

# LAMELLA ROOF TESTS

By Ben Benioff, '22

The interesting summary of an exhaustive series of tests on a full-size Lamella roof has just been published. These tests were conducted on September 15, 16 and 17 of this year in Los Angeles by Summerbell Roof Structures, under the supervision of Professor Frederick J. Converse of California Institute of Technology. The Lamella roof, familiar to all Tech alumni in the construction industry, is an arch type of roof structure and has been built in this country since 1925. Designed by a Dutch engineer and produced initially in Europe, its formulae and calculations were limited to vertical load design only. Following the earthquake of 1933, Summerbell Roof Structures of Los Angeles approached Dr. von Karman, Director of the Guggenheim Laboratories at California Institute of Technology, with the request that he derive formulae to show the application of this roof as a distributing element for lateral forces, inasmuch as the reports of the actions of this structure in the Long Beach quake were all very favorable. These data together with an analysis on vertical load design, also made by Dr. von Karman, were compiled by the company and with the aid of Prof. Converse a comprehensive method for analysis of all types of loading on a Lamella roof was set up and has since been used.

The tests were made to verify by active field measurements the analysis made by Dr. von Karman. To get away from inaccuracies that are inherent in smaller model tests of this

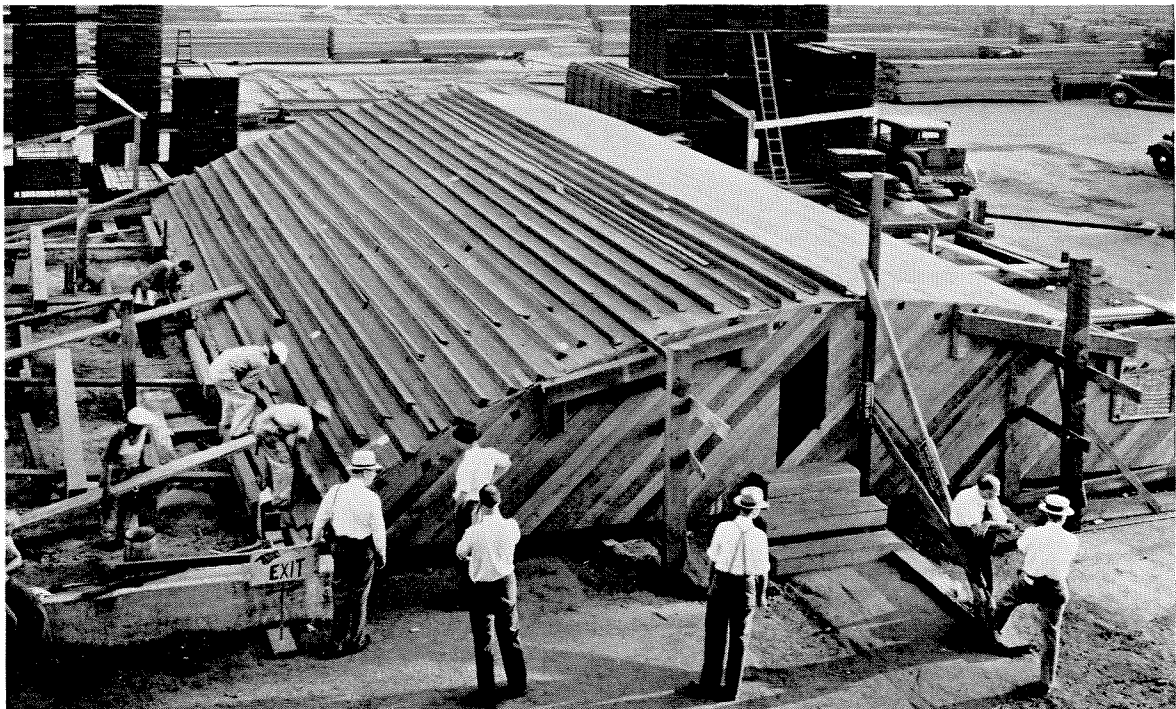
kind, it was decided that the tests should be made on an actual roof.

A roof 40' wide and 51'-10½" long with a rise of 6'-7" from the spring line was constructed in the Los Angeles yards of Hammond Lumber Company. It was designed and constructed in every respect as a normal job would have been and was built to comply with the standards required by the State Division of Architecture for school buildings. The four corners of the roof were held against lateral motion by means of kickers to the old concrete foundations over which the roof was constructed. The building was otherwise unrestrained and the side sills of the roof were supported on steel rollers. Against these sills four high capacity hydraulic jacks were placed to apply lateral loads.

For application of vertical loads, structural steel angles were used and placed in such a manner as to permit a uniform loading or a concentrated loading as the test might require. The roof structure at the beginning of the test was fully sheathed as were the end walls.

In all, eight separate tests were made on the test roof and all were under the direction of Professor Converse, who also had four or five undergraduate students to assist him. The tests included the application of (1) a lateral force on one sill; (2) lateral force on both sills; (3) a concentrated load on one side of the roof; (4) a uniform load over one-

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Engineers and workmen prepare for one of the tests.

half the span and for the last four tests higher applications of lateral loads with part of the roof sheathing removed and last with all the sheathing removed from the end walls.

Evidence of the importance attached to the findings can be seen by the fact that more than 250 architects, engineers, public officials, and construction industry people were present and followed the three days of tests.

Of course, among the alumni of the Institute there are a large number in the construction industry, many of whom were present at some time while Converse and his cohorts were simulating wind forces and earthquakes. Among those present were E. D. Seaver, '21, and Benioff, '22, who are structural engineers for Summerbell Roof Structures and were instrumental in bringing this test about. Among others seen were Wm. M. Taggart, '22, John E. Shield, '22, Robert Moodie, '26, Mott Prudames, '32, Morris Goldsmith, '24, Ernst Maag, '26, T. C. Combs, '27, Al Creal, '36, Julian Stafford, Ex. '22, Sidney Bamberger, '33, and Frank Lowe, '36.

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## MILITARY AFFILIATIONS

"Caltech Men in National Defense," by John E. Shield, '22, in the September issue of the Alumni Review, contained the names of many alumni who hold commissions in the various arms and services of the Army, Navy and Marine Corps. Realizing inability, despite a most thorough investigation, to obtain the names and assignments of all men so affiliated, a request was made for additional data. The response has been generous.

On page 16 herein are two letters from men far distant from Pasadena, containing several names. The following were also "reported in":

Kenneth Fenwick, '28, Lt., j.g., U.S.N., C.E.C., Res.

Thomas H. Evans, '29, 1st Lt., Engr. Res.

Carlyle H. Ridenour, '18, Major, Air Corps, U.S.A., Hamilton Field, San Rafael, Calif.

Robert G. Macdonald, '33, 2nd Lt., Engr. Res.

Harold J. Martin, Ex. '25 Capt., Coast Artillery, Res.

Wayland Maxey, '29, 2nd Lt., Q.M. Res; 29th Quartermaster Regiment.

Robert Bungay, Jr., '30, Third Coast Artillery, Res.

Gordon S. Mitchell, Ex. '30, has been assigned to special duty.

The following officers are assigned to the 975th Coast Artillery, Reserve:

1st Lt. M. D. Darling, '27.

1st Lt. Herbert Sawyer, Ex. '26.

1st Lt. Stuart Seymour, '25.

1st Lt. Lawrence Nye, '29.

1st Lt. Harlan Asquith, '29.

1st Lt. Winton Hoch, '30.

## SUPERMICROSCOPE

A supermicroscope which uses electrons and a magnetic "lens" instead of light and glass lenses has been designed and built at the Institute by Prof. William V. Houston and Hugh Bradner, a graduate student.

By means of this electronic microscope it will be possible to sidestep the natural obstacle of observing entities measuring less than one wave length of visible light in diameter. The first use for the new microscope will be the study of the surface emissions of electrons caused by bombarding the surfaces with energy of varying wave lengths.

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## A.I.M.M.E. PAPERS

The number of fields in which the national preeminence of C. I. T. men is granted is steadily increasing. The National Meeting this fall in Los Angeles of the American Institute of Mining and Metallurgical Engineers listed the following papers:

1. Gravitational Concentration Gradients in Static Columns of Hydrocarbon Fluids, by B. H. Sage and W. N. Lacey, C. I. T.
2. Type Occurrence of North American Bleaching Clays, by Ian Campbell, Prof. Geol., C.I.T., and G. Austin Schroter, '28, Geologist and Mining Engineer.
3. Recent Developments in Clay and Sillimanite, by J. Clark Sutherland, '29, Economic Geologist.

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## Buwalda National Park Adviser

Dr. John P. Buwalda is serving on the Board of Expert Advisers to the United States National Park Service, whose duties are to advise on problems of park development, conservation, and administrative policies. At the recent meeting of the Board special consideration was given to a plan for the further comprehensive development of Yosemite National Park.

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## IMAGE SLICER

Dr. Ira S. Bowen has announced the invention of an "image slicer" for increasing the efficiency of spectroscopic analysis. The device splits up the image of a star or nebula into a number of thin strips by means of a combination of mirrors which feeds each of the strips through the spectroscopy slit. The slices of light are then recombined into a single band suitable for analysis by a cylindrical lens. By this means it will be possible to use from 50% to 75% of the available light rather than the 5% to 10% of the older method.

The statement made in the last issue of the "Alumni Review" that Dr. Bowen was to leave the Institute was misleading. His off-campus work has not affected his staff functions and the Editors take this opportunity of correcting the statement.