praise!'
Now, a' together, hear them lift their lesson—
theirs an' mine:
'Law, Order, Duty an' Restraint, Obedience,
Discipline!'
Mill, forge an' try-pit taught them that when roarin'
they arose,
An' whiles I wonder if a soul was gied them wi'
the blows."

In 1844, however, that master of light and color, J. M. W. Turner (1775-1851), was inspired by a scene on the Great Western Railway in England to paint a superb picture dedicated to steam and to speed. Although an old man at the time, Turner comprehended the dynamic poetry of a train in motion through a landscape simultaneously swept with rain and drenched with sunlight, and portrayed it upon a canvas that now hangs in the National Gallery in London.

While no other treatment of steam locomotion compares in artistic merit with Turner's "Rain, Steam and Speed", there do exist a few paintings of early trains which merit reproduction in a series of this kind because of their historical accuracy. Among these are some of the works of the American historical painter, Edward Lamson Henry (1841-1919).

To quote from the Dictionary of American Biography, "Henry's major interest was in the past life and customs of the United States, especially during the first half of the nineteenth century. He began soon after his return (from study in Paris under Suisse, Gleyre, and Courbet) to paint pictures which were accurate to the last chair and the most minute button. Owing in part to his attention to detail, his work was of greater historic than artistic merit . . . Primarily an illustrator in oils, he found an appreciative public in that vast majority which demands of a picture first of all that it tell a story."

Plate 1 reproduces Henry's painting of the first train operated in the state of New York. The locomotive portrayed, named the "De Witt Clinton", made its first trip in July, 1831, over the Mohawk and Hudson Railroad (now the New York Central). On August 9, it made the trip from Albany to Schenectady, a distance of seventeen miles, in less than one hour.

A painting of a railway scene of a somewhat later period (1837) by the same artist is reproduced in Plate 2. Unfortunately, a copy of Henry's better-known painting, "Railway Station—New England" is not available to the writer. Although not great art, Henry's paintings, because of "their rare sincerity and their quaintness," probably "will always be of interest and of value . . . and will throw an ever-penetrating light into our vanished customs and past social history".[1]

1. Lucia Fairchild Fuller, *Scribner's Magazine, 66,* 256 (1920).

C.I.T. NEWS

C.I.T. STARRED SCIENTISTS

IN a recent letter to California Institute of Technology, Stephen S. Visher, professor of geography at the University of Indiana, enclosed a summary of the graduates of C.I.T. who have received stars in present and past editions of "American Men of Science".

Professor Visher's summary includes the following C.I.T. starred alumni. *In chemistry:* Joseph E. Mayer, '24, Kenneth S. Pitzer, '35. *In physics:* Carl D. Anderson, '27, Richard H. Crane, '30, J. W. M. DuMond, '16, Robley D. Evans, '28, Edwin M. McMillan, '28, William Shockley, '32.

The list also includes the following C.I.T. starred alumni in doctorates. *In astronomy:* O. C. Wilson, '34. *In chemistry:* L. O. Brockway, '33, R. G. Dickinson, '20, P. H. Emmett, '25, Sterling B. Hendricks. '26, Linus Pauling, '25, E. Bright Wilson, '33, Don M. Yost, '26. *In mathematics:* H. P. Robertson, '25. *In physics:* Carl D. Anderson, '30, I. S. Bowen, '26, R. M. Bozorth, '22, H. Richard Crane, '34, J. W. M. DuMond, '29, Robley D. Evans, '32, Charles C. Lauritsen, '29, A. C. G. Mitchell, '27, S. H. Neddermeyer, '35, H. Victor Neher, '31, L. N. Ridenour, '36, Robert B. Brode, '24. *In zoology:* Albert Tyler, '29.

Stars in "American Men of Science" indicate that in the opinion of his peers the starred scientist is distinguished for research. It implies either a large volume of good work or a considerable amount of original work. It does not imply that the work done by other scientists is not outstanding, but merely that it has not impressed the voters as being quite so worthy of approbation.

Professor Visher's letter also contained Table I reprinted from "Science", which is reproduced below. Column I gives the number of scientists first starred in 1933 to 1944, serving on the faculties of the universities which had three or more such scientists in 1944. Column II is the number of the members on the teaching staff on November 1, 1944. Column III is the number of scientists starred in 1933-1944 per 100 members of the 1944 teaching staff. It indicates that in this respect C.I.T. leads the field.

TABLE I

	I Starred Scientists 1933-1944	II Total Teaching Staff 1944	III Starred Scientists Per 100 Members of Staff
Brown	4	157	2.6
California	41	2,376	1.7
California Institute of Technology	20	140	14.3
Chicago	30	798	3.8
Columbia	36	2,488	1.4
Cornell	18	1,052	1.8
Duke	3	465	0.6
Harvard	50	1,775	2.8
Hopkins	16	765	2.1
Illinois	18	1,743	1.0
Indiana	7	467	1.5
Iowa	10	622	1.6
Iowa State	4	413	1.0
Massachusetts Institute of Technology	19	442	4.3
Michigan	30	820	3.7
Minnesota	18	836	2.1
North Carolina	6	311	2.0
Northwestern	12	1,330	0.9
Ohio	9	1,123	0.8
Pennsylvania	14	1,322	1.1
Penn. State	3	864	0.3
Princeton	26	220	10.2
Rochester	7	544	1.3
Rutgers	5	444	1.1
Stanford	22	645	3.4
Swarthmore	3	91	3.3
Virginia	6	270	2.2
Washington (St. L.)	6	468	1.3
Wisconsin	13	1,469	0.9
Yale	22	994	2.2

THE ANNUAL SEMINAR

ON April 29 at the Ninth Annual Alumni Seminar at C.I.T. two hundred and seventy-one Caltech alumni and guests heard reports of the work underway or completed at the Institute, and learned of some of the projects planned for the future.

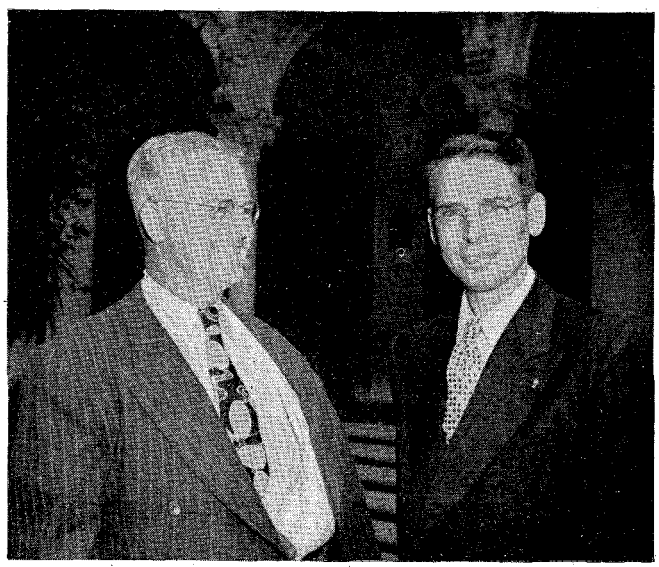
A program without a wasted moment featured the following events: A chapel service conducted by Dr. Max M. Morrison, pastor of Westminster Presbyterian Church, Pasadena, with music arranged by Mrs. Lucille Martin, Westminster director of music; a discussion by Dr. Martin Summerfield of C.I.T.'s Jet Propulsion Laboratory on the history of rockets for weapons for jet propulsion and for high altitude reserve; a report by Mr. Allen E. Puckett on the program of the Guggenheim Laboratory, with particular reference to the problems involved in flight at the speed of sound; a commentary by Dr. Wallace Sterling, Professor of History, on the world political situation; luncheon in the student houses; a talk by Dr. Frederick Lindvall, Professor of Mechanical and Electrical Enginering, on the methods of electrical analysis of mechanical problems; a survey by Dr. William E. Pickering, Associate Professor of Electrical Engineering, on the present status of radar and the application of radar to peacetime use; a discussion by Robert Gray, head of the department of Industrial Relations, on recent developments in his field of activity; and a talk by James R. Page, President of the Board of Trustees of the Institute on C.I.T.'s past achievements and future program.

One of the highlights of the Seminar was Mr. Puckett's forecast of air travel at speeds of 1,000 miles per hour. Discussing the difficulties encountered in overcoming the wall of resistance created by drag at speeds above our present maximums of 400 to 500 miles per hour, Mr. Puckett evaluated the designers' chances of reducing drag or increasing horsepower to surmount the problems of wind resistance and complex air flow prevalent at the speed of sound (760 miles per hour at sea level). Using slides and an able descriptive facility, Mr. Puckett drew a graphic picture of what might happen to a plane and pilot accelerating approximately 740 to 760 miles per hour. He stated that the baffled pilot might find, without using more power, that the speed of his plane had suddenly increased, not from 740 to 760 miles per hour, but from 740 to 1,000 miles per hour or more. Theoretically, drag may decrease when the speed of sound has been exceeded by a body in flight, said Mr. Puckett. He further predicted that aircraft speed in the future would not increase in small increments of five to ten miles per hour, but that speed gains would be tremendous once means are found to pass the critical point of resistance near the speed of sound. Mr. Puckett believes that the aerodynamicists will soon be able to perfect planes capable of flight at supersonic speed.

Another subject of special interest to the alumni was covered by Dr. Lindvall in his talk on electrical analyses of difficult problems of motion, vibration, and heat flow. Reviewing the existing possibilities of representing physical systems by electrical circuits, Dr. Lindvall enumerated some of the advantages of electrical calculation over mechanical calculation. The present use of suitable electrical units of inductance, resistance, and capacitance to represent physical elements of a given problem is relatively expensive and it takes a correspondingly longer time to obtain a dependable solution. In certain complex calculation, speed gains by use of electrical calculation might save days, weeks, or even years, of computation. Dr. Lindvall told of the work being done by Westinghouse, General Electric, and the Massachussets Institute of Technology, and of the electrical facilities available in their laboratories. At the present time no comparable equipment is in existence on the west coast, but it is Dr. Lindvall's hope that C.I.T. may acquire electronic computing devices which will provide equivalent facilities in California. Dr. Lindvall stated that the problem of financing the acquisition of equipment was now under consideration and that the alumni might be called upon to help determine to what extent western industry would need the services of this modern electronic computing device.

The alumni also listened to up-to-the-minute accounts on radar and rocket developments. Dr. William Pickering covered the history of radar from its inception and clarified both the basic principles of radar operation and the uses of the many types of radar in World War II. He concluded by outlining the application of radar in peacetime. Dr. Martin Summerfield stressed the important place rocket principles will have in industrial application and in pure scientific research.

Covering the important field of world affairs, Dr.



AT LEFT: Nicholas D'Arcy '28, and Kenneth Belknap '27, '47 and '46 Seminar chairmen, respectively. BELOW: Alumni luncheon at student house.

Sterling presented a helpful charting of the activities of the United Nations and of the Paris Peace Conference. The problems of labor and management were ably presented by Mr. Robert Gray. Mr. Gray's comments on securing employee understanding and cooperation, and on the current G.I. "on the job" training program, were received with interest evidenced by an active question and answer period which followed his talk.

Mr. James Page paid tribute to the achievements of Dr. Robert A. Millikan and of the Institute, and prophesied a creative future for C.I.T. exceeding the achievements of the past quarter of a century.

Special commendation on the success of the entire program is due Kenneth A. Belknap, '27, general chairman of the 1946 Seminar Board, and Nicholas D'Arcy, '29, assisting chairman. The alumni owe thanks also to the members of Ken Belknap's committee for their competent assistance in handling introductions, luncheon arrangements, registration, and the other arduous chores essential to the smooth functioning of a successful program. Ken's committee included: Ernest B. Hugg, '29, George Rice III, '31, Lupton A. Wilkinson, '38, Joseph J. Peterson, '37, Paul Hammond, '36, Harold Huston, '29, Harlan Asquith, '29, Edward Cornelison, '25, James H. Keeley, '31, Ira Bechtold, '30, Conrad Scullin, '29, and Charles Varney, '22.

DR. CORYELL WILL JOIN M.I.T. STAFF

DR. CHARLES D. CORYELL, who is distinguished for his work in the inorganic and physical chemistry of the isolation and identification of radioactive atoms, has been appointed professor of chemistry of Massachusetts Institute of Technology, according to Dr. Karl T. Compton, president of that Institute.

Dr. Coryell was a scholarship student at the California Institute of Technology from 1929 to 1932. During this three-year period he received the bachelor of science degree in chemistry and was awarded the California Institute of Technology Junior Travel Prize. In 1933 he enrolled for a year at the Technische Hochschule in Munich where he carried on special investigations on the fluorescence of acetone. Returning to C.I.T. for graduate work, Dr. Coryell received his degree of doctor of philosophy in physical-inorganic chemistry in 1935.

In 1938, Dr. Coryell joined the staff of the University of California at Los Angeles as an instructor in introductory chemistry, quantitative analysis, and physical chemistry; he was appointed assistant professor in 1940, and associate professor in 1944. In 1942 he was granted a leave-of-absence to lead a research staff working on the radiochemistry of the fission products in the chemistry division of the metallurgical laboratories at the University of Chicago.

Transferred to the newly opened Clinton laboratories at Oak Ridge, Tennessee, in 1943, Dr. Coryell was chief of a research section on radio-chemistry and fission products at the first industrial atomic power and plutonium production plant. This work involved intensive research in inorganic, physical, and analytical chemistry, especially that part known as radiochemistry, together with development work on high activity radiochemical separations and remote control operations. Upon completion of final reports for this project, Dr. Coryell will join the staff of the department of chemistry at the Massachusetts Institute of Technology in July.

INCREASE IN TUITION

AT a meeting held on April 1, 1946, the board of trustees of the California Institute voted to increase the annual tuition fee to $500.00, effective October 1, 1946, according to an announcement by James R. Page, chairman of the board.

The California Institute, like other non-tax supported colleges and universities, relies for a major fraction of its income on returns from invested endowments. This income has been reduced as interest and dividend rates have fallen, and still further reduction is expected. At the same time, the Institute is confronted with increased expenditures for salaries and wages, supplies and equipment, operation and maintenance. The decision to increase tuition was made as one, but only one, of the steps necessary to bring Institute income into line with Institute expenditure.

To aid students who have undue difficulty in meeting the cost of beginning or continuing their work at the Institute, there are available funds for loans and scholarships of which the trustees and faculty hope to make as liberal use as possible. It is hoped that no student who clearly belongs at the Institute will be prevented from attending because of financial need.

ATHLETICS

By H. Z. MUSSELMAN,
Director of Physical Education

A SQUAD of thirty-five enthusiastic men reported to Coach Mason Anderson for a six-week spring football practice session. This group will be enlarged later this season by men now engaged in other spring sports.

At present, only two lettermen from last year's squad —Don Hibbard, end, and Dennis Long, tackle—are available. However, several other men who, as members of the V-12 unit, made their letter on the 1945 team expect to be released from Service this summer and are planning to return to the Institute in the fall to complete their undergraduate work.

The fall term will not open until October 7, thus delaying the regular practice until that approximate date and necessarily curtailing the 1946 schedule. Opening the season with Occidental in the Rose Bowl on Friday evening, October 25, the Engineers on consecutive weeks will play Whittier, Redlands, Pomona, concluding their schedule with the newly-organized Pepperdine team.

MT. PALOMAR TELESCOPE

THE astrophysical observatory of California Institute of Technology, with a reflecting telescope one million times as powerful as the human eye, which can peer sextillion miles into space, and which does not vary from perfection more than one millionth of an inch, is nearing completion.

Construction work on the $6,000,000 Mt. Palomar reflecting telescope, financed by the Rockefeller General Education Board, was halted during the war years, but has now been resumed. The giant eye, originally cast in the Corning Glass Works, New York State, in 1929, will be ready for installation on the 6,500-foot mountaintop site fifty miles north of San Diego in the summer or fall of 1947. The 200-inch mirror disk, with a diameter and height of 137 feet each, will have four times the light-gathering power of the 100-inch telescope on nearby Mt. Wilson, presently the largest in existence.