may at once introduce in their reductions my expressions of the diurnal nutation, employing the constants:

$\nu = 0''.07$, $L_o = 1^h.5$ E. from Greenwich.

My formulæ are, *in the meridian*:

$$\Delta a = -tg\,\delta\,(\eta\,\Sigma, + \xi\,\Sigma_2).$$
$$\Delta\delta = -\xi\,\Sigma_1 + \eta\,\Sigma_2$$
$$\xi = \nu \sin(2L + a);\ \eta = \nu\cos(2L + a);$$
$$L = L_o + \lambda$$

λ denoting the longitude of the observatory, W. from Greenwich.

$$\Sigma_1 = -1.155 - 0.134\cos\Omega + 0.36\cos 2\odot + 0.82\cos 2\mathbb{C} + 0.14\cos(2\mathbb{C} - \Omega) - 0.13\cos(\mathbb{C} - \Gamma')$$
$$\Sigma_2 = -0.18\sin\Omega + 0.39\sin 2\odot + 0.89\sin 2\mathbb{C} + 0.18\sin(2\mathbb{C} - \Omega) + 0.07\sin(3\mathbb{C} - \Gamma') + 0.07\sin(\mathbb{C} - \Gamma'),$$

where the arguments are true longitudes.*

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CURRENT NOTES ON PHYSIOGRAPHY (XVII.).

THE LABRADOR PENINSULA.

THE last few years have added much to our knowledge of this inhospitable region. Besides the Bowdoin expedition to the Grand falls of the Hamilton river, Low and Eaton, of the Canadian Geological Survey, traversed the interior by several routes (London Geogr. Jour., June, 1895, 513–533, map) and Bell, of the same survey, gives an excellent summary of his own explorations and of all available material (Scot. Geogr. Mag., July, 1895, 335–361, map). Labrador is a moderately elevated plateau, averaging 1,800 feet above the sea, of Archæan rocks; hilly, interspersed with many lakes and swamps, and having a surface of bare rocks, alternating with numerous and large boulders and other glacial debris. Mountains rise along the northeast, north and northwest border, the loftiest being the first named, with summits reputed to be 8,000 or 9,000 feet high. These present steep sides and jagged crests, and are believed to have escaped the glaciation that ground so heavily over the rest of the region. The largest of the numerous lakes in the interior plateau —Mistassini—is a hundred miles long. Many lakes have two outlets. The rivers on the plateau do not flow in deep or well defined valleys, but are prone to spread over the country in straggling channels; branches turn off unexpectedly on either side and, after an independent course of from five to fifty miles, rejoin the main channel. Every river is broken throughout its whole course by falls and rapids at irregular but generally short intervals, thus necessitating many portages in canoe traveling. Canyons like that of Hamilton river, and fjords like that of the Saguenay, are explained by Bell as the sites of deep-weathered dykes, cleaned out by glacial action. Grand falls on the Hamilton occur where this river plunges down the side of the canyon, which continues for twenty-five miles to the northwest, although not occupied there by any considerable stream. Recently elevated beaches occur along the eastern coast, up to 500 feet above the sea. Excepting in the north, the plateau is generally forest covered, but the trees seldom reach two feet, and are generally less than one foot in diameter. Great loss is caused by forest fires. The population is very scanty; 18,000 total, or about one to thirty square miles; and most of these live near the St. Lawrence and Atlantic coasts. About a thousand schooners, many of which carry several families, go from Newfoundland to the Atlantic coast to fish in the summer.

TRANSVERSE VALLEYS IN THE SOUTHERN ALPS.

FÜTTERER concludes a careful study of the 'Durchbruchsthäler in den Süd-Alpen'

*The constant term of Σ indicates that each star position of every catalogue must be corrected with $\Delta a = \grave{o}''.081 \tan\delta\cos(2L + a)$, $\Delta\delta = -0''.081\sin(2L + a)$. The last form of correction has been detected empirically by Gould in his own catalogue of Cordoba, and has allowed me to reduce greatly the systematic differences noticed by Downing between the catalogues of Greenwich, the Cape and Melbourne. (See *Annuaire* for 1894, p. 348 and 372.)

(Zeitschr. Gesell. f. Erdk., Berlin, xxx., 1895, 1–94), with the following reflections, here condensed: The most intimate knowledge of the geology of a river basin, including not only the composition of the strata but even reaching to the origin of their particles, is necessary to provide an interpretation of the origin and continual changes of a river system. Even in well-studied regions the results do not suffice to solve such problems, for unfortunately an interest in these 'geographical' questions is often absent among geologists. On the other hand, neither can the simple study of the actual condition of a river course explain the deeper problems of its geological development. As in the organic world, so here in the relations between mountain form and river courses, only from a knowledge of the processes of origin can we gain a true understanding of the world as it stands before our eyes (p. 92). This is sound physiographical doctrine. Fütterer discovers from the small remnants of ancient river deposits on the passes been the upper Tagliamento and the streams of the Carinthian Alps that these modern rivers are only feeble successors of a once much stronger river system that headed in the central Alps; and further that the Tagliamento, which exceeds both in drainage area and water volume the other rivers of the region, is only a *parvenu* among the Carinthian streams (91). The author notes (p. 78) a close agreement of his results with those obtained by Foerste in his thesis on the Drainage of the Bernese Jura (Proc. Boston Soc. Nat. Hist., 1892). Details are given concerning many streams, after which a general history of their development is presented (p. 76).

A SWISS LANDSLIDE IN THE GLACIAL PERIOD.

The valley of the Linth is obstructed for about four miles above (south of) the village of Glarus by a mass of loose material which Heim identifies as the product of an immense landslide or mountain fall (Der diluviale Bergsturz von Glärnisch-Guppen, Viertelj'schr. Naturf. Gesell. Zurich, xl, 1895, 1–32). The scar left by the fall is traceable on the lofty slope about two miles to the west. Morainic material lies upon the slide, and hence it is regarded as of at least glacial antiquity. Glacial action, however, not only did not suffice to clean out the valley, it did not even smooth down the rolling surface of the slide, or scrape away the river deposits that were accumulated up-stream from the barrier. The Linth now trenches the slide about half a mile back from its front on the eastern side of the original valley, as if the impetus of the slide had raised its margin to an uphill slope. The greatest thickness of the slide is 200 meters. Its original volume is estimated at $\frac{4}{5}$ km.^{3}, or about eighty times that of the great landslide of Elm in 1881. The Linth has now carried away about $\frac{1}{5}$ km.^{3}; 4,000 or 5,000 years being thought time enough for this work.

VALLEYS IN THE PLATEAU OF THE ARDENNES.

Arctowski describes this interesting region (Bull. Soc. géol. France, xxiii., 1895, 3–9) as the result of marine denudation of a vigorous ancient mountain system, the Cretaceous sea being regarded as the most active agent in accomplishing its reduction to baselevel. Following a miocene elevation of the region, streams began to sink their valleys beneath its even and gently sloping surface. The Hoyou, a branch of the Meuse from the north, and one of the most characteristic of the smaller streams of the Ardennes, exhibits several alternations between gentler and steeper slopes, although the points of increasing slope do not manifest any definite relation to the entrance of side branches or to the geological structure of the bed. Arctowski therefore concludes that the changes of slope indicate

upward movements of the region; the effect of the earliest movement having now been propagated nearly to the head of the stream, while the latest elevation has caused a deepening of the valley only near its mouth. (The lateral terraces that might be expected if this explanation were true are not mentioned.) The extremely meandering course of many deep valleys in the plateau is ascribed to lateral erosion on convex curves of originally irregular courses, and not to perpetuation of meanders originally developed on upland surface and somewhat increased during the incision of the present valleys.

THE RIVERS OF SPAIN.

THIS large subject is treated in a descriptive manner, with especial reference to the value of rivers for irrigation and navigation, by R. Torres-Campos (Bol. Soc. geogr. Madrid, xxxvii., 1895, 7–32, 81–140). The excessive aridity of many river basins and the dependence of agriculture on irrigation are the themes of many pages. In the basin of the Ebro, for example, irrigating canals create productive farms, sustaining a dense population; but away from the streams there is neither tree nor bush, and one may there travel 'leagues and leagues' without seeing the trace of human habitation. The dryness of this region has obliged many of the laboring classes to emigrate. Some go to South America, some to France; and the improved condition of the few who return stimulates the departure of others. On parts of the coast of Valencia the streams from the mountains have built out a sloping plain of fertile alluvium, where the construction of roads and canals has been so easy that the region is occupied by a prosperous and progressive population. No consideration is given by the author to the origin of the rivers or to the present stage of their development.

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SCIENTIFIC NOTES AND NEWS.

FIELD WORK OF U. S. GEOLOGICAL SURVEY.

DIRECTOR WALCOTT, of the U. S. Geological Survey, has returned to Washington, after a two months' absence in the northern Rocky Mountain region, spent in field work. He was studying the Cambrian rocks and faunas of Montana and Idaho.

The field work of the season is drawing to a close. Nearly all the geologic parties have come in, though work is still going on on the Pacific coast, and, to a small extent, in the Interior or Mississippi basin. Work in the northern Rocky Mountain region and in Washington was brought to a stop early in October by severe storms. In this region Mr. Emmons and Mr. Willis were at work as well as the director. The special work in Alaska, an examination of the gold and coal resources, was advanced so far as conditions would permit, and Drs. Becker and Dall are now in Washington preparing their joint report on the subject. Since submitting to the Secretary of the Interior his report on the character of the lands involved in the McBride claim in Washington, Mr. W. Lindgren, who made the expert examination for the Government in that case, has been mapping the geology of the mining region of northern-central California.

Topographic work is still in progress in all quarters. The number of sheets surveyed is unusually large and the work is generally of excellent character. Surveys are, or have been, in progress in about twenty-five States and Territories. The Chief Topographer, Mr. Henry Gannett, made an inspection of the work, especially that in the West. The work going on in Indian Territory is of special interest because of the peculiar conditions governing it. Here, in connection with the regular topographic mapping, a subdivisional or parceling survey is being made in the interest of the General Land Office. This