equally probable, may arise from the greater dryness of air in the park region as compared with that of Iceland and New Zealand.

The chemical investigation of the Yellowstone springs is not yet sufficiently complete for their satisfactory classification; but they are broadly divided by Dr. Peale into those of calcareous, siliceous, and aluminous character. The so-called aluminous springs, being those highly charged with mud, or matter in a state of suspension, will doubtless eventually be relegated to one or other of the first-named classes. The possible therapeutical value of the springs is as yet practically untested; and it is to be remarked in this connection, that the climate is such as in any event to be unfavorable to those suffering from debilitating diseases. A few experiments on the color of the waters are recorded; but these, it must be confessed, are unsatisfactory, as the samples had been long in bottle; and, apart from this, it is doubtful whether the waters of the park offer peculiarities so marked as to throw any important light on a subject which has already been elaborately studied by physicists and chemists.

The older theory of geyser action requiring a steam-chamber which blew off, from time to time, through a water-trap connecting with a tubular orifice, and implying a quite exceptional co-ordination of circumstances, became virtually untenable when geysers were discovered in such considerable numbers in different regions. Bunsen's explanation, depending on the superheating of water under pressure in fissures, or more or less tubular receptacles, seriously modified in action by local circumstances, is considered sufficient to account for the observed phenomena.

Appended to this report, is a valuable bibliography of the park, and of the literature treating of geysers and hot-springs generally.

In the latter part of the volume, Mr. Gannett reviews the geographical work on which the excellent maps accompanying the report are based.

Notwithstanding the amount of precise information now made available on this region, much yet evidently remains to be discovered. The field-work on which the report on the park is based extended over about two months only; and the observations have too often been of what Mr. Holmes regretfully describes as the 'twenty-five-mile-a-day kind.' Armed with the present report, embodying the results so far obtained, each scientific visitor for a long time to come may well hope to add some important new facts. The definition of the catchment areas from which the various groups of springs are supplied, and the circulation of the underground waters, may be specially noted as an important point scarcely yet touched.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Princeton science club.

Nov. 8. — Dr. L. W. McCay reported that the Perrot method for estimating P_2O_5 can only give accurate results providing chlorine be absent. This, however, is seldom the case in apatites, superphosphates, etc. He therefore proposes a modification, — dissolving the tri-argentic phosphate from the filter-paper with dilute nitric acid, thereby leaving the chloride, and proceeding at once to titrate the silver according to Vallhardt. He reserves for himself the privilege of developing the subject.

Jan. 10. — Dr. Halsted opened a discussion as to whether Euclid was a suitable text-book for elementary geometrical instruction; — Mr. Fine read a paper on Synthetic solution of a class of problems in maxima and minima on the partition of a segment of a circle; — Professor Macloskie, Notes on biological articles in recent scientific serials; — Dr. McCay, Analysis of beer made in state of New Jersey; — Mr. McNeill, Determination of co-ordinates of certain stars by the meridian circle; — Professor Scott, The lamprey (the peculiar flattened shape of the spinal cord in the lamprey arises late in larval life, and is an acquired peculiarity. In the embryo the dorsal roots of the spinal nerves are all connected by a commissure, which also connects the tenth, ninth, and seventh nerves together, and with the spinal nerves. This commissure apparently forms the lateral nerve. The third nerve arises independently, and would seem to be of segmental value); — Professor Osborn, A method of double injection of anatomical specimens (by first injecting the veins through the arteries with blue gelatine, then injecting the arteries with plaster of paris, which is stopped at the capillaries, the veins and arteries can be readily distinguished); — Professor Young, The cause of the unusual sunsets, On the spectrum of the Pons-Brooks comet.

Ottawa field-naturalists' club.

Jan. 17. — The paper of the evening was by Mr. E. Odlum, M.A., of Pembroke, 'On the sand-plains and changes of water-level of the Upper Ottawa;' the portion of the river specially referred to being a stretch of some forty miles opposite the town of Pembroke, and extending from the head of the Coulonge Lake to the entrance of the reach known as the Deep

River. The district thus included lies along latitude 45° 50′, between longitudes 76° 40′ and 77° 40′; the town of Pembroke being 77° 10′, with an elevation above sea-level of 423 feet. At the upper end of the district the Ottawa divides its waters, and encircles the large Allumette Island; the Culbute Channel on the north being narrow, while the southern one expands so as to be known as the Upper and Lower Allumette Lakes. On the Quebec shore the land rises precipitously; the Laurentian Mountains seldom receding more than a mile, and at times rising sheer from the water's edge in towering cliffs of trap. On the Ontario side the land is comparatively undulating, and rises by a succession of plateaus separated by ridges of rock, or by ranges of hills gradually increasing in height. After a graphic description of the beauties of this district, the writer outlined the principal sand-plains which constitute a large portion of the steppes of the southern shore, and pointed out that their levels coincided with the well-marked terraces found on Allumette Island and at other points along the river. The formation of these sand-plains was then fully discussed; and it was claimed that they had undoubtedly been formed from the *débris* transported by flowing water from the rock ranges that bound and intersect them, and toward which the surface gradually changes from fine sand (or occasionally clay), through coarser sands, pebbles, etc., to bowlders. The principal plain is that called the Chalk-river sand-plain, extending from near Pembroke, twenty miles westward. It is interrupted toward the lower end by broken ridges, which harmonize in position with the rapids, and which formed parts of barriers between a higher level westward and a lower level eastward. Occasional sand-ridges occur, which lie between the ancient mouths of rivers, of which some are now extinct, and others, as the Petawawa and Muskrat, still flow in greatly diminished volume. The two principal levels of this plain correspond with two terraces boldly marked on the Laurentians near the head of Coulonge Lake, fully thirty miles away. A lake as large as, or larger than, Superior must in the past have hidden in its great depths Allumette Island, the entire Pembroke district, and adjacent sand-plains, as well as thousands of the now arable acres lying toward Renfrew. As indicated by the terraces, there had been two distinct periods, in the first of which the water had been 200 feet deeper, and in the second 100 feet deeper, than the present level. After describing the constitution of the soils derived respectively from the granite or trap ridges, and their relative capacities for agriculture, the writer very lucidly and interestingly explained the changes, as witnessed by him, which are still going on in the district, and the manner in which, by the incessant weathering and denudation of the rocks, sand-plains on a smaller scale are still being formed. The present barriers which cause the rapids interrupting navigation were explained to be of varying degrees of hardness, so that change proceeds more rapidly at certain points. Thus the channel rocks at the foot of the river-reach in question are composed of fine sandstones (Potsdam) compacted with bluish clay, and are being rapidly eroded; and at a not excessively remote date the channel will be so lowered that the upper and lower lakes will form one navigable level, while the channel to the west, having a much harder bed-rock, will be changed to impassable rapids by the subsidence of the lake below them. Reference was made to various older channels which evidenced former higher levels which the existence of terraces and undoubted water-lines fully confirmed. In the discussion that ensued, several members who had visited the locality and other portions of the Upper Ottawa gave evidence as to the existence of numerous traces of old water-currents at points now much above the present levels.

Mr. H. M. Ami presented a list of the Cambro-silurian fossils of the neighborhood, containing 228 species, and prefaced by a few notes as to its compilation. The report of the geological section on the summer's work was also read, and the president announced that classes in botany and zoölogy would be held weekly.

Franklin institute, Philadelphia.

Jan. 16. — The annual report of Board of managers exhibited the addition of a hundred and thirty-nine new members during 1883, and of over three thousand volumes to the library. Preparations for the Electrical exhibition, to be held during the autumn of 1884, are in an advanced state. A national conference of electricians is in contemplation. The subject of a "Proposed ordinance for the examination of steam-engineers" was warmly debated, *pro* and *con*, but no decisive action was taken. Mr. S. Lloyd Wiegand read a paper defending the use of cast iron in the construction of steam-boilers, it having been alleged by Nystrom and others that steam-boilers with flat cast-iron heads were dangerous. The secretary's report embraced a summary of engineering and industrial progress for the past year.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

The U. S. naval observatory.

Vice-Admiral Stephen C. Rowan was appointed July 1, 1882, to succeed Rear-Admiral John Rodgers as superintendent of the observatory. On May 1, 1883, Vice-Admiral Rowan was relieved by Rear-Admiral R. W. Shufeldt. The report of Admiral Shufeldt to Commodore J. G. Walker, chief of bureau of navigation, under date of Oct. 22, 1883, covers the work of the observatory for the past year.

The *personnel* of the observatory is as follows: —

Rear-Admiral R. W. Shufeldt, superintendent; Commander W. T. Sampson, assistant to superintendent; lieutenants, Pendleton, Moore, Bowman, Gar-