166. Notice of a fern indigenous to California, but heretofore considered as an introduced hot-house species.—*Mrs. Leander Stone.*
167. Scheme for aiding the Euler's transformations of co-ordinates.—*J. D. Warner.*
168. The temporal process of the malar bone in the ancient human crania from Madisonville.—*Frank W. Langdon.*
169. Buffalo drives on the Rock river in Wisconsin.——*Stephen D. Peet.*
170. The Emblematical Mounds on the four lakes of Wisconsin.—*Stephen D. Peet.*
171. Fossil teeth of Mammals from the Drift of Illinois.—*Wm. McAdams.*
172. On comparison of yard and metre by means of reversible pendulum.—*C. S. Peirce.*
173. Exhibition of a curious stone relic.—*G. W. Holstein.*
174. Some Phenomena in the conjugation of the infusorium Actinophrys Sol.—*J. D. Cox.*
175. On the errors to which Self-registering clinical thermometers are liable.—*Leonard Waldo.*
176. Note on the chemical examination of maize residue from the manufacture of glucose.—*C. Gilbert Wheeler.*
177. The Temperature of North German Traps at the time of their extrusion.—*H. Carmichael.*
178. Recent existence of sword-fish, shark, and dolphin in the fresh water pond near Buffalo, N. Y.—*Wm. Zimmerman.*
179. Antiquity of Man in America.—*W. De Haas.*
180. Progress of Archæological Research.—*W. De Haas.*
181. The Mound Builders. An inquiry into their assumed southern origin.—*W. De Haas.*
182. Four years' observation with the Lysimeter, at Framington, Mass.—*E. Lewis Sturtevant.*

The next annual meeting of the Association will take place at the City of Montreal under the Presidency of Dr. J. W. Dawson, Principal of McGill College. The election of Dr. Dawson will be a welcome announcement in all scientific circles, and the meeting for 1882 will doubtless be one of the most memorable in the annals of the Association.

We commence this week with the publication of a series of the papers read at the Cincinnati meeting or abstracts prepared by the authors. Those who have not forwarded their communications are requested to do so as soon as convenient. We shall be willing to prepare suitable illustrations, if a request for the same is made at once, to afford time for their preparation.

REPORT ON THE GEOLOGY AND RESOURCES OF THE BLACK HILLS OF DAKOTA. By HENRY NEWTON, E. M., and WALTER P. JENNEY, E. M., Washington, D. C., 1880.

The report on the Black Hills issued six years after the death of its leading observers, to whose name at least it may prove an appropriate monument, comprises the geology, palæontology, mineral resources, lithology and related subjects of interest of that boss of rocks whose circular uplift commands the outstretched plains of central Dakota.

To the *fames sacra auri* may at least be attributed one important service in this connection, as it was a transient disturbance with the Indian settlers, caused by the appearance of gold hunters on their domain, that immediately led to the survey.

The Black Hills had been assigned to the Sioux, and this unauthorized irruption raised the question how far the United States Government might permit a violation of their contract with the Indians, and how much benefit in mineral wealth would accrue to the new explorers and settlers if their incursions were tolerated. To answer more especially this latter question, and to make substantial contributions to general knowledge, the United States Government instituted a survey of this interesting and unknown country, and to Messrs. Jenney, and Newton, was intrusted its management and direction, under the auspices of the Department of the Interior.

After six months spent in this wild and inhospitable region, members of the survey returned, richly provided with means for a more deliberate examination of its character, and scientific aspects in the laboratories and cabinets of the east.

A delay—one of the innumerable hitches incident to congressional apathy or pre-occupancy—in the appropriation of monies for the printing of their report, invited Mr. Newton to revisit the hills in the spring of 1877 to complete his observations, mend or extend his theories, and here he contracted typhoid fever, of which he died—a loss to science, to society and education.

The work begun under his vigorous and intelligent supervision naturally halted, and although many of its various parts were long since completed, it is only now that in a compiled form they appear in print.

Mr. Gilbert edited the work and undertook the difficult and thankless task of deciphering, compacting and evolving from the *disjecta membra* of Mr. Newton's notes, the part devoted to the discussion of the geology, physical and stratigraphical of these hills. It is not difficult to detect the mind and pen of the author of the "Geology of the Henry Mountains," and whether or not the essay would form an exact reproduction of Mr. Newton's views, it is itself a valuable monograph, instructive and suggestive.

The Black Hills cover an area of 850 square miles, rising from the level and uninhabited wastes about them to an altitude at their highest point of nearly 8000 feet, thickly covered with dense and primeval forests of pine, whose condensed shadows from afar hides all else, and for long marches distinguishes these highlands to the approaching traveller.

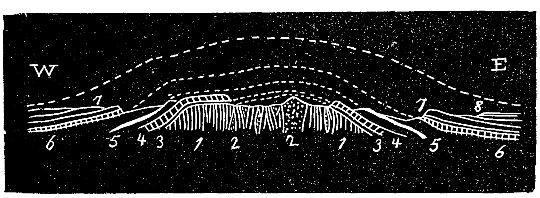
The Black Hills, briefly, are an uplift of conformable strata, displaying their consecutive beds in symmetrical succession, from a central axis or elevation, disintegrated and channelled, sculptured and modified by subærial and aqueous erasion. The simplicity and perfection of their stratigraphical structure render them comparatively easy of exposition, and make them a capital example of primary sedimentation, possibly to become classic in future illustrations of geological principles.

The formations, as they are crossed from the centre of the group outward to the circumference, and similarly disposed on every side—*i. e.*, sloping inward to the centre—are the archæan, Potsdam sandstone, carboniferous, shales and limestone, red beds—Trias, Jura—cretaceous and then beyond, upon the plains Tertiary. The central area is a diversified region abounding in park-like expanses, wild and rugged chasms, peaks, isolated pyramids, picturesque gorges, table-lands and a net-work of enfilading streams pouring outward east and west to swell the waters of the Cheyenne and Belle Fourche rivers. This is the archæan area or axis, upon whose flanks repose the higher strata, and in whose gulches and stream beds were found the traces of gold which first brought these hills to scientific notice. This axis lies generally north and south, is slightly arcuate, with its convexity pointing eastward, and is composed of schists, quartzites, gneiss rock, granite, trachytic intrusions and associated metamorphic slates. The granite and quartzites form salient ridges, and the trachyte sharp peaks in the landscape. Next out-cropping underneath the carboniferous is the Potsdam, unconformably bedded upon the upturned edges of archæan slates, carrying characteristic fossils and made up of basal conglomerate, sandstone locally altered around trachytic cones to quartzite, and calcareous beds. This rock has undergone extensive removal along with the carboniferous strata which surmounts it; indeed, according to the results of the survey, has been removed from the entire uncovered archæan nucleus. Here a remarkable gap occurs; the next succeeding formation is the carboniferous, and we pass from the primordial at one step to the end of the palæozoic strata, with the striking omission of the Silurian and Devonian systems. We are then told that the carboniferous limestone overlies *conformably* this lower rock—a statement hardly credible—that its hard and resistant strata rise in conspicuous relief like an amphitheatric wall around the included and debased archæan area, with a talus of *debris* composed of its own and Potsdam fragments, piled upon its sides. Beyond the mural escarpments of the carboniferous, a trough-like valley encircles the latter formation like a moat, the bottom of which is formed of the Red Beds, probably Trias or Jura. These consist of marls and clays, sandstone or limestone bands, whose soft material has been easily and largely removed. Beyond this again, and rising from it in steep cliffs, the mechanical basis of the cretaceous is met—the Dakota Sandstone—forming the foot hills which encircle as a final group this geological unit. Beyond again stretches the plains of tertiary strata.

The history of the Black Hills, as written by this survey, is this: A low archæan area primarily, whose erasion and degradation has furnished the sands, and fragments of which the Potsdam sandstones, conglomerate, and quartzites have been formed, has been finally overlaid upon submergence with a regular but unconformable sheet of Potsdam rock. The dome thus made has been lifted from the water and for the long time from the Potsdam to the Lower Carboniferous remained dry land, not even subjected—an extraordinary statement—to considerable denudation. Then the carboniferous sea flowed over all and deposited its even floor of limestone over the Potsdam, which two, most regularly superimposed, now form the walls of the archæan inclosure, from which they have been removed by erasion.

The Triassic and Jurassic followed, surmounting the carboniferous with beds of marl and clays, and adding their accumulations to the rising mound of strata.

Lastly, the cretaceous sealed in the column of deposits so that the ideal dome assumed the form of the adjoined section after upheaval.



IDEAL CROSS-SECTION OF THE BLACK HILLS.

1. Archæan Schists.
. Granite.
3. Potsdam.
4. Carboniferous.
5. Red Beds.
6. Jura.
7. Cretaceous.
8. Tertiary.

Then the uplift occurred which brought these heavy beddings upward in a flat-topped oval displacement, a highland from which, by a process of enormous denudation, the cretaceous and the Jura and Red Beds have been pared away, their slanting beds and monoclinals now surrounding the hills. The carboniferous and Potsdam have also disappeared from the large area on the east side of the dome, where the archæan schists are exposed, and in time will retreat further and further, uncovering new portions of the azoic terrain. The carboniferous now forms the surface rock of the wide western plateau, and is deeply cut by a net-work of anastomosing cañons. A bird's-eye view of the whole presents the aspect of an overturned colossal pastry, with its bottom crust on one side badly gnawed away. In this place it would be impossible to discuss the serious questions which arise in reference to this exposition. Its guarantee is in the field work and observations of its authors, and it certainly presents a geological chapter of extreme interest.

Prof. Whitfield's important contributions in the palæontology form a striking feature in the report. Mr. Jenney reports, after a detailed examination of the mineral resources of the country, that "the Black Hills are pre-eminently a gold-producing region." Mr. Caswell contributes a chapter on the lithology of the Black Hills.

Very much of general scientific interest is found throughout this handsome volume, and the United States Government have, in its publication, added one more honor to its deserved eminence amongst nations re-organizing science, and added one more debt to the increasing sum due to it from all scientific students.

L. P. GRATACAP.

WASHINGTON, 1880.

THE GREAT PRIMORDIAL FORCE.*

By HENRY RAYMOND ROGERS, M. D., Dunkirk, N. Y.

The law of "*Conservation of Force*" having received the full and unqualified endorsement of all true scientists, is to-day the basis of all physical philosophy and the key to the explanation of all physical phenomena. No view of force can henceforth be accepted which is incompatible with it.

It may be said to be the product of the last half century, its origin being obscure and uncertain. Its earlier conceptions evinced but little promise of the grand future that awaited it, and its advancement, like that of all fundamental truths, has been exceedingly slow. It must be confessed that to-day, even, our knowledge of its provisions is but *rudimentary*. In the way of applying it to the explanation of the mysteries of nature's varied phenomena but little has yet been done. We are confident that whenever this immutable law shall be properly applied, a new era will have dawned upon physical science.

Another fundamental principle of recent discovery has been developed *pari passu* with that mentioned, and in importance is only secondary to it, viz:—the "Unity of Force,"—the correlation of all the forces. It has been demonstrated that all forms of force are resolvable into one another, it is therefore manifest that whatever name, or designation, we may give to these varied forms, but one essence pervades and animates them all. Instead of many independent forces, set forth in an irrational, contradictory, and mostly complicated philosophy, actually there exists *One Great Primordial Force*; simple in its character, competent to explain all physical phenomena, and in harmony with the nature of things. It is the force that rules the universe of matter,—innumerable star-suns and minutest atoms alike; and, for its realm, it has the vast bewildering space and all the cosmical bodies which occupy its depths.

This force is real and *substantial*. "Conservation of force proves as certainly as it proves anything, that all force is substantial. Nothing can be conserved, or preserved, unless it is something that exists, and it seems to be an axiomatic truth that nothing can exist unless it be a substance of some kind. If force in one form is convertible into force of another form, then all force in whatever form it may be exerted is substance, since it is impossible to conceive of the conversion of one thing into another thing, and neither thing be anything substantial. Our inability to take cognizance of the constituents, or corpuscles of a force, is no valid reason to a thoughtful

* Read before the A. A. A. S., Cincinnati, 1881.