less than twelve miles. It is not probable that the antarctic glacier was much, if any, higher than this in glacial times; for it will be readily understood, that, after the glaciation had proceeded so far as to place the south pole in the midst of a vast ice plain, the incoming clouds from the surrounding oceans would deposit most of their moisture before reaching the centre, and the glacier would be built up at or near its circumference. Hence we should expect to find the glacier, instead of thinning gradually from twelve miles at the centre to nothing at its outward edges, would present more the appearance of a great section of a hollow sphere of nearly uniform thickness, laid over the earth at the pole.

Further confirmation of this view is found in the fact that the southern hemisphere has a cooler mean annual temperature than the northern. Mr. Croll says this is due to the constant transferrence of heat to the north by means of ocean-currents, nearly all the great currents originating south of the equator; while Sir Charles Lyell thinks the true cause lies in the fact of the smaller extent of land surface in the south. It is also true that from March 20 to Sept. 22 — the duration of the sun's northern declination — there are 186 days, while from the autumnal to the vernal equinox there are only 179 days: the northern summer is therefore seven days longer than the southern summer, and the southern winter is that much longer than the northern. If this inequality in the length of the summer and winter in the two hemispheres had its origin during the glacial epoch, it would at least have the effect of melting the ice in the north more rapidly than in the southern hemisphere; and, if it existed before glacial times, the effect would have been to accelerate the growth of the southern ice-cap more rapidly than that of the northern.

At the culmination of the glacial epoch, therefore, we may assume that the northern glacier was of an average thickness of 1 mile, and in extent about 25,000,000 square miles, making 25,000,000 cubic miles of ice; that the area covered by the southern glacier was about 30,000,000 square miles, and 5 miles of average thickness, making 150,000,000 cubic miles of ice; and the two extending over more than one-fourth of the earth's surface, and aggregating 175,000,000 cubic miles of ice. These two gigantic "fossils" would be equal in size to about one-thirtieth part of the bulk of the moon, and would represent an amount of evaporation from the water surface of the earth sufficient to lower the sea-level more than 5,000 feet, or about one mile.

Now, I submit that the attraction of the sun and moon upon this mass of ice would, if continued for a long time, be sufficient to effect some change in the direction of the earth's axis. Just how much that change would be, I have not determined; but that there would be some change seems to be evident from the bare statement of the proposition. When we consider that this matter has been removed to the poles from the equatorial regions, the inequality of distribution of the earth's mass would be greatly augmented. The action and re-action of the sun and moon and the planets on the protuberant mass of matter about the equator produce what is called "nutation," and the procession of the equinoxes. Now, this mass being equally distributed around the earth like a ring at the equator, only the nutation, or nodding, of the axis is produced. But in the case of the antarctic ice-caps the result of the attraction would be somewhat different; for, this being largely at one side or at the pole, and the mean attraction of the moon being in the plane of the ecliptic, its tendency would be to draw the mass towards the ecliptic — so far, at least, until an equilibrium should be found.

That the relative magnitudes of the two polar ice-sheets should always remain the same, would hardly be presumed. The sinking of the ice to the bottom of the Northern Atlantic would necessarily cut off the Gulf Stream, and prevent its further progress northward, if it existed in preglacial times. Even if the ice extended only a few hundred feet below the surface, it would materially interfere with that current, since it is a broad shallow stream, flowing upon the top of the ocean. Similar conditions in the southern ocean might have aided the causes already named in effecting a change or changes in the relative sizes of the two great glaciers. During such changes, therefore, if any existed, oscillations of the earth's axis may have occurred before it became fixed as at present. We should therefore expect to find pauses in the recession, and perhaps a re-advance, of the northern glacier; and such we do actually find from an examination of the great Kettle Moraine in the northern United States, and of the reindeer epoch in Europe.

As already stated, the ocean-level would be very materially lowered. Thus we can account, in part at least, for the land elevations in high latitudes, to which all geologists resort for a partial explanation of glacial phenomena. True, this lowering of the level would be co-extensive with the entire ocean surface; and the old shore-lines would be found, if discovered at all, below the present water-level. But, as Professor Dana says, "elevations of land do not leave accessible records like subsidences." One of the strongest evidences of land elevation is the existence of numerous extensive fiords, which Professor Dana says are "valleys of erosion," and which Professor Le Conte calls "half-submerged glacial valleys." But, as the ice did not exist at sea-level in low latitudes, these fiords are not found there as fossil remains to mark the degree of elevation. But we know that England was united to the continent of Europe by dry land, that the Mediterranean sea was an interlocked fresh-water lake, that the delta of the Mississippi was at least 400 feet higher than it is at present, and that many of the islands of the Pacific Ocean were at a higher level. Professor Winchell, in his "Pre-Adamites," says that probably the now sunken continent of Lemuria, in the Indian Ocean, was dry land during the glacial period, as were also some of the Malay Islands and others. Professor Le Conte says, "The boldness of the whole Pacific coast, especially in high latitudes, indicates a previous more elevated condition of the land surface [during the quaternary] than now exists;" and Mr. Darwin thinks that "at this period of extreme cold the climate under the equator at the level of the sea was about the same with that now felt there at the height of six or seven thousand feet."

Moreover, if this inequality in the amount of the accumulation at the two poles existed as intimated, it would be sufficient to remove the centre of gravity of the earth a little to the southward of its former position. This would be followed by a greater flow of water from the north polar regions; and here we would have another cause of land elevation in high northern latitudes, since lowering the water-level is equivalent to an elevation of the land. While there may have been local elevations and subsidences of the land surface in high latitudes during the glacial and Champlain periods, there seems to be strong reason for believing that the growth and decay of the two great ice-barriers added materially to such changes of level by alternately lowering and elevating the general ocean surface. This lowering of the sea-level might be taken into account in considering the question of the geographical distribution of plants and animals; but it is not my design to pursue that branch of the subject here.

The suggestion here made, that the large accumulation of the earth's mass at the south pole was one of the contributive causes of the change in the direction of the earth's axis, is but a corollary to Dr. Warring's statement, that "between the end of the miocene and the beginning of the Champlain, that movement occurred which gave the earth seasons, unequal days and nights, and greatly enlarged its limits of inhabitability."

T. A. BEREMAN.

Mount Pleasant, Io., Feb. 5.

BOOK-REVIEWS.

Hegel's Logic: a Critical Exposition. By WILLIAM T. HARRIS. Chicago, S. C. Griggs & Co. 16°. $1.50.

WHAT Hegel calls logic is what other folks call metaphysic; and Mr. Harris has here undertaken to tell us what, as he understands it, Hegel's metaphysic is. We say "as he understands it;" for it is notorious that Hegel's disciples have not been agreed as to what his philosophy really is, some giving it a pantheistic or atheistic interpretation, while others, like Mr. Harris, think it a perfect philosophical basis for Christianity. This disagreement is partly due to the obscurity of Hegel's style, which makes it impossible in some cases to understand him, and his disciples have in this respect followed the bad example of their master. The

following passage, for instance, in Mr. Harris's work, can hardly be called intelligible: "In the category of ground, or substrate, says Hegel, 'the simple identity of essence is in immediate unity with its absolute negativity.' That is to say: Reflection posits identity and non-identity by relating to itself; its return is a self-repulsion" (p. 333). If our readers can find a meaning in that, they will do better than we can.

As regards method and doctrine, the great blunder of Hegel, as of some other Germans, consists in mistaking mere abstractions of thought for concrete realities, and this blunder is the source of most of their peculiar doctrines. Moreover, the claim put forth by Hegel and his followers, that their philosophy is all deduced from pure thought, without any elements derived from experience, is not in accordance with the facts. The idea of thought itself is derived from experience, and so is that denoted by the word "pure." Then the ideas of being, quantity, quality, relation, and others, which are essential data in Hegel's system, are obviously got by experience; and thus the claim that his philosophy is independent of experience cannot be allowed. Happily, the Hegelian philosophy is already dead in the land of its birth, and is rapidly dying elsewhere; and the feeble attempts of certain Americans to galvanize it into life again are foredoomed to failure.

AMONG THE PUBLISHERS.

THE word "croup" carries such terror with it, and is applied to so many conditions in infancy, that Dr. W. L. Carr's exhaustive article on "Croup as a Symptom in Different Diseases," in the February number of *Babyhood*, will be read with interest by thousands of young mothers. A hardly less important topic is treated by Dr. William H. Flint in his article on "The Causes of Foul Breath in Childhood," which points out clearly the origin of that annoying condition, and will be found of practical value. "A Short Talk about Ears," by Dr. W. K. Butler, is another leading medical article. In a lighter vein are contributions on such subjects as "Spoiling a Child," "Baby's Memory," "Nursery Methods in Vienna," etc.

— "Across East African Glaciers" is the title Dr. Meyer has given to his account of the first ascent of Mount Kilima Njaro, one of the most important events of recent African exploration. It will be published immediately in this country by Longmans, Green, & Co.

— We have received from the Open Court Publishing Company of Chicago a pamphlet by Alfred Binet, "On Double Consciousness," consisting of articles reprinted from the *Open Court*. The introductory chapter is on the study of experimental psychology in France, in which the author points out that the school to which he himself belongs have devoted themselves in the main to pathological psychology, or the study of the mind in abnormal states. He then takes up the various phenomena observed of late years which appear to him to show that there may be in a given individual a double consciousness, or, as he sometimes expresses it, a double personality. In support of this view, he recounts a number of curious experiments; but the reasoning by which he deduces from them his theory of double personality seems to us very incautious and inconclusive. In particular, he constantly confounds personality with consciousness, — a mistake that could not be made by any person trained in philosophy. M. Binet's experiments will interest those engaged in similar researches, but his theories should be accepted with great caution.

— Mr. Charles F. Cox read a paper before the American Folk-Lore Society in November last on "Faith-Healing in the Sixteenth and Seventeenth Centuries," which has now been issued as a pamphlet from the De Vinne Press, New York. The object of the paper is to delineate some of the older forms of what is now known as "Christian science," which were far more extravagant

Publications received at Editor's Office, Feb. 2–7.

LANGLEY, E. M., and PHILLIPS, W. S. The Harpur Euclid. London, Rivingtons. 515 p. 12°. (New York, Longmans, Green, & Co. $1.50.)

ROADWAYS and Maintenance, and Road Laws. Essays by various authors. Philadelphia, Univ. of Penn. Pr. 319 p. 8°.

TALMAGE, J. E. Domestic Science. Salt Lake City, Juvenile Instructor Pr. 331 p. 12°.

U. S. MARINE-HOSPITAL SERVICE, Annual Report of the Supervising Surgeon-General of the, for the year 1890. Washington, Government. 387 p. 8°.

WHITING, H. A Short Course of Experiments in Physical Measurement. Part II. Cambridge, John Wilson & Son. 583 p. 8°.

WHITMAN, J. M. Constructive Steam Engineering: Embracing Engines, Pumps and Boilers, and their Accessories and Appendages. New York, Wiley. 900 p. 8°. $10.