build up marginal strain sufficient to produce a slip and thus cause an earthquake may require slice movement during a decade or a century, but not until man has lived in California one or two thousand years can accurate judgments be made of that matter.

When a slip takes place, the adjoining fault surfaces move with a grating effect because they are not smooth. Waves of several kinds and of unlike velocities, thus set up, are propagated through the earth; and when they reach the surface, an earthquake is there experienced. Its destructive effect is greater if it emerges through alluvium than through solid rock. Just as a shock causes jelly in a dish to quiver more than the dish, so alluvium quivers more than the bed rock on which it lies. For that reason the damage in the recent earthquake was greater at Long Beach and Compton, which are built on an alluvial plain on the coast twenty miles north of the earthquake origin, than at Laguna, which is built on a rocky coast only twelve miles southeast of the origin.

We must recognize that southern California will continue to have earthquakes, not periodically, not regularly, but at unknown intervals; and we should therefore build for safety against them. We must demand earthquake-resistant construction for safety of life and property.

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ENGINEERING LESSONS OF THE QUAKE

Civil engineering has been defined as the science of building things that stand up and mechanical engineering as the science of building things that move. During an earthquake things move, but they are also expected to stand up. This may be the reason for having a civil engineer speak at a meeting under the auspices of mechanical engineers. The destruction by an earthquake is the result of inertia, not only of buildings and other structures, but to perhaps a greater degree of human inertia. Engineers can deal tolerably well with the inertia of inanimate things, but feel much more helpless in overcoming the inertia of human nature.

The vertical component of an earthquake motion is generally of less amplitude than the horizontal, and it is customarily disregarded in discussions of engineering design because the factor of safety provided for static vertical force is ample to take care of added stresses produced by the vertical component of earthquake motion. There is quite general agreement that earthquake damage to buildings is due principally to horizontal forces. Building regulations in Japan, Italy and New Zealand, representing the consensus of opinion of engineers who have considered the problem, require that designs shall provide for an arbitrary horizontal acceleration of the order of 1/10 gravity. This is the most reasonable and expedient method at present available to minimize earthquake hazard to life and damage to property. The approximate additional cost of incorporating this resistance to horizontal forces in a building of Class "A" is from 5 to 7 per cent. of its total cost. This should not be misinterpreted to mean that a Class "C" building can be converted to an earthquake-resistant Class "A" structure for an additional cost of 5 to 7 per cent.

The earthquake of March 10 was discriminating. The buildings that it singled out for destruction were the worst of design, material and workmanship. It emphasized, what every one now accepts, that the function of mortar is to hold bricks together, not to keep them apart. The desirability of using cement mortar and wet brick is not a new discovery. It was advised after the San Francisco fire of 1906 and after every subsequent earthquake. But why repeat what has been said so often. Existing publicly owned buildings, such as schools, can be remodeled to reduce the menace to the lives of the children. Each building should be studied by a structural engineer as thoroughly as he would a limit-height office building. Even though the existing schoolhouses can not be made as earthquake resistant as new structures specially designed with this end in view, the danger to life can be reduced greatly.

With privately owned, Class "C" buildings, such as stores, the problem of finance is greater than that of design. Building codes can not be made retroactive. Whatever method of bringing about the betterment of these buildings is used, the job is not exclusively for the engineer. Perhaps the biggest contribution he can make is to keep the interest in earthquake-resistant construction from waning, as it has too consistently after all past earthquakes; then we may hope to have buildings so safe that we may adopt as a slogan: "Come to California and enjoy the earthquakes."

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A METHOD OF MOUNTING MAPS

MOUNTED maps are more durable and do away with the possibility of being torn during classroom or field use. In universities there often arises the need for mounted maps and the facilities for mounting are lacking. At Syracuse, in the geology and geography department, the necessity of having maps mounted with small expenditure resulted in the development of the following technique.

The method of map mounting described here is mainly the result of the writer's personal experience, suggestions offered by Mr. Hawthorne Daniel, of the American Museum of Natural History, and general references.[1]

The size of the mounting surface should be determined by the unit size of the map or number of maps to be mounted. The one used by the writer is sixty-six inches wide, one hundred and forty-four inches long and two inches thick. This width takes the full two-yard-wide bleached sheeting and the length accommodates a large number of small maps at one mounting. The thickness is such that it prevents warping from wetting.

The first essential of good mounting is a smooth, flat, fine-grained surface, on which the cloth may be securely stretched. The writer has found that a mounting board of white pine with a sanded surface is very satisfactory. The board is backed by three oak battens (2″ x 4″) which also prevent it from warping. Nails (2″ finishing nails) are toenailed every six inches along the sides with the points slightly projecting underneath, on which the cloth is caught as stretched.

Second, bleached muslin is necessary for permanent and high-grade mounting because of the increased adhesive qualities over unbleached cloth. All the maps at Syracuse are mounted on either Ranger or Pequoit quality sheeting at an approximate cost of twenty-five cents per yard in fifty-yard bolts seventy-two inches wide.

Third, a good quality of flour paste is essential. The boiled paste is better than cold-water paste. Steko Paste, made by the Steko Paste Company, of Rochester, N. Y., has been used and found satisfactory. This comes as a dry flour in two-pound bags.

Fourth, as the paper of the maps varies greatly, only experience will determine the proper dampness to mount maps. Matching of two parts of one map or of two maps is done before dampening to check the match and to insure soaking according to the amount of stretching necessary to match the smallest of the sheets. Both sides of the map sheet are sponged off so that the paper is soft but not coated with a film of water and so that all the wrinkles have been removed.

[1] "Notes on the Cataloging, Care and Classification of Maps and Atlases," by Philip Lee Philips, F.R.G.S., Library of Congress, Government Printing Office, 1921. "Directions for Mounting Maps," U. S. Geological Survey.

Fifth, large rubber window squeegees (12″ and 16″) are used, one for spreading the paste and one for smoothing the map and wiping off the excess paste. The greater the pressure applied the more closely will the map adhere to the cloth. All air bubbles must be removed, that the maps may lie perfectly flat with no wrinkles. There is little need to try to keep paste off the surface of the map, in fact, a little aids in working the softened paper. The excess need only be squeegeed off. After drying the slight coating of paste will be unnoticed.

Maps must be completely dry before being removed from the board in order that they may remain permanently flat. To insure proper drying, the room in which the maps are mounted should be a fairly dry one and remain so at all times of the year.

The finishing of the maps is determined by their ultimate use. Maps mounted for desk or field work are trimmed or folded. Maps for wall use require trimming and then half-round molding (usually one half inch) is used. Two pieces to form a full round with small $\frac{5}{8}$″ No. 4 flat head wood screws holding them together aid in handling and hanging the larger maps. These rounds are sometimes fastened with glue in addition to the screws. Best effects are produced by staining the molding. Screw eyes, with wire for hanging and other finishing touches, may be added to suit the needs of the users.

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A CONVENIENT COLOR CHART FOR GENETICISTS

FOR the past year I have been using a color chart which has proven to be well adapted for genetic work. It does not give a precise and permanent record of every shade of color, as do Ridgway and other charts of that nature. It is, however, cheap and convenient and is roughly quantitative. The chart measures 12 inches in diameter and is approximately circular. There are eighteen colors arranged radially like the spokes of the wheel, blue, violet-blue, blue-violet, violet, red-violet, violet-red, red, etc., through oranges, yellows and green back to the blues again. Each color is divided into seven shades, grading from black at the center to a pale tint at the periphery. It is a matter of only a moment when scoring a plant, to move the petal back and forth until an approximate match is reached. The chart is not well adapted to scoring the peculiar colors met with in certain Nicotiana hybrids, where varying shades of yellow and green are overlaid by pinks, reds and violets. I have, however, used it successfully on Tradescantias, Aquilegias and Irises. While it would probably fade, if