

thousand years ago extended, in certain directions, well into the temperate zones, seem to offer positive evidence that the earth is growing colder. The theoretical (beautifully simple) explanation of the origin, growth and final retreat of the ice, which results from my modification of Manson's hypothesis, is, very briefly stated, as follows:

After the minimum polar-surface-temperature had fallen to 0° C. snow commenced to fall at the two poles during the respective winter months; each year this snow was, for some time, completely melted during the respective warmer seasons of the year; as the earth grew colder, the snow and ice covering became permanent and spread equatorwards with seasonal fluctuations at the ice front; but as the ocean grew colder the amount of evaporation from its surface decreased, so that the available amount of snow to be melted at the ice front continually diminished (while the intensity of the direct solar rays at the surface of the earth was, for a given latitude, continually on the increase);⁵ a final retreat of the ice front was, therefore, inevitable. As the snowfall will later on cease altogether, the land ice will continue to retreat and probably disappear at the poles. These results are for ideal sea-level conditions; topographic irregularities, differences of elevation, direction of air and water currents—all act to produce great deviations from the theoretical results here made to depend on latitude and ocean temperature alone; these deviations have, in the past, been so great that evidences of former *local* glaciation should be found throughout nearly the whole series of stratified rocks.

In addition to the theoretical data given on page 415 of the current volume of *SCIENCE*, I would, in connection with Dr. Barrell's remarks on radiation of heat, call special atten-

⁵ Because of this condition of things, it seems extremely probable that formerly, when the arctic climates were less severe, equatorial and temperate regions were for a time actually somewhat colder than they are to-day, for the lowering of the surface temperature resulting from the ever decreasing heat-trapping power of the atmosphere was, for a time, probably more than offset by the increased intensity of the direct solar rays.

tion to the fact that, since the publication of my paper demonstrating that Newton's law of radiation is theoretically exact, no less authority than Professor Newcomb has asserted (but not demonstrated) that Stefan's law of radiation has been established; now, as I claim to have demonstrated that "some surprising error in previous methods" has actually developed, Dr. Barrell or some other scientist must show that my demonstrations are erroneous before further intelligent use can be made of laws of radiation established by others and used (to quote from *SCIENCE*, February 14, 1908, p. 269) as "the formulæ accepted to-day" by scientists.

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ANN ARBOR, MICH.,

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CLOUDS OVER A FIRE

TO THE EDITOR OF *SCIENCE*: In connection with Mr. B. M. Varney's letter on "Clouds over a Fire" in *SCIENCE* for May 15, 1908, I may say that I have often observed the same phenomenon here. In cutting sugar cane the stalks are stripped of leaves in the field, and when the cutting of a field is finished the leaves are set afire as they lie spread over the field. When the weather is calm there arises a column of dark smoke which is often beautifully capped by a mass of white cloud. I have wondered whether the particles of smoke furnish nuclei for the formation of water drops as the smoke rises to a level of super-saturated air, or whether, as Mr. Varney suggests, the draft carries water vapor to a level of cloud formation.

WM. F. WALLIS

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QUOTATIONS

DANIEL COIT GILMAN

DR. GILMAN was soon called from California to conduct what was, at its inception, a unique undertaking. This was nothing less than the establishment of a university for graduate study, with an equipment and faculty that should make it the rival of the best universities of Europe. On the disap-