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Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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THE MINERAL WATERS OF THE YELLOWSTONE NATIONAL PARK.

THE recent publication of Bulletin No. 47, of the United States Geological Survey, containing analyses of hot-spring, geyser, and river waters from the Yellowstone National Park, is not without interest to the medical profession and to the public at large.

The waters, collected by experts employed by the Geological Survey, have been most carefully examined by Dr. F. A. Gooch, now professor of chemistry at Yale College, and Mr. J. Edward Whitfield of the survey laboratory, and represent the latest and best methods of water-analysis.

The analyses of these waters are of particular interest, because the great variety of mineral springs found in the Yellowstone, attracting the attention of all visitors to that region, suggests their use as remedial agents in the cure of disease.

Aside from the well-known resorts of the Virginias, there are but few places in the United States where natural hot waters are thus utilized. The hot-springs of Arkansas have long been known, and many cures effected by their use, combined with the care of the attendant physicians. More recently the Spas of Las Vegas, N. Mex., have been brought before the notice of the medical profession and the public generally.

Without detracting from the merits of these justly noted sanitaria, it may be stated that at neither place do the waters present as important a combination of salts in solution as those of the Yellowstone Park. Indeed, with the exception of the hot-springs in New Zealand, no waters readily accessible are known presenting the variety and remedial constituents of the Yellowstone springs. In New Zealand the government, appreciating the munificent endowment which nature has given the country in its hot-springs, has set apart certain tracts as sanitary resorts; and at the most famous resort, Rotorua, bath-houses and bathing-pools, with the usual accessories of reading-rooms and hotels, have been built at government expense, and are under the supervision of a government physician.

From a therapeutic standpoint, the analyses of hot-spring waters from the Yellowstone may be grouped as calcareous, alkaline-silicious, acid, and sulphurous.

The former, comprising the hot water of the Mammoth Hot Spring, are highly charged with carbonate of lime, which they deposit, on exposure, in the form of travertine. They resemble in composition the waters of Carlsbad, as will be seen by a comparison of the analyses of the two waters.

For bathing purposes they are less agreeable, and probably less beneficial, than the alkaline waters of the geyser basins of the Yellowstone Park.

These latter waters are generally highly charged with alkaline salts, — sodium chloride and sodium carbonate, together with silica, being the chief constituents, — but there is generally present also a small amount of sodium borate, also sodium arseniate, the latter a most valuable therapeutic agent in a variety of diseases.

The luxury of bathing in these waters must be indulged in to be appreciated. The extreme softness of the water, and the delightful freshness which one notices after the bath, render the use of the water a great pleasure. In New Zealand, where a water almost identical in composition, save that it lacks the arsenic, has been used for several years, this type of water has been found most beneficial in the treatment of gout, rheumatic troubles, and sciatica. In France the curative properties of waters carrying arsenic in solution are fully recognized, especially for the cure of certain forms of nervous and skin diseases. While the Yellowstone waters contain a little less arsenic than those of the French springs at La Bourboule, there is no reason to doubt their usefulness for similar diseases. At present the only water of this class utilized for bathing purposes is that of the Hygeia Spring, supplying the baths of the hotel at the Firehole, or Lower Geyser Basin.

This water carries three-tenths of a grain of sodium arsenic to the gallon. It has been tried by the writer, and found a most delightful water for bathing, but no invalids have yet tested its virtues. Springs of this character are, however, very numerous, and their waters might be easily utilized for bathing.

The acid waters, carrying free hydrochloric acid, are less numerous in the park, but many springs of this character are found at the Norris Geyser Basin. The waters may be perfectly clear, as is the case with the outflow of the Echenis Geyser and the discharge from Green Spring, or turbid, and charged with more or less sulphur, as is more frequently the case. Such waters have achieved a considerable reputation in New Zealand as a tonic and alterative, particularly in diseases of the liver and in functional troubles of females.

They also exert a powerful effect upon the body in all skin-diseases, but are probably less useful than the sulphurous waters in such cases. At present no waters of this character are utilized for baths, but could be readily led into suitable bath-houses at the Norris Basin. This locality is indeed the best suited for a sanitarium of any of the geyser basins of the park, as all the varieties of waters occur here, save the calcareous.

Sulphurous waters are very familiar, though those of the Yellowstone are particularly strong. The Mammoth Hot Spring waters, though smelling strongly of sulphur at the vent, possess little, if any, of that important constituent when led into baths, for it is all deposited about the vents and upon the algæ growing in the waters; but excellent examples of this type are found at the Norris Basin, as well as elsewhere in the park.

Now that the roads and hotel accommodations in the park are so good, and the region so easily reached in Pullman coaches and with dining-cars, it is to be hoped that the waters of these springs may bring relief to many sufferers.

WALTER HARVEY WEED.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Time-Measuring among Savage Peoples.

THE question has arisen in the National Museum whether the American aborigines or any other savage peoples have any mechanical devices for measuring the time of day or portions of the day. I do not now allude to calendars, of which there are many, nor to observation of dawn, sunrise, a little after sunrise, near noon, noon, etc., based on the diurnal movement of the heavenly bodies, but to primitive dials and the like. I have heard of the Montaguai's practice of setting a staff in the snow and marking the shadow, and of the Pueblo habit of marking the path of a sun-ray across the floor, but my information is not first-rate. My familiarity with the African and Insular peoples is limited; but it is designed to set up in the National Museum an elaborative series to illustrate time-keeping, and we are anxious to know what manner of invention should stand at the beginning of the series.

OTIS T. MASON.

Washington, Jan. 10.

Professor Ferrel and American Meteorologists.

IT would seem to be high time that some one having authority should read the riot act to a number of American meteorologists. The views lately advanced by Dr. Hann, that cyclones (excepting those of tropical regions) have their origin rather in the great general movements of the upper atmosphere than in the ascensional movement of relatively warm and moist air and the consequent vapor condensation, may or may not stand the test of a more extensive and critical series of temperature studies than those made in 1889, but it is none the less incumbent upon American meteorologists to treat with proper courtesy the conscientious and life-long labors of a fellow-countryman; and it is but scant courtesy to exhibit to the world an eagerness to drag into prominence and accept seriously a new theory of cyclonic genesis, when such a theory lacks in every way extensive and careful study, and is really but little more than a mere possibility suggested by an eminent foreign meteorologist, when he found in certain temperature observations a somewhat marked difference from those which the accepted theory seemed to him to require.

There may be "thermic," and there may be dynamic, cyclones; but the observations should be numerous and trustworthy before it is claimed that such a distinction exists, and before we seriously accept the very radical view that temperatures in cyclones are determined by the motions of the air. A thorough series of temperature determinations at different parts of the storm, as a mechanism, is needed, and should be offered. Especially is this demanded when the acceptance of the new view implies a partial remodelling, at least, of a theory that is of long standing, and has the sanction of one of the best equipped minds of the many that have tackled meteorological problems. Should occasion require, Professor Ferrel can doubtless successfully defend the views he holds; but, for the benefit of some who may not be aware of his methods of work, it may be not out of place to say here that nothing from his hand is the result of haste, but, on the contrary, the result of mature thought, and patient, careful, deliberate study of the best scientific information at his command.

With all possible deference to Dr. Hann's eminence in matters meteorological, it is to be questioned whether a series of temperature observations at some fourteen stations, seven of which have an altitude of over two thousand metres, for only two storms (the barometric maximum of Nov. 12–24, and the minimum of Oct. 1), prove any thing, after all, but that it is quite possible to find temperatures higher than the normal when lower ones might be expected. But this abnormality is but a slim support for a new theory, nor does it disprove the old. The air in the high area late in November was apparently warmer than the air in the "low" at the beginning of October; but that does not prove that the mean temperature of the air in any and every maxima is always higher than the mean temperature of any and every extra-tropical minima (it is conceded that the new theory will not hold for tropical storms). Dr. Hann claims that seven of these alpine stations have an elevation over two kilometres above sea-level. Yet it may be an open question if these heights give the conditions which he sought, more particularly if we remember that certain of the cirri clouds certainly have an elevation of not less than eighty kilometres, and a two-kilometre temperature observation may give but an uncertain indication. We can even find at surface stations abnormalities, that, if misinterpreted, might lead us to doubt a great many of our accepted views in the matter of atmospheric temperature. Mr. Kingston,[1] director of the Toronto Observatory in 1868, called attention to the fact that the twelve-year normals (1841–52) were not applicable to observations of later years, and, according to five year normals, it was easy to show that January was warmer than February, etc.; and Schott shows in a table how, from 1841 to 1850, February was colder than January at New Haven, Toronto, Philadelphia, Charleston, and Savannah, while from 1851 to 1860 the reverse holds true.

It is therefore, it seems to me, only fair to insist that American meteorologists demand full and most thorough evidence before seriously considering the question of modifying present theories; more particularly, too, when an unintentional but none the less real disposition exists in certain quarters to speak carelessly of Professor Ferrel and his work, and to deny him his proper place.

Not a bad example of this carelessness appears in a translation by E. F. Bamber, in the *Philosophical Magazine* for December, 1890, of Werner von Siemens's views on a general system of winds of the earth. The eminent physicist, in refuting the statement of Dr. Sprung in a recent paper in the *Meteorologische Zeitschrift*, that he attempted, like Ferrel, to found on theoretical calculations a theory of the general system of winds on the earth, disclaims in all modesty a sufficient proficiency in the higher mathematics to do this, but then immediately adds, it appears to us somewhat illogically, that he "considers this method altogether inappropriate." He therefore repudiates the charge that "he sought, like Ferrel, to demonstrate by means of calculation an original state of atmospheric motion in order to afterwards base his further speculations thereon."[2] There is no intentional intimation here, we take it, that Ferrel's views are based on a supposition more or less hasty and uncertain, and there is therefore little occasion for the rejoinder that any such intimation indicates a lack of familiarity with Ferrel's work; but it ought to be felt and recognized, especially by American meteorologists, that experimental fact rests at the bottom of every natural law

[1] See Schott's Tables, p. 199.

[2] Sitzungsberichte d. K. Preuss. Akad. d. Wiss. zu Berlin, 1890.