The governor of Minnesota has recommended to the legislature that $25,000 be appropriated at the present session for the use of the state entomologist in combating white pine blister rust in Minnesota. As arranged, the plant pathologist of the experiment station and the state entomologist will work in cooperation the coming season; the plant pathologist to have charge of scouting and eradication along the eastern border of Minnesota in the St. Croix Valley; the state entomologist, by virtue of his office as nursery inspector, will take care of inspection and eradication in nurseries, parks, cemeteries and private plantings. It is expected that the state of Wisconsin will cooperate energetically on its side of the St. Croix River.

## UNIVERSITY AND EDUCATIONAL NEWS

Through the generosity of a friend of Harvard University, who prefers to remain unknown, there has been established an assistant professorship of bacteriology in the Harvard Medical School, to be known as the Silas Arnold Houghton Professorship. In the words of the donor, the gift is made "in grateful memory of Dr. Houghton as a physician and a friend."

M. G. Kains, professor of horticulture and horticulturist at the Pennsylvania College and Station, has resigned and has been succeeded by Dr. S. W. Fletcher, formerly director of the Virginia Station.

Dr. H. B. Fantham, of Christ's College, Cambridge, has been appointed to the professorship of zoology at the South African School of Mines and Technology, Johannesburg, and Dr. C. E. Moss, of Emmanuel College, has been appointed professor of botany to the same institution.

At London University Mr. James John Guest, B.A., of Trinity College, Cambridge, has been appointed to the university readership in graphics and structural engineering, tenable at University College, in succession to Dr. W. H. Eccles, reader in graphics, who has been appointed professor of applied physics and electrical engineering at Finsbury Technical College.

## DISCUSSION AND CORRESPONDENCE

### THE SLIDES OF THE PANAMA CANAL

To the Editor of Science: In view of the fact that portions of the annual report of the governor of the Panama Canal for the fiscal year ending June 30, 1916, containing criticisms of the writer's views of the canal slides have been published recently in many newspapers throughout the country, the writer is impelled to make the following statement.

The governor implies in his report that the sole basis for the writer's expressed opinion that "practically all of Gold Hill and much of Zion Hill must be removed" "before the Canal can be said to be completed and permanently opened to traffic" was, as he states, an investigation of "fully three or four hours" and says that he (the writer) stated that he had made a "thorough examination." In the first place, the writer did not state that he had made a "thorough examination," these words being used without the writer's knowledge. Whether the examination was sufficiently thorough and enough information obtained to justify an expression of opinion may be determined from the following statements.

It is doubtful whether any other activity of the government has ever received equal publicity through the press, official reports, lectures and descriptions of returned visitors and employees as has the Panama Canal during its construction, so that there has been no excuse for any interested person not having exact and detailed information concerning the canal project.

The writer, as well as most geologists, had his interest aroused several years ago, by the unexpected difficulties encountered by the Panama Canal engineers. This was especially the case because it was evident that the combination of geological and climatic conditions prevailing there were mainly responsible for the troubles. From careful studies of much published and unpublished data the writer was fairly familiar with the situation long before the opportunity came to visit the region.

On returning from an extensive trip through the South American continent, the writer

spent October 22, 23, and November 1–4, 1915, in the Canal Zone and the intervening time, October 24–31, in Costa Rica. During the period heavy downpours of rain were frequent in both Panama and Costa Rica and landslides were especially active. Numerous landslides were observed in Costa Rica. While there, also, opportunity was afforded in the Aguacate gold mines to observe the great depth to which oxidation and rock decomposition extends in a region where the climatic conditions are similar to those prevailing in Panama.

On returning to Panama a landslide was seen along the line of the Panama Railroad which interfered with traffic for a short time. The forenoon and early part of the afternoon of November 2 were spent in going over the entire area then in movement on both sides of the Gaillard Cut and also a trip across the Cucaracha slide and entirely around Gold Hill. The area affected by the slides is 0.88 mile in length along the canal and extends back 1,400 feet on the east side of the canal and 1,200 feet on the west, a large part of which was then in actual movement. In the afternoon, through the courtesy of the Canal Commission officials, some time was spent in the examination of unpublished cross sections of the cut made during the process of steam-shovel excavation.

The information obtained seemed sufficient on which to base an opinion and forced the conclusion upon the writer that the slide conditions were more serious than commonly supposed and influenced him in giving expression to his views. Subsequent movements seemed to prove that the seriousness of the situation had not been generally appreciated.

In the governor's report it is stated that "probably the greatest injury done the Canal was through Benjamin Le Roy Miller, Ph.D., who occupies the chair of geology in Lehigh University." The writer can not accept such responsibility and believes that the "greatest injury done the Canal" has been the frequent disappointments to the shipping public, due in part to the closing of the canal and the uncertainty regarding its use, but in a large measure to the over-optimistic reports emanating from the Canal Zone that the slides would shortly cease and permanent service be established by the clearing of the channel. It should be recalled that the canal was closed to traffic for over 4½ months after the writer's conclusions were published, although the shipping public was led to believe that service would be re-established and maintained with comparatively little delay. As stated in the governor's report the canal was closed 232 days, between the date of opening, August 15, 1914, and June 18, 1916, slightly more than one third the time. These facts undoubtedly furnish other and more weighty reasons for the shipping public's loss of confidence in the present usefulness of the canal than the expression of opinion of a visiting geologist.

The writer agrees with Dr. J. C. Branner, president emeritus of Stanford University, who was a member of the Committee of the National Academy of Sciences that went to Panama last December at the request of President Wilson to study the slides and prepare a report upon them, in statements which he made in *Sunset, the Pacific Monthly,* for June, 1916. He says:

> But when one sees the sliding area extending further and further away from the Canal, the volume of the moving masses gradually getting bigger and bigger, and the very hills themselves toppling over and adding to the confusion trees, mud, rocks and great blocks of basalt as big as houses, and when he sees that these millions of tons, that have to be removed, cost about sixty cents a cubic yard, he feels that some way ought to be found to make the hills stay where they are.

How shall the hills be made to "stay where they are" is the question? Dr. Branner as the result of "forty years of study of landslides in tropical countries" believes that this can only be effected by preventing the heavy rainfall of the region from entering the ground adjacent to the canal. It is somewhat questionable whether this can be accomplished and, if not, there seems no alternative but the complete removal of the threatening hills. Perhaps some unnecessary material might be removed but this would be fully compensated for by the increased confidence in the canal. One writer states:

It may be accepted as a fact that, unless dredging is supplemented by preventive measures, slides will continue to fill the Canal prism at intervals for an indefinite period, that traffic through the Canal will be interrupted for weeks and months at a time and that the expense of removing the slide material will add millions to the investment. As a commercial undertaking the Canal will be a flat failure unless continuous traffic through the waterway can be guaranteed; if extensive delays due to slides occur every fall when the effect of the summer deluge is felt, schedules, rates and contracts will be disturbed so frequently that fifty per cent. of the Canal's usefulness will be gone, even if the closed season lasts for only a few weeks at a time.

Aside from its commercial aspect, the Panama Canal was designed to be one of the country's most important defensive works. A continuation of the slides at frequent intervals will render the ditch worthless as a defense measure. . . .

Half a canal is worse than no canal. Muffled exclamations of admiration will not stop the slides. Unless the slides are stopped, definitely and permanently, the Canal is a failure as a commercial undertaking and a defense measure. Dredging the débris will not stop the slides.[1]

Neither Dr. Branner, the writer, nor any other patriotic citizen would intentionally circulate false reports in regard to existing conditions in the Panama Canal region nor venture to make predictions that might unduly alarm the public, but, on the other hand, nothing is gained by fostering a false sense of security.

In England, Germany and Russia reports of the failure of the canal are said to have been freely circulated. These reports have emanated from geologists and engineers and seem to have led many of the people in those countries to believe that the Panama Canal would eventually be abandoned and the Nicaragua route substituted. These reports either exaggerate the importance of the slides or underestimate the will of the people of this country. If the earthquake menace, to which Dr. Branner calls attention in his article in *Sunset,* does not materialize, the Panama Canal will unquestionably be completed and made to serve its intended purpose, even though it require years of time and the expenditure of additional millions of dollars to accomplish. The American people would not willingly abandon a project that has so stirred the pride and stimulated the patriotism of the entire country as has the Panama Canal, even though the length of time for its completion and its cost far exceed the early calculations.

[1] Editorial in *Sunset, the Pacific Monthly,* June, 1916, p. 35.

Benj. L. Miller

Lehigh University,
December 12, 1916

## SCIENTIFIC BOOKS

*Field Geology.* By Frederick H. Lahee, Assistant Professor of Geology in the Massachusetts Institute of Technology. McGraw Hill Book Co., 1916.

The title of this book suggests two possible ways in which it may be used; as a preparation for field work, and a hand-book in the field. It is for the latter use, as a reference book in the field, that it will be found to be especially valuable.

The plan of the author is an unusual and, in the reviewer's opinion, a very desirable one. "Where possible the treatment has been empirical rather than genetic." Two examples will illustrate this method of presentation. Under Hills, Ridges and Other Positive Land Forms are included (1) Fault Mountains, (2) Volcanic Cones, (3) Constructional Hills and Ridges, such as sand dunes, drumlins, eskers, kames, moraines and winter talus ridges. Under Cross-bedding are included (1) Delta Structure, (2) Torrential Cross-bedding, (3) Wave-built Cross-bedding, (4) Eolian Cross-bedding, and (5) Ripple marks. In other words, forms which look alike are classed together without regard to their origin.

A number of tables for the identification of structures and topographic forms are scattered through the text and included in the appendix. These analyses have been prepared with almost as much care and detail as are those in botanies for the identification of flowering plants. Especially is this true of the table of clastic sedimentary rocks (pp. 463–471). It is doubtful, however, if these tables will prove of great value in the field as