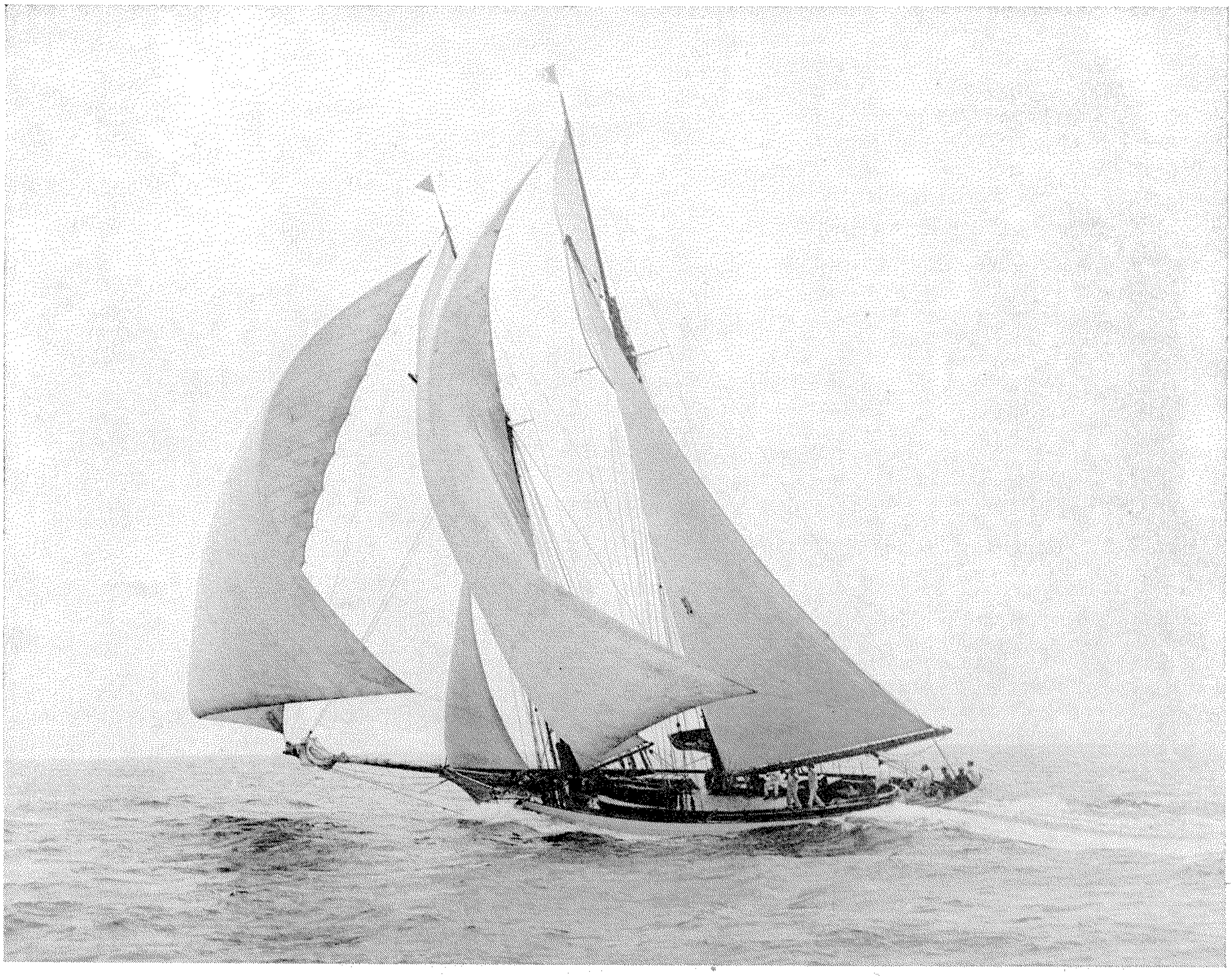
In spite of the large number of referrals, only a total of 51 men were placed during the year. Percentage-wise, this is 14 per cent of all the applicants requesting positions from the Placement Office, or 18 per cent of all the men referred to positions.

In commenting on these percentages, the report points out that the individuals involved were not depending upon the Placement Office as the sole source of job referrals. Through their own efforts many secured employment and consequently did not remain in an unemployed status very long.

At the present time, the Placement Service is handling the largest number of requests ever received, averaging around 60 per month. Many have been for men without experience and have come primarily from the larger companies, seeking recent college graduates as trainees. However, the majority of the requests are still for men with experience.

Because of the non-coincidence of job requests and job orders, no men could be found to satisfy the job requirements of 328 of the job orders. As of June 30, 1946, there were 259 job orders on file with the Placement Service, requesting the services of 515 men, and very large number of these positions were for men with experience. Some difficulty has been encountered because the salary scale offered was frequently lower than that requested by the applicants.

The Placement Service could very easily increase the number of referrals if it were not for the policy it has established of referring only men who appear to have the qualifications specified by the company requesting applicants. This policy, it is believed, is to the best interest of all concerned. How well it works in actual practice depends upon how accurate and detailed is the information furnished the Placement Service by the applicant and the employer alike.



The Quickstep

# Seventy - Three Years of Photography

STARTING his photographic career in 1875 when wet collodion plates were standard equipment, Henry G. Peabody, who now lives in Glendora, California, has shown in the 71 years that have followed, that technique is of greater importance than equipment.

Most of the photographs reproduced in this article were taken with a home-made 8 x 10 inch box camera, 50 years ago, and show a degree of photographic artistry that will stand up to today's achievements. The techniques used by Mr. Peabody in his pioneering days, as well as his experiences as an early camera man, are of interest in a day of one thousandth second shutter speeds, f/1.9 lenses, and film speeds with a Weston rating of 200. Today, at 91, Mr. Peabody is making prints of salon quality in his Glendora darkroom, and commuting to Pasadena twice a week in order to work with much of his equipment stored in this city. As this is written, early in 1947, Mr. Peabody is waiting for enough snow to fall on Mount San Antonio, framed by two closer peaks as it is seen from his home, to take a Southern California winter scene.

The prints of sailing craft illustrating this article are reproductions of those given to the California Institute of Technology by Mr. Peabody in the fall of 1946.

Mr. Peabody, who graduated from Dartmouth in 1876, started experimenting with photography as a student. It was still an avocation when he entered Massachusetts Institute of Technology to take courses in electrical engineering with the class of 1878, of which he is now the sole surviving member. After a year he took a job in Chicago with the Western Electric Company. While there he made photographs in his spare time, even going into partnership with another pioneer, Hesler, who took interiors while Peabody photographed landscapes and architectural detail. All of this was done with wet collodion plates, which had to be sensitized just before being used, exposed for what seems today an interminable length of time, usually from five to 10 seconds, and then developed immediately.

It was still 1878 when Peabody's partner received a letter from a friend named Carbutt, disclosing that he was working on a dry plate emulsion and had arrived at a workable coating, but was in poor shape financially. Hesler thought the matter over and then sent about $25 to Carbutt in exchange for some 5 x 8 inch plates. The Pullman Company had just ordered some interior pictures taken of its new cars by the firm of Peabody and Hesler. The dry plates seemed a light burden to carry through the car yards. Wet collodion plates used by all photographers at that time would have required either a speedy messenger to rush the newly prepared plates to the Pullman Company and back to the firm's darkroom, or a wagon to carry a portable darkroom to the scene to be photographed. Peabody tried the new plates. The results were excellent. This, he believes, was the first time that a commercial picture was taken on a dry plate in this country.

The new emulsion, besides being much handier, was also faster. An exposure of one tenth to one fifteenth of the previous time required became standard. With a lens speed of f/16, Peabody used shutter speeds as high as one fiftieth of a second, and this 10 years before Eastman popularized photography with low-priced cameras and films. Even today, Brownie-type cameras have a shutter speed of only one twenty-fifth of a second.

Among other commissions that Peabody carried out in Chicago were many catalogue illustrations for the Western Electric Company. Although the wood block was the only type of engraving then in use,

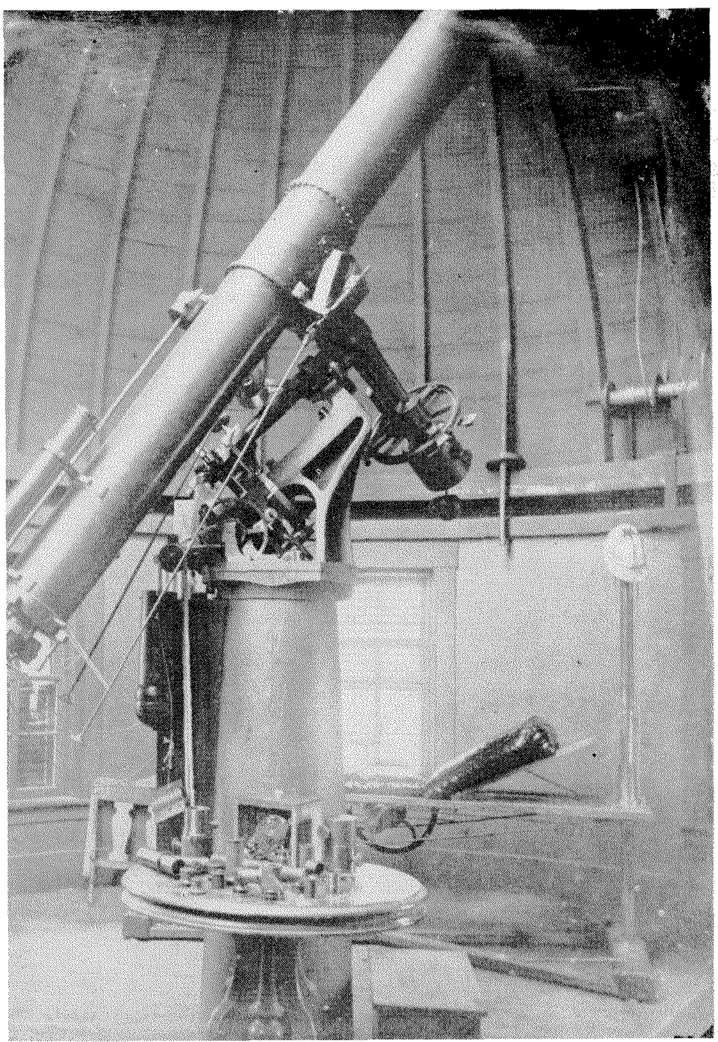
official photographer of the Boston and Maine Rail-

Henry G. Peabody

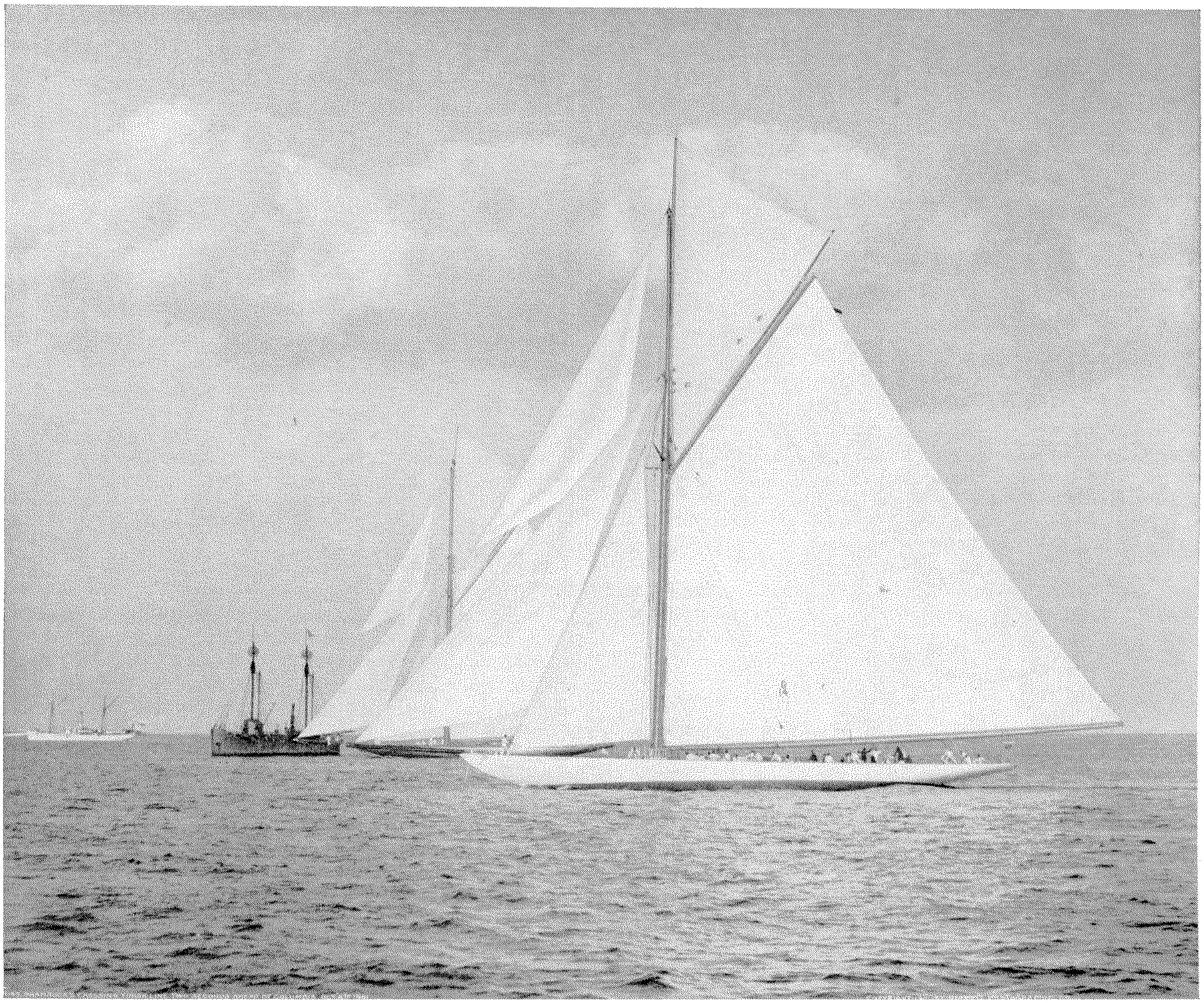
it was adapted to photographic reproduction by sensitizing blocks of wood, making prints on them, and then using the reproduction as a pattern. The carving was electrotyped and used to make the printing impressions. Half-tones soon improved the photo reproduction process, coming in near the end of the eighties and replacing other methods of reproduction by the middle nineties.

Leaving Western Electric and returning to Boston after eight years in Chicago and New York, Peabody found himself in the midst of the depression of '85. Electrical engineers were in small demand, and two years later, when the expanding industry offered many new jobs, he had immersed himself so completely in photographic work that he never left it.

As a young photographer in 1885, Peabody joined the Corinthian Yacht Club in Marblehead, Massachusetts, and later the Atlantic Yacht Club of New York. For recreation while he was serving as the official photographer of the Boston and Maine Rail-



**LEFT: This photograph of the nine inch Equatorial Telescope at Dartmouth College was taken in May, 1876, on a wet collodion plate. It was made with a Harrison Globe lens, the first wide angle lens made in this country, with a stop of f/22, and an exposure of half an hour. Wet blotting paper was placed back of the plate in the holder in order to keep it moist and prevent the silver nitrate solution from drying and crystallizing during the long exposure and interval between the coating and developing of the plate.**



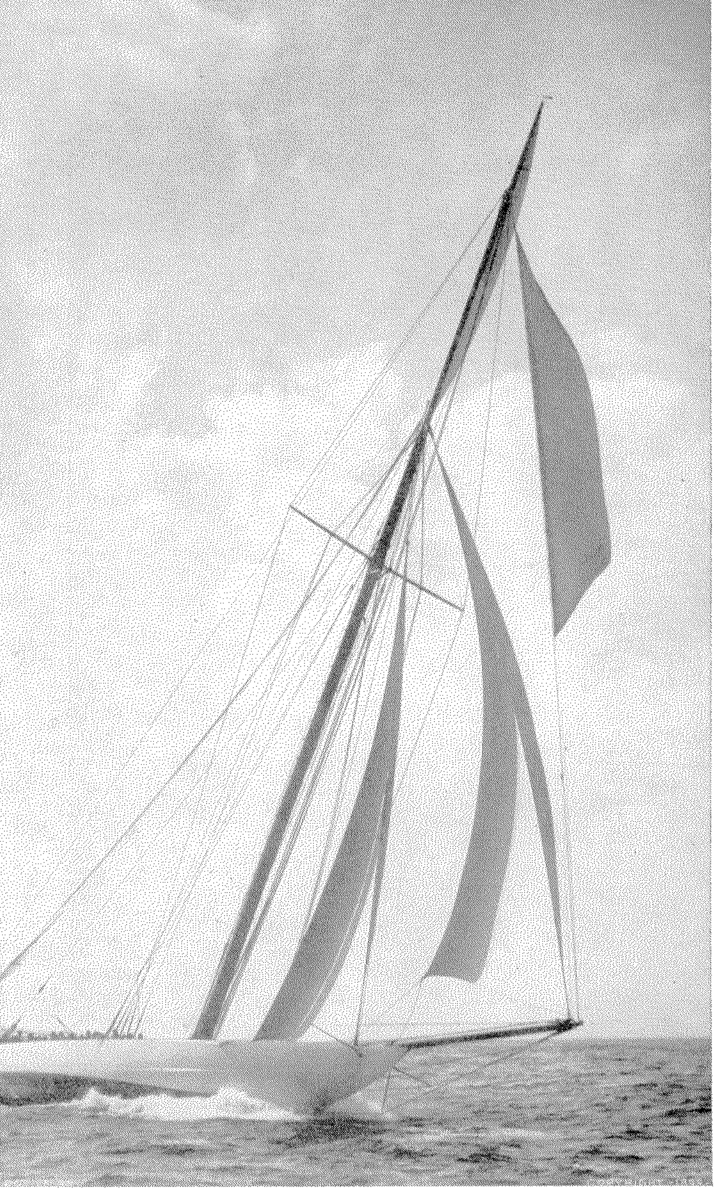
**Shamrock II crossing the finish line two seconds ahead of Columbia in an America Cup race, October 4, 1901. Columbia won this race, however, on time allowance. The Sandy Hook lightship is in the left background.**

road, he photographed the yachts of members. Given a private car to use as darkroom and living quarters, Peabody took scenic pictures of the Boston and Maine route, and later worked under a similar arrangement with the Great Northern road when it opened its line to the Pacific Coast through the Rocky Mountains and the Cascades to Puget Sound. It was on this commission that he first used filters, employing some of yellow-tinted glass made by Carbutt, which were very similar to the K-2 Wratten filters now common.

Between trips to photograph railroad scenery, Peabody continued his work with yachts. Six defences of the America Cup between 1887 and 1903 gave him opportunities to photograph the finest sailing craft of that era. Besides the Cup races, the Newport trial runs and the Astor Cup events, the annual New York Yacht Club cruises around Cape Cod to Marblehead gave him ample opportunities to get pictures of ships under many conditions.

The America Cup races were patrolled by the Navy, and Peabody usually worked from the judges' boat, an oceangoing tug, or the Sandy Hook lightship. This craft marked the start and finish of the races, and thus provided a better vantage point for the photographer than did the crowded judges' tug. Although he usually took pictures solely for his own collection, Peabody carried **Boston Globe** credentials which got him on the press tug when an unpatrolled race would permit approaching the competing ships.

Much of this work was done with a rapid retilinear double combination lens, later replaced by a single anastigmatic lens. Peabody's first shutters were made in his own shop, but later, American photographers became so numerous as to permit a New York mechanic named Prosch to devote his full time to their manufacture. The Prosch shutters, designed to work between two lens elements, had three spiral springs of different tensions which gave speeds ranging to one two-hundredth of a second. Peabody used one of these shutters with a single anastigmatic lens, with the shutter in front of the lens. This arrangement protected the lens from flying spray, an important advantage when photographing is being done close to the water. In the nineties Peabody was even able to make successful exposures in the rain.



LEFT: Columbia running for the line in an America Cup race, October 17, 1899.

The camera he used in most of this work was a home-made box, about one foot square, with hand holds in front and a finder on the top. This took an 8 x 10 inch plate holder. The shutter release was extended to one of the hand holds. In use this camera was steadied against the photographer's chest while the exposure was made.

Even after it was no longer necessary for a photographer to carry a portable darkroom, the burden of the man who planned to take pictures outside his own front yard was not light. With cameras, tripods, and plate holders of rather solid wood, and all scaled to an 8 x 10 inch size, Peabody usually hired a cab to transport his equipment. Fortunately the railroads connected with the docks in New York where he did many of his photographic studies of racing yachts. Usually he carried 12 double 8 x 10 inch plate holders.

Many of Peabody's type photographs of contemporary sailing craft were made from his own 21 foot catboat, a steady keel-boat which he sailed single-handed, making photographs at the same time. These pictures represented the best yachts of recognized types. Peabody compiled two sections, depicting sloops and schooners, of a projected volume, **Representative American Yachts.** Showing his work, he sold subscriptions on the volume, then completed it and printed about 200 copies of the book. This subscription list, containing the names of J. Pierpont Morgan, James Gordon Bennett, August Belmont, and other notables of that period, is now a valuable collection of signatures.

**Representative American Yachts** was illustrated by the Heliotype process, a method which converted the photographic negative into a printing medium which would take ink in proportion to its density. The emulsion was stripped from its plate, treated, and attached to a second plate of heavier glass. This method produced an excellent reproduction when printed on a hand press, but was limited as to the quantity of prints. Somewhat less than 1000 reproductions was the maximum number obtainable.

In 1898 Peabody went to work for the Detroit Photographic Company, and traveled for 10 years, taking pictures, chiefly views and street scenes in the large cities, national parks, and abroad. An observation made by Mr. Peabody was that while carriage wheels could be stopped by the shutter speeds then in use, the hoofs of the horses pulling them were always a little blurred on the film.

One of Peabody's photographic ventures of the early nineties was the "Squadron of Evolution," our new steel Navy. He photographed these ships as they were built, until the process was speeded up to the point where he could not get around to the shipyards in time to cover them all. One print of the Squadron was made in 1893, shortly after the picture was taken, on albumen paper, the best obtainable at that time. This German-made printing paper had to be sensitized before being used, and then exposed on the same day. The paper was carefully floated in a silver nitrate solution so that only the coated side was wet. After two minutes of this, the 18 x 22 inch sheets were hung to dry in the dark. Then they were suspended for 10 minutes in ammonia fumes. One print of the Squadron has been hanging on various walls for over 50 years without showing any signs of fading. Its contrast is about equal to number two paper today, which is termed "normal." Early photographers varied the contrast of paper prepared in this manner by changing the concentration of silver nitrate in the sensitizing bath.

Peabody spent the winters of 1898 and 1899 in Mexico, photographing Spanish Colonial architecture for Sylvester Baxter, in company with Bertram Goodhue the architect. A text, 24 volumes in size, of photographs of Mexican architecture of the Colonial period which was being ravaged by time, weather, and tourists, was produced. This may be found in the offices of many architects who have had available the price of $350 for a set.

Stopping in Southern California on his return from the second winter in Mexico, Peabody was so impressed with this region that he never spent another winter in New England. After finishing his documentary work for the Detroit Photographic Company in 1910, he returned to the East only twice.

(Continued on page 12)

# The Uses of Radar in the Weather Service

By PATRICK J. HARNEY

THIS article briefly introduces to the non-specialist reader the uses of radar now made possible in a weather service. Detailed descriptions of the several different phases of activity are to be found in more technical papers. Herein the use of micro-wave radar, i.e. sets operating on wave lengths of less than a meter, is assumed.

In general, three phases of radar performance are of interest to a meteorologist. The first, which is the most prominent in the mind of the forecaster, is the ability to furnish information on the velocity of winds aloft in all kinds of weather. The second is the ability to distingush heavy precipitation areas aloft. The third attribute, about which there are many erroneous impressions, is referred to as the effect of the atmosphere on the propagation of electro-magnetic waves. As might be expected, it is the abnormal propagation effects caused by special weather conditions that are of most interest; hence that term is used to describe that phase. Other phases of the performance of radar will be of use in the future, but insufficient information for publication is available at this time.

## RAWINS[1]

The tracking of ballon-borne reflectors has been practiced from the beginning of the use of mobile radar sets. Such sets, as well as others which can determine elevation, can follow a so-called corner reflector, made up of three intersecting planes of conducting material, each of say one square yard in area. Such "corners" weigh several hundred grams and require at least a 100-gram-sized balloon to lift them. They may be followed to the limit of the radar set's range on a comparable target such as an airplane. Improved performance may be secured by using smaller reflectors of better return which will allow a balloon of the same size to ascend more rapidly and reach higher levels. Oddly enough, a suitable train added to a balloon may cut down the drag and make the balloon appear to rise faster, because of the streamlining of the airflow.

Three men using a set arranged for convenient operation can make and work up a run to 30,000 feet in about half an hour. Where so-called automatic tracking is built into the radar set the crew can be reduced and one-man runs are feasible under certain conditions. If winds to a lower elevation suffice, a 30-gram-sized balloon with a special light-weight reflector can be used. To save time in this case a 60-gram balloon is desirable.

As compared with the old pilot balloon triangulation measurements, a high order of accuracy is available in radar because the distance to the target is determined by the set. The computation of horizontal distance involves no assumptions regarding the rate of ascent of the balloon. Here, the accuracy obtained will depend upon the type of equipment used, the effectiveness of its operation and the wind velocity. Operators who work as a team can produce, with comparatively simple equipment, results that can only be exceeded by the more expensive automatic-tracking devices. The more powerful the set, the better the target and its presentation and the closer it is, the more accurate the data. Probable figures for error computed for a high-performance set are tabulated as follows:[2]

**Speed (mph) Max. Direction Error in Degrees**

| Range Yards | Max. Error | at 10 mph | at 30 mph | at 50 mph | at 100 mph |
|---|---|---|---|---|---|
| 20,000 | 2½ | 0.2 | 0.2 | 0.3 | 0.7 |
| 40,000 | 3 | 0.3 | 0.4 | 0.6 | 1.4 |
| 50,000 | 4 | 0.4 | 0.6 | 0.9 | 2.0 |
| 60,000 | 4 | 0.6 | 0.8 | 1.2 | 2.7 |

These figures do not include a margin for operator's errors. It is probable that this accuracy would not be achieved at the start of a wind-finding program, but it would be possible to achieve higher accuracies, were automatic tracking and computing machinery economically feasible.

According to the table given above, a balloon ascending at a rate of 1000 feet per minute, with a radial wind speed of 10 miles per hour, at 30,000 feet could be observed to about two miles per hour and a small fraction of a degree in its velocity vector. A run to 20,000 feet with a radial wind of 100 miles per hour would have errors of about four miles per hour and three degrees.

## STORM DETECTION

The ability of micro-wave radar to detect precipitation areas is believed to be due mainly to the reflective properties of water droplets and snow flakes. Limiting this ability is the fact that only the greater water concentrations cause observable reflections with present sets. This precludes the observation of stratus, ordinary fair-weather cumulus and cirriform clouds; hence it is a misnomer to say that the set "sees" clouds. Only clouds "laden with moisture," as the saying goes, appear on the observing screen or 'scope of the receiver. But the moisture seen by its echo is associated with convective activity, usually resulting in precipitation. This makes radar an excellent tool for local forecasting, since thunderstorms

1 The term RAWIN has been designated by the services to define information secured about winds aloft by electronic means. This covers the use of radar and balloon-borne target described in this article and also the method which uses a balloon-borne transmitter with or without radiosonde, an instrument transmitting meteorological information by radio, together with an RDF (radio-direction finding) set on the ground. Sometimes the first level of a RAWIN report is taken from an optical measurement of the balloon by theodolite (a PIBAL) because the radar or the RDF sets in use have a limiting minimum distance or height at which they can operate.

2 From a nomogram devised by Captain George E. Austin, A. C.

and heavy showers are easily tracked and warm-front precipitation (warm-front action refers to over-running of one air mass by another) often can also be observed.

It is easy to see that local-weather short-term forecasting for precipitation takes on an entirely different aspect, if a glance at the 'scope in his office shows the forecaster even a limited local distribution of precipitation. The telephone weather service can be so improved thereby that from the user's standpoint the other aids to forecasting are academic when a person is only interested in the question of rain in the next hour or two.

The maximum distance from which precipitation areas return a signal is the factor that determines the effective use of radar for such a purpose. At the very high frequencies used in radar, propagation is line-of-sight to a slightly greater distance than light rays, because of greater refraction in the atmosphere. Under conditions of abnormal refraction, this range is considerably increased. The higher the location of the set and the higher the water-laden droplets in the tops of the clouds, the greater the range will be. The power and sensitivity of the set as well as the height of the location impose limits. Raising the height of the set may, in fact, have a disadvantage, since the additional ground targets seen tend to "clutter-up" the screen and obscure low lying close-in echoes. A typical installation on an airplane hangar roof, where the 'scope can be conveniently located in a second-floor office, can cover an area of more than 75 miles in radius. This depends upon the power of the equipment, for the most powerful sets do observe severe storms to a range of about 200 miles.

The choice of a suitable site depends upon economic as well as geographical considerations. If a radar installation becomes practical on a city weather station building, such an office can handle the important forecasting of local precipitation, removing a load from an airport forecast station. The building chosen need not be the highest one; it is enough that it be free from too many local obstructions to the view of the horizon. The Empire State Building, for instance, first suggests itself as a site, but other tall buildings hardly considered in the skyscraper class in New York City would serve satisfactorily in that location.

One observed factor is that precipitation echoes attenuate signals from objects behind them at a greater range, as well as obscuring echoes within the clouds. It is possible, therefore, that echoes from RAWIN reflectors may be lost in storm clouds. The amount of time in which this happens with skilled operators and adequate equipment is, however, a small percentage of the time covered by a given storm. Radio direction-finding sets following airborne transmitters, such as the combined RAWIN and radiosondes (Rawinsonde), do not "see" precipitation echoes and so are not bothered by them. It may be said that the same principles can be applied to the development of the radar-sondes.

This is essentially a short-range device for storm detection, as far as the meteorologist is concerned. It is not to be confused with the long-range location of the source of atmospheric static, given the name "Sferics" by a network of RDF stations.

## ABNORMAL PROPAGATION EFFECTS

Much misinformation about the effects of the atmosphere on propagation of electric waves has been widespread. This will only be corrected by the dissemination of the information on the subject gained during the war, when it was a subject of intensive study. Such information is of importance to television and communication as well as radar. It so happens that radar development sponsored much of the research in micro-structure of the atmosphere.

Briefly, as mentioned above, the earth's atmosphere refracts the radio or radar electromagnetic waves just as it effects the transmission of light and sound. The vertical distribution of density of the overlying atmosphere changes with the weather, and as a result the coverage of a given set varies from day to day. However, when the gradients become extreme, the energy acts as though it were reflected from such layers and the results are long ranges. The analogue is also used to say that the energy is "trapped" by "super-refraction," but the result is still called "anomalous propagation."

It has been suggested that by studying the propagation of radio waves in the atmosphere, information can be gained about the thermal and moisture distribution aloft. For instance, the use of reflections from discontinuities in temperature and humidity aloft, as discussed in pre-war meteorological and radio journals[3], seemed an attractive possibility, but until a better understanding of the quasi-optical physics involved is reached, no new information on the atmosphere can be gained in this way. Also in the past, empirical attempts to relate positions of Highs and Lows with radio-signal strengths met with some success.[4] Such pressure gradients have no effect on microwave propagation.

Work in this field has been a boon to meteorology in one respect, since it has really developed the science of micro-structure of the atmosphere. This is of perhaps greater interest and importance in the other research fields of meteorology and oceanography.

In regard to the atmospheric effects on radio-wave propagation, the position of the meteorologist is not an enviable one. His field of activity, the atmosphere, can now be held responsible for "anomalous" propagation, which allows radio signals to come from or appear in unexpected places. The result may be an interference with, or an interruption in, the communication, broadcast, television services being proposed, as well as in radar. Under certain conditions this phenomenon can be taken advantage of to extend the range of present sets. Now these effects in our troposphere can be likened to the reflections from the Kennelly-Heaviside Layer in the ionosphere of which the radio engineer is cognizant. But here the radio engineer not only asks the forecaster what the state of the atmosphere will be, but further inquires what will be the effect on propagation. All this is a challenge to the meteorologist, but one which he can make the most of only when he has the radar set at his disposal[5].

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3 See Friend, Bull. Amer. Met. Soc. 22(2):53-60, 1941. The reflection is a function of the vertical dielectric-constant gradient, but the effects of temperature and humidity on the dielectric-constant or its corrolary, refraction index, cannot be separately distinguished by radio means alone.

4 A.M.S. Bulletin March 1946: p. 114.

5 Acknowledgment is due the men of many organizations, notably the Signal Corps, the Air Forces, and the Radiation Laboratory of the Massachusetts Institute of Technology for the opportunity to obtain the information used in this article.

# GRAHAM ALLAN LAING

**Professor of Economics, California Institute of Technology**

**Born July 14, 1884** **Died November 12, 1946**

Social Hour at the home of Professor Graham Laing, after one of his Economics Seminars.

ALUMNI who elected "Econ 45" in the senior year at the Institute will recall scenes similar to the one in the photograph. Annually, for almost 20 years, Professor Laing conducted his seminar at home one night a week throughout the term. Toward the end of the evening, Mrs. Laing always appeared with coffee and tea and a selection of cakes and sandwiches.

Many hundreds of people in the communities between Santa Barbara and San Diego will recall Professor Laing's lectures delivered before various civic and educational groups. For many years also, in addition to his popular lectures, he taught courses for the Extension Division of the University of California, Berkeley, and for the American Bankers' Institute.

Professor Laing was encyclopedic in his learning. At home both in science and letters, he exemplified the humanistic spirit. On the platform and in conversation, the play of his active mind was invariably stimulating, and his retentive memory seldom was at a loss to produce the apt quotation. The many who have listened to him will recall with pleasure, in addition to the wisdom he proffered, the clear and witty delivery in rapid, incisive, Dundee-American Scots.

Many who knew Professor Laing well will remember most vividly perhaps the rich human qualities that made him the colorful personality he was. Few men have so relished humanity. With Terence he might have said, "I am a man; therefore I consider that nothing human is alien to me." A great capacity for fun accompanied an even greater one for sympathy and tolerance. In consequence, he was much sought after, as much for his helpful counsel as for his whole-hearted laughter.

Those who knew Professor Laing best will recall evenings of serious, though never solemn, conversation; an inexhaustible supply of stories, limericks, and other light verse; and, occasionally an evening when he would sing, in a rich natural baritone, Scotch border ballads and other old songs.

Among Professor Laing's closest friends a number treasure some gift from his wood shop; for next to the delight he took in his work as a skilled woodcraftsman, he delighted to give it away.

From 1942 through 1944, Professor Laing was project supervisor for one of the Institute's confidential defense activities. A heavy responsibility, it meant making and administering a total budget of several hundred thousand dollars. Though his health was precarious during the war, he did not become seriously ill until about a year ago.

Mrs. Laing continues to live at the familiar, hospitable house on Pleasant Way.

**This article was prepared by Dr. Roger Stanton, assistant professor of English Language and Literature, California Institute of Technology.**

## Seventy-Three Years of Photography

(Continued from page 8)

Most of Peabody's later work was designed to be used in visual education. In the twenties and thirties he photographed all of the national parks, at first producing lantern slides and later 35 millimeter film strips and motion pictures. More recently his motion picture films have been re-issued by Bell and Howell on 16 millimeter film with a sound track of descriptions by the photographer. Before this was done, Peabody traveled for 15 years, lecturing on the natural phenomena that he had photographed.

In the fall of 1920 the Norman Bridge Laboratory of Physics was under construction at the California Institute. Peabody suggested to Hiram Wadsworth, a trustee of the Institute at that time, that a photographic laboratory should be incorporated in the structure. After consultation with the architect, Bertram Goodhue, it was decided to adopt Peabody's plan, and a laboratory was built on the top of the building, connecting with the elevator shaft. Much of the original equipment in the laboratory was contributed by its designer, and some of it is still in use.

Mr. Peabody recently moved from Altadena to Glendora, and although he built a darkroom in his present home within a month after his arrival, he still commutes to his Pasadena laboratory two or three times a week. He still has prints to make from his negative files, and after the next fall of snow there will be several winter scenes to develop.

# C. I. T. NEWS

## PRESIDENT DUBRIDGE APPOINTED TO ATOMIC ENERGY ADVISORY BOARD

PRESIDENT Lee A. DuBridge was named last month by President Truman to serve on the nine-man advisory board to the Civilian Atomic Energy Commission. This board, according to President Truman, has been chosen to advise the Civilian Commission on "scientific and technical matters relating to materials, production and research an development."

The first item on which the advisory board is expected to aid the commission is the layout of an atomic energy power plant and establishment of research centers in various parts of the nation.

Other members of the board include Professor J. R. Oppenheimer, Dr. J. B. Conant, Enrico Fermi, Glenn T. Seaborg, and I. I. Rabi.

## SAILING TEAM LOSES CUP

COMPETING with Pacific Coast collegiate yachtsmen, the Caltech team failed to repeat its 1941 victory, and came in seventh out of a field of 10 in the second annual Pacific Coast Intercollegiate Sailing Association Regatta. Held in Newport Bay on Sunday, December 22, the race meeting was won by Stanford sailors, with Loyola and U.C.L.A. coming in second and third. Other colleges participating were Pomona, Santa Barbara State, U.S.C., U.C., and Fullerton and Santa Ana Junior Colleges. An Annapolis team was invited, but failed to arrive in time for the meet.

Three crews of two men each were entered by the participating colleges. Boats were supplied by the Newport Yacht Club, which borrowed them from members. In this race Dyer Dinghies were used, and distributed to the teams by lot.

Weather on the day of the race proved poor for sailing. Light breezes only occasionally disturbed the calm bay. The dinghies crept around the course with a few spurts by a boat or two on the windward side of the fleet.

Active on the race committee was Jack Palmer '41. This group laid out courses for three races, with all boats entered in each.

Further meets of a dual or triangular sort are planned by Institute sailors during the spring. No definite dates have been set so far.

## MANY FORMER LETTERMEN ON TRACK TEAM

TRACK and field prospects for 1947 look good. Coach "Doc" Hanes, with 14 lettermen back in school, is expecting an exceptionally well-balanced squad. From the 1946 team are Paul Saltman, hurdles, George Brown, pole vault, Tom Miller, high jump, Doug MacLean, javelin, Bill Simons, 880 and mile, Bob Funk, 440 and Charles Shaller, sprints. Two javelin throwers from previous years, Jim Smith, who won letters in 1942 and 1943 and was throwing the javelin around 200 feet while in the service, and Chuck McDougall, 1942 letterman, are back. Stan Barnes, who ran the 880 in a little under two minutes in 1944, and Elroy Chinn, a 21-foot broad jumper, are squad members this year. Three graduates who starred on the championship 1945 team are eligible: Hubie Clark, quarter miler, Ken Shauer, 440 and 880 man, and Don Tillman, weights. Shauer holds the school record of 49.4s in the 440, and ran the 880 in 1945 in 1m 59.2s. Tillman established new Tech records in 1945 with marks of 47 feet 3 inches in the shot and 142 feet 3 inches in the discus.

# ALUMNI NEWS

## ALUMNI ASSOCIATION OFFICERS

| | | |
|---|---|---|
| PRESIDENT<br>A. L. Laws '26 | | SECRETARY<br>D. S. Clark '29 |
| VICE-PRESIDENT<br>W. M. Jacobs '28 | | TREASURER<br>W. R. Freeman '25 |
| | BOARD OF DIRECTORS | |
| F. T. Schell '27 | | J. R. Bradburn '32 |
| C. F. Friend '38 | | R. D. Andrews '15 |
| H. B. Lewis '23 | | H. M. Huston '29 |
| | C. W. Varney Jr. '22 | |

## ALUMNI CHAPTER OFFICERS

### *New York Chapter:*

PRESIDENT — Evan Johnson '38
969 Madison Ave., New York 21, N. Y., Tel. BUtterfield 8-4116
VICE-PRESIDENT — H. E. Mendenhall '23
3 Oakridge Avenue, Summit, N. J. — Tel. SU 6-2822
SECRETARY-TREASURER — Richard Pond '39
174 North 19th Street, East Orange, N. J. — Tel. OR 4-2164

### *San Francisco Chapter:*

PRESIDENT — Maurice Jones '26
908 Curtis Street, Berkeley 6, California, Tel. THornewall 2893
Bechtel McCone Brothers — Tel. DOuglas 4032
VICE-PRESIDENT — Ted Vermeulen '36
2226 McGee Avenue, Berkeley 3, California
Shell Development Company — Tel. EXbrook 5400
SECRETARY-TREASURER — Robert P. Jones '35
1431 Park Blvd., San Mateo, California, Tel. San Mateo 3-7634
Standard of California — Tel. SUtter 7700

The San Francisco Chapter meets weekly for lunch at the Fraternity Club, 345 Bush Street, on Mondays.

## C.I.T. GRADUATES PROMINENT AT A.I.M.E. TECHNICAL SESSION

SEVERAL C.I.T. graduates aided in the presentation of a technical sessions program of the A.I.M.E.'s Petroleum Division in Los Angeles, late in October.

Norris Johnston, Ph.D. '30, of the General Petroleum Corporation, was on the Technical Sessions Program Committee, and presided at an afternoon meeting.

Nicholas D'Arcy '28, of the Charles W. Carter Company, spoke on **Hydraulic Drives in the Oil Fields.** Dr. B. H. Sage, M.S. '31, Ph.D. '34, professor of chemical engineering at the Institute, with Robert H. Olds '38, M.S. '39, research assistant in chemistry, considered the **Volumetric Behavior of Oil and Gas from Several San Joaquin Valley Fields.** E. V. Watts '36, of General Petroleum, presented **Some Aspects of High Pressures in the D-7 Zone of the Ventura Field.**

Past president of the Southern California Section of the A.I.M.E., Harvey S. Mudd, who is also vice president of the Institute Board of Trustees and an Associate, addressed the annual banquet of the Southern California Section of the A.I.M.E. at the close of the two-day program on **Recent Observations in Europe and Cypress.**

## ALUMNI DANCE IN FEBRUARY

THE twelfth Annual Alumni Dance and Buffet Dinner is planned for the night of Saturday, February 15, at the Pasadena Athletic Club, corner of Los Robles and Green Street. Hal Loman and his orchestra will play for the dancing, beginning at 9:00, the buffet opens at 8:30, and the cocktail lounge will be open all evening.

Alumni are cordially invited and are welcome to make up a party of friends, alumni or not, to enjoy the affair. Dress will be informal and the ticket price, which includes everything, is seven dollars per couple. Accomodations are limited, however, and it is advisable to make reservations as early as possible. The final date for ordering tickets is February 12, and no refunds can be made for cancellations turned in after February 13. No tickets will be sold at the Club.

## ALBERT CHAPMAN '25 RECOMMENDS VENEZUELA

ALBERT Chapman '25, who is with the Creole Petroleum Corporation at Maracaibo, Venezuela, writes:

"After I returned from overseas I ran into Hans Kramer, our old PMS&T back in '21-'23. Now a B.G. and had just been assigned to the Mississippi River Commission (He has since resigned and is with Sverdrup in Kansas City, specializing in hydraulics consulting.)

"I returned to civilian life just a year ago, and with my wife, took a six week drive from Washington, D.C. (my last station) to our home in Texas, traveling up through Portland Maine, Niagara Falls, New York, Detroit, Indianapolis, Tulsa, Dallas and Houston. In Niagara Falls I ran into that red-headed piano player, Paul Noll, '25. We had dinner together and after dinner Paul demonstrated that his fingers had lost none of their old touch, playing duets with my wife on the Niagara Hotel piano.

"While overseas in Eritrea and Egypt I ran into Paul Jones '36, when he was on a construction job there. My own overseas assignment was area engineer in Egypt, Eritrea, and later was commanding officer, Suez Canal Ports, in charge of all U.S. Army operations along the canal. I came back after 31 months, as a lieutenant colonel and with a Legion of Merit. I was then assigned as chief, Mechanical and Electrical Branch, Research and Development Office, Chief of Engineers, Washington, where I stayed until I went on civvy street.

"I am now with Creole Petroleum Corporation, part of the Standard Oil Company of New Jersey family. I am rated as senior engineer and am in the division engineer's office in Maracaibo. The work is interesting and the climate grand. Summers are far milder than either Texas or Egyptian summers. The thermometer did not go above 95 degrees all summer, which I'll bet is more than sunny California can say! This is a good outfit to be with and I can heartily recommend it and foreign work to any Tech man.

"We are planning to come out to Pasadena in June, 1950 for the 25th anniversary of the graduation of the class of '25. From what I hear, Tech has changed a lot since then!"

# ALUMNI ASSOCIATION FISCAL REPORT

In concurrence with a resolution of the Alumni Association Board of Directors the following fiscal reports are published covering the activities of the Association during the fiscal year ending June 30, 1946.

## BALANCE SHEET — JUNE 30, 1946

### Assets

| | | | |
|---|---|---|---|
| Cash in bank and on hand | | | $ 6,034.77 |
| Investments: | | | |
| [1]California Institute of Technology Trust: | | | |
| Life membership funds | $15,893.59 | | |
| General funds | 831.79 | $16,725.38 | |
| United States Treasury bonds | | 222.00 | 16,947.38 |
| Furniture and fixtures (net) | | | 221.04 |
| Postage deposits | | | 103.39 |
| TOTAL ASSETS | | | $23,306.58 |

### Liabilities

| | | |
|---|---|---|
| Accounts payable | | $ 2,438.75 |
| Deferred credits to income: | | |
| Dues paid in advance | $ 2,576.75 | |
| Subscriptions to E & S Monthly | 518.50 | 3,095.25 |
| Reserve for life memberships: | | |
| Fully paid memberships (321) | 16,050.00 | |
| Partly paid memberships (86) | 1,831.94 | 17,881.94 |
| TOTAL LIABILITIES | | $23,415.94 |

### Capital

| | | |
|---|---|---|
| Surplus, July 1, 1945 | $1,416.03 | |
| Less excess of expenses over income for year | 1,525.39 | |
| Deficit, June 30, 1946 | | ( 109.36) |
| TOTAL LIABILITIES AND CAPITAL | | $23,306.58 |

**1 California Institute of Technology Trust is an irrevocable trust. Funds invested therein share proportionately with Institute funds in income which is distributed annually. However, the investment principal cannot be withdrawn from the trust.**

## STATEMENT OF INCOME AND EXPENSE YEAR ENDED JUNE 30, 1946

### Income

| | | | |
|---|---|---|---|
| Annual dues | | | $3,226.85 |
| [1]Interest | | | ---- |
| [2]Capital gain | | | 108.94 |
| Other income | | | 29.11 |
| Total Income | | | $3,364.95 |

### Expenses

| | | | |
|---|---|---|---|
| Administration | | $1,403.40 | |
| [2]Social | | ( 19.59) | |
| [3]Seminar | | ( 338.38) | |
| Membership | | 266.70 | |
| Placement | | 250.00 | |
| Chapters | | 73.00 | |
| [3]Assistance to Associated Student Body | | 195.54 | |
| E & S Monthly | $3,823.27 | | |
| Less subscription income | 763.65 | 3,059.62 | |
| Total Expenses | | | $4,890.29 |
| Deficit | | | ($1,525.39) |

**1 Interest on funds invested in California Institute of Technology Trust. Due to a change in accounting methods during the year, interest is not taken into income until received. This statement therefore does not reflect $672.60 interest earned but not received until the succeeding fiscal year.**

**2 A proportionate share of capital gains made on California Institute of Technology Trust portfolio.**

**3 Underwriting portion of costs of publication of the California Tech and the Big T.**

**Amounts shown are net. Brackets represent deficit or an excess of receipts over disbursements.**

## BUDGET YEAR ENDING JUNE 30, 1947

### Income

| | | | |
|---|---|---|---|
| Dues | | | |
| Members to 9/30/46 — Annual | 1,378 | | |
| Life | 346 | | |
| Total | 1,724 | | |
| Dues rec'd to date | | | $5,111.25 |
| Assume 1,800 total—means 76 additional @ $4.00 | | | 304.00 |
| Total available dues | | | 5,415.25 |
| Less 1,800 @ $2.00 reserved for E & S | | | 3,600.00 |
| Net income from dues | | | 1,815.25 |
| Interest on Trust funds—4.3% per Mr. Nash | | | 672.60 |
| Share of Capital gains of Trust fund per Mr. Nash | | | 72.45 |
| Miscellaneous income—addressograph | | | 725.00 |
| Total | | | $3,310.30 |

### Expense

| | Actual 1945-46 | 1946-47 |
|---|---|---|
| Administration | $1,857.75 | $2,050.00 |
| Social | ( 108.48) | ---- |
| Seminar | ( 345.86) | ---- |
| Membership | 209.12 | 250.00 |
| Placement | 250.00 | 250.00 |
| Chapters | 73.00 | 100.00 |
| Assistance to Asso. Student Body | 195.54 | 200.00 |
| Fund Committee | | 250.00 |
| Total | | $3,100.00 |
| Est. Surplus | | $ 210.30 |

The outstanding feature of the above income report is the substantial net loss, resulting primarily from increased costs of publication of **Engineering and Science Monthly.** The net cost of publication of the magazine rose from $1340 the preceding year to a figure of $3060, a sharp advance of $1720 or about 128 per cent. This was due to a combination of unfavorable circumstances including marked increases in the cost of paper, printing, and engraving and some decline in advertising revenue.

The serious problem posed by this situation also showed up in the June 30 balance sheet, with an indicated deficit of $109.

In attempting to put these activities on a sounder financial basis for future years a series of conferences and committee meetings were held. It was definitely established that all expenses except for magazine were at an irreducible minimum; that the magazine was such a vital part of Alumni and Institute activities that every effort should be exerted to continue it on the existing basis; with all operating costs rising, some increase in dues was almost an essential move. A program was then worked out involving the following steps:

a) Alumni Association annual dues and charges for life memberships were increased to put them more in line with those of other schools.

b) The arrangement whereby the business affairs and publication details of **Engineering and Science** had been handled by an outside agency since the fall of 1943 was terminated, and all activities were again consolidated in the Alumni office under supervision of a salaried managing editor.

c) The Institute administration, recognizing the value of the magazine in its public relations program, agreed under certain conditions to underwrite deficits sustained by the magazine during the current fiscal year.

To date this latter step does not appear to be necessary.

Aside from the above financial difficulties the Association enjoyed another progressive year. The usual number of dinner and social meetings were held, the Alumni Seminar was enjoyed by a large group of interested Alumni and guests, and an innovation in the form of a Theatre Party at the Pasadena Playhouse rounded out a very successful year for the social and program committees. Membership continued to increase, and the end of the year saw the following tally as compared with the previous year:

| | June 30 1946 | June 30 1945 |
|---|---|---|
| Annual Members | 1412 | 1256 |
| Fully Paid Life Members | 321 | 257 |
| Total | 1733 | 1513 |

Plans were made at the end of the year to assist in the welcoming of the new Institute president, Dr. DuBridge; and the Association has signified its intention and desire to cooperate with the new administration in furthering the work of the Institute. The mutual advantages of such cooperation are very strongly felt by both groups.

(Signed) Charles W. Varney, President 1945-46
Allen L. Laws, President 1946-47

## MISSING ADDRESSES

**The residence, business or military addresses of the following graduates are unknown. If anyone reading this column could supply this information, it would be appreciated if they contact the Alumni Office. —Editor.**

**1937**
Murphy, Joseph N.
Nojima, Noble
Odell, Raymond H.
Parry, H. Dean
Rinehart, John S.
Schultz, John R.
Servet, Abdurahim
Shaw, Thomas N.
Shuler, Ellis
Smith, Joe N.
Townsend, Robert D., Jr.
Tsubota, George Y.
Walseth, Sterling
Wiseman, Sam H.
Yin, Hung Chang

**1938**
Ackerman, John B.
Davidson, Donald D.
Djnab, Kamal
Elliott, Norman
Fuetsch, Frederic T.
Gershzohn, Morris
Hayward, Russell E.
Jack, Samuel S.
Jennings, Stephen
Jetter, Ulrich
Kanemitsu, Sunao
Lowe, Frank C.
McLeish, Charles W.
Moorman, Thomas S.
Nysewander, Cecil W.
Ofsthun, Sidney A.
Orr, James M.
Putt, Donald L.
Stone, William S.
Taso, Chi Cheng
Tieker, Paul O.
Wang, Hsih Heng
Windsor, Emanuel

**1939**
Arnold, Lee
Burns, Martin C.
Cabeen, William
Easton, Robert L.
Fan, Hsu Tsi
Goering, Kenneth J.
Hendry, Noel W.
Hiehle, Ernest M.
Hoy, Robert B.
Hsueh, Chao Wang
Jackson, Andrew M.
Jones, Winthrop G.
Liang, Car Chia Chang
MacKnight, Robert H.
Neal, Wilson H.
Norquist, Kenneth S.
Parish, Elliott W., Jr.
Robertson, Francis A.
Stephens, Frank B.
Tatom, John F.
Widmer, Robert H.
Wilson, Harry D.
Yates, Donald N.

**1940**
Batu, Buhtar
Bigelow, James O.
Chen, Shang-Yi
Gentner, William E.
Gould, Clark W., Jr.
Green, William J.
Haffner, Bernhard
Hartman, Edwin
Hetzel, Eustace P.
Hlynka, Isadore
Hsu, Chang Pen
Kreiger, Stuart A.
Menis, Luigi
Pai, Shih-I
Tao, Shih Chen
Tobin, Bernard
Vernon, James B.
Wang, Tsumg-su
Wasem, Richard
Yuan, Luke C.

**1941**
Bell, Richard W.
Benson, Arthur S.
Carlmark, Carl W.
Chang, Chieh Chien
Fisher, Robert E.
Garrett, James R.
Gould, Martin
Green, Alex E.
Hamway, Daniel S.
Hight, Charles T.
Ikeda, Carl K.
Kuo, I. Chang
Lewis, Lloyd A.
McIntosh, James
Miller, Joseph A.
Moore, Charles L.
Myers, Charles S.
Nicholson, George H.
Peters, Ralph
Roen, Charles B.
Shores, Von R.
Spencer, Norman C.
Steele, George F.
Taylor, D. Francis
Tiemann, Cordes F.
Whitfield, Hervey H.
Wolfe, Samuel

**1942**
Bergh, Paul S.
Carr, Earle A.
Curtis, Thomas G.
Dall, George R.
Go, Chong Hu
Howell, Benjamin F.
Larson, Erwin R.
MacKenzie, Robert
McDaniel, Gene W.
Merryfield, Lloyd
Novitski, Edward
Shaffer, Philip A., Jr.
Smith, Alexander
Wilson, Albert G.

**1943**
Bragg, Robert M.
Eaton, Alvin R., Jr.
Hanger, Willard M.
Ise, John, Jr.
Laforge, Gene R.
Ling, Shis Sang
Merritt, Melvin L.
Nilakantan, Parameswar
Vincente, Ernesto

**1944**
Abrams, Leonard S.
Cowden, Warren L.
Cox, Charles S.
Curci, Harold V.
Dixon, Howard H.
Ely, Frederick B.
Hahs, Martin L.
Hunt, Charles W.
Knudson, Alfred G., Jr.
Martin, Don Stanley
Rattray, Maurice, Jr.
Silgado, Enrique F.
Smith, Frank C., Jr.
Stanford, Harry W.
Sunalp, Halit
Trimble, William M.
Writt, John J.

## PERSONALS

### FORMER FACULTY

HANS KRAMER, who was ROTC instructor at the Institute from 1920 to 1924, is retired from the Army as a brigadier general. He is now engaged as a consulting engineer in San Francisco.

ANTONIN HEYTHUM, lecturer in industrial design from 1942 to 1945, writes: ". . . some news which may interest you is my acceptance of a full professorship at Syracuse University, where they are considering the introduction of a five year curriculum in Industrial Design. On my request I received a full time assistant whom I chose among the associates of one of the leading industrial design offices in New York City. He is in Syracuse permanently supervising the students' work, while I am committed to be in Syracuse only twice a month to check on the work, to give tests and criticism, and to introduce new assignments. We have 20 students to begin with. The way my engagement is arranged, it does not interfere with my work at the Columbia School of Architecture."

#### 1914

GUY D. YOUNG continues as owner and operator of 165 acres of orchard and vineyard at Exeter, California. Also, during October and November he operates a Red Emperor packing house from which 126 carloads were shipped this year.

#### 1916

MAX H. CARSON, with the U. S. Geological Survey at Honolulu, flew to the States for a two weeks visit. While here he attended a conference of District Engineers of Geological Survey at Montgomery, Alabama, visited in Washington, D. C. and spent some time at Los Alamos, New Mexico.

#### 1917

ROY T. RICHARDS, having served in both World Wars, is now assistant general superintendent of the Central Arizona Light and Power Company in Phoenix.

#### 1927

J. DAVIS SHUSTER came west from Braintree, Massachusetts, to see his family and to visit in San Francisco over the Christmas holidays, returning by plane after the first of the year. Davis is electrical engineer with Bethlehem Steel Company in Quincy, Massachusetts.

LEONARD SNYDER was unable to attend the December 10 Alumni Dinner because of a severe case of mumps.

#### 1928

TOMIZO SUZUKI has been working for the Hazama Gumi Company, Ltd., contractors in Nagoya since December, 1941. The company at present is doing extensive construction work for American and British Occupation Forces. He reports that life in Japan is extremely hard because of the scarcities of foodstuffs, clothing and housing.

#### 1929

NICHOLAS M. OBOUKHOFF, research professor and professor of mathematical physics at Oklahoma A. and M. College, read two papers at the December 7 meeting of the Oklahoma Academy of Science. His topics were "Teaching of Graduate-Course Education to Undergraduate Students" and "Geographical and Historical Background of the Present-Day Situation in Manchuria."

#### 1930

HARRY MASON was with the Army Engineers for more than four years, serving both in the European and Pacific theaters. Harry has now returned to a position with the Los Angeles County Flood Control as office engineer.

#### 1931

EVERETT TROSTEL is employed by the consulting firm of DeGolyer and MacNaughton in Dallas, Texas.

#### 1932

CHARLES D. CORYELL holds the position of professor of chemistry at M.I.T.

#### 1934

CARROLL CRAIG is now manager in Bleitz Camera and Baco Manufacturing Companies, both of Hollywood.

DAN MATHEWSON was married in August, following his release from the Army in the middle of the year. Dan has gone back to work at Lockheed.

GLEN E. WOODWARD was discharged from the Navy as lieutenant-commander in May and is now with DeGolyer and MacNaughton consulting firm of Dallas as petroleum engineer. Glen has two children.

#### 1935

ELMO S. MATHEWS was formerly with the U. S. Army Signal Corps in Washington, D. C., and is now at Harvard Business School.

#### 1936

MALCOLM E. DOUGLAS was married to Miss Elaine Towne of Kennebunkport, Maine, on August 24. The couple now live in Lynn, Massachusetts.

JOHN GATES is exploitation engineer in charge of chemical development in the Shell Oil Company production laboratory in Los Angeles.

#### 1937

JOHN S. EDWARDS goes to work for Chemical Process Company in Millbrae the first of the year. Chemical Process is a small, relatively new company for the manufacture of chemicals used in ion exchanges in the treatment of water.

LIEUTENANT COLONEL WILLIAM J. ELLISON, JR. was married November 2 to Miss Helen Stoshitch in San Francisco.

#### 1938

BOB BARRY is chief engineer and member of the executive committee of the Mission Appliance Corporation in Los Angeles.

#### 1939

NOAH H. ANDERSON is moving to Longview, Washington, where he is employed in the Reynolds Metal Company.

#### 1940

ERWIN J. POIZNER was given his M.S. in geological engineering at C.I.T. in September, 1946, and now is employed by the Shell Oil Company at Tyler, Texas.

CHARLES D. RUSSELL has taken a position as research chemist with Carter Oil Company in Tulsa.

NORMAN P. OLDSON has returned to the Bureau of Ships in Washington, D. C., following participation in Operations Crossroads at Bikini. Norman was married October 19 to Miss Ellen Thompson of Peoria, Illinois.

#### 1941

JOE LEWIS is the father of a second son, John Rigg, born November 3. The first son, Joe III (Jeff), was born in 1944 while Joe was serving in the Navy.

JOHN G. PARTLOW and his wife, the former Miss Imogene Burgess of New Martinsville, West Virginia, now live in Pittsburgh, Pa., where John is electrical design engineer for turbo generators at Westinghouse. The couple were married August 17.

#### 1942

ALBERT ALBRECHT is employed by Gilfillan Bros. in Los Angeles as engineering superintendent.

CHARLES M. BROWN has returned to Glendale to establish the West Coast branch of Melpar, Inc., of Washington, D. C. He left RCA Service Company, Camden, New Jersey, in March, 1946, to join Melpar, where he became supervisor of the electro-mechanical division.

MURRAY J. LESSER is now working on Fairchild Engine and Aircraft Corporation's nuclear energy for aircraft project at Oak Ridge, Tennessee.

#### 1944

WARREN AMSTER was discharged from the Army in August and has returned to the Institute as a graduate student working for an A.E. degree.

ARTHUR CARSON is employed at Los Alamos, New Mexico.

ELMER S. HALL moved to Washington, D. C., in October to work with Melpar, Inc., in the electronic division.

WHEELER J. NORTH got his discharge from the Army in October with the rank of first lieutenant in the Signal Corps.

ROLF W. PROTZEN has changed his name to ROLF W. KLOCK and is employed as chief engineer for the Brucon Company in San Francisco, manufacturing hydraulic equipment.

#### 1945

ROBERT R. BENNETT is at Tech as a teaching assistant and graduate student working for his M.S. degree in electrical engineering.

STANLEY D. CLARK is engaged to Miss Doris Donnelly of Santa Monica.

R. F. SCHMOKER Ensign (CEC) USN, has been appointed maintenance superintendent at Naval Air Station, San Diego, and is residing at that station with this wife and daughter, Linda Suzanne, age one month.

#### 1946

MORTON M. ASTRAHAM is employed by the Glenn L. Martin Company.

CHARLES G. BEATTY, HARVEY H. BRINKHAUS, YOSHIYUKU J. FUJIMURA, and JOHN SUTYAK are working at the Westinghouse Electric Corporation plant in East Pittsburgh. Pennsylvania.

KENNETH N. DOIG is in mechanical engineering production work with Shell Oil Company in Los Angeles.

JAMES DRAKE has a position with Marquardt Aircraft Corporation in Venice, California, working on the ram-jet project. Jim is living in Santa Monica.

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# The Main Line

JANUARY, 1947

This is the time when it's customary to make good resolutions for the New Year.

For our part, we resolve to do the best job of railroading we can. Last year we were hampered by shortages of equipment, but this year we expect to make some headway in solving that problem.

You already know about the two sets of custom-built streamliners we've ordered for the Shasta Route between San Francisco and Portland, and the Golden State Route between Los Angeles and Chicago. These trains are slated for delivery this year, and we are sparing no expense to make them the finest ever built.

For our freight service, we've ordered 40 miles of assorted freight cars and 20 powerful diesel-electric locomotives. In addition, Pacific Fruit Express has ordered 40 miles of new refrigerator cars.

## Passengers Wanted

During the war we were forced to discourage non-essential travel. This went on so long that we're afraid some people got in the habit of not even trying for train reservations.

We hope everybody realizes that we want pleasure travelers now. The "Next time, try the train" sign is out. We want your business and will do everything we can to give you a fast, comfortable trip.

Pullman space is still not easy to get at the last moment, but coach and chair car seats are comparatively plentiful. Nearly all of our fastest trains, by the way, carry chair cars or coaches—the *Overland Limited, Golden State Limited, Sunset Limited, Beaver, the Daylights* and even the streamliner *City of San Francisco*.

Coaches and chair cars aren't as fancy as Pullmans, of course, but for the combination of economy, speed and comfort, they're hard to beat.

Our newer streamlined chair cars have seats cushioned with soft foam rubber, enormous "picture" windows, and air-conditioning.

## All Aboard for Snow

Many skiers have discovered that the train is the most sensible way to the snow fields. You don't have to worry about tire chains, frozen radiators, etc. Just sit back and take it easy while the engineer does the work.

Norden and the Sugar Bowl are on Southern Pacific's main line over the High Sierra. From our Shasta Route you can reach Mt. Shasta and Lassen. Merced on our San Joaquin Valley Line is the gateway to Yosemite National Park.

## Fan Mail

Mrs. George Garratt of Portland dropped us a note saying how much she enjoyed the cruise on Shasta Lake last summer. (She found out about it in our August ad.)

We didn't know we had readers in the east until Mr. E. M. Miller wrote us from Anderson, Indiana, recalling with pleasure a trip he made between San Francisco and Los Angeles on the Southern Pacific.

We may have to start a poet's corner. Mr. R. C. White of Crestline, California, sent in some verses praising S.P. service. We are sorry that lack of space prevents us from printing it.

Mr. George Hackett of Spokane writes that his favorite locomotives are the big cab-in-front jobs that pull S.P. trains over the High Sierra. We agree, but we also like the sleek "4400's" that pull the *Daylights*.

Thanks to Mrs. Emory Marshall of Walnut Creek, California, for her nice note about our November advertisement.

## Ever see New Orleans?

If you're planning a trip east within the next two months, have you thought about seeing New Orleans on your way?

Railroad round trip tickets offer such a generous choice of routes that the chances are you can include New Orleans in your ticket for no extra rail fare—also Southern Arizona, El Paso, the Mexican Border country, San Antonio and Houston.

Of course it takes a little longer to go via New Orleans, but not as long as you might think since we speeded up the *Sunset Limited*.

This year the famous Mardi Gras parade will be on February 18.

## The New "Imperial"

In case you didn't read about it, we have a new daily train between Los Angeles and Chicago, the *Imperial*. Faster than pre-war trains over this route, the *Imperial* consists of standard Pullmans, modern chair cars and coaches, lounge car for Pullman passengers and dining car. The *Imperial* is really an international train, running for 51 miles through Old Mexico. It also shows you California's sunny Imperial Valley.

## Accent on Dependability

Winter accents an important advantage of trains that you probably seldom think about—*dependability*.

It is a safe bet that the *Morning Coast Daylight* will leave San Francisco tomorrow morning at precisely 8:15 a.m. and arrive in Los Angeles tomorrow night at 6 p.m.—regardless of weather conditions along the route.

There's nothing sensational about dependability. It's something you take for granted with trains, just as you do with the paper boy and the milkman.

Nevertheless, in this uncertain world, it's nice to know that you can depend on the trains to go through—rain or shine. It's just one more reason to "try the train," next time.

—H. K. Reynolds

**S•P** *The friendly Southern Pacific*