upon the mathematical work of Hertz, J. J. Thomson and Heaviside, of the character of the electrical waves which pass out from the vertical wire at the sending station; he calls attention to the rational basis for Marconi's law, or rather a modification of Marconi's law, that the range of signalling in miles is proportional to the product of the heights of the vertical wires at the sending and receiving stations, and explains why longer distance signalling is possible over water than over land. Those who are interested in this matter will find Professor Fessenden's discussion instructive and interesting.

Long distance wireless telegraphy seems to be now almost within reach, with high sending and receiving wires and with very powerful electrical disturbances at the sending station, very slight improvements in the sending and receiving apparatus will likely carry the range up to a thousand miles or more.

W. S. F.

CURRENT NOTES ON PHYSIOGRAPHY.

IOWAN DRIFT.

CONTINUED studies of the drift of Iowa by members of the State Geological Survey give new details regarding the topographic differences between the three chief drift sheets (Kansan, Iowan and Wisconsin), indicative of their differences of age. Calvin describes the Iowan drift sheet (*Bull. Geol. Soc. Amer.*, x, 1899, 107–120) as forming a broad plain of long, gently sweeping undulations, on which stream erosion has in general done little work; only the main drainage lines, many of which follow sags in the drift that are taken to indicate pre-Iowan valleys of erosion, are well defined; small lateral channels have been eroded only a mile or so from the main valleys. In contrast with this little carved surface, the Kansan sheet, next south, was maturely and deeply eroded before the Iowan sheet was deposited. The Kansan-Iowan interval is thought to have been fifty times the post-Iowan period. About the middle of the latter period is taken as the date of the lobe of Wisconsin drift that enters from Minnesota and overlaps both the Iowan and Kansan sheets. The surface of this lobate area shows even more distinct signs of youth than are found in the Iowan area; undrained depressions are of frequent occurrence on its undulating prairies; oxidation and leaching have hardly begun; stream erosion is insignificant. The value of topographical evidence as indicating geological dates is seldom better illustrated.

The same author described 'a notable ride' from the driftless area of northeastern Iowa to the Iowan drift sheet, where the contrasts of a maturely dissected upland of normal development, and the broad swells and troughs of a till plain are well presented (*Amer. Geol.*, xxiv, 1899, 372–377).

WESTERN AUSTRALIA.

AN account of part of western Australia by Cadell ('Some geological features of the Coast of Western Australia,' *Trans. Edinb. Geol. Soc.*, vii, 1897, 174–182) ascribes the absence of harbors to a recent slight elevation after prolonged denudation. The elevation is indicated by raised beaches, now 10 or 15 feet above sea level, one beach being from 12 to 18 miles wide and reaching 25 miles inland. The beaches lie on a low, flat plain of denudation, monotonous and desolate, sloping imperceptibly to the sea. An inland excursion of seventy miles was chiefly over a perfectly flat surface of granite, clay slate and other rocks, strewn with wind-worn pebbles and relieved by occasional crystalline knobs which rise over its prairie-like expanse. No mention is made of incised valleys; the few water courses of the region, usually with dry beds, seem to lie but little below the general level. The rocks are as a rule deeply weathered; water being commonly found in wells at depths of 45 or 50 feet. The inland termination of the plain is not described. The possibility of accounting for such a plan by subaërial or by marine denudation is recognized, and a preference is expressed for the latter agency in this case (although the deep weathering of the rocks seems to be more accordant with a subaërial history). A comparison is made between this denuded lowland and the flat pavement on which the Cambrian rocks of northwest Scotland rest; it is further suggested that if the Australian plain were scoured by glacial action, it would be transformed to a hummocky surface, resembling the 'rough

quarter' of the gneissic uplands of Sutherland (N. Scotland).

MOUNTAINS AND VALLEYS.

Richter of Graz writes on 'Gebirgshebung und Thalbildung' (*Zeitschr. deut. u. österr. Alpenverein*, xxx, 1899, 18–27), re-affirming the modern view that the bold forms of the Alpine summits result from the carving of valleys between them. He calls attention to the rough equality of height among the peaks of the Alps, and discusses the relation of peak height to valley spacing. He points out that in lofty ranges, the valleys must be relatively far apart, in order to allow the intervening mountain to rise to a great height. Before the greater uplift of the Alps, when the relief of the surface was less, streams and valleys were probably more numerous and closer together. As elevation progressed, some streams deepened their valleys faster than others and the side branches of the more active streams tapped the less active streams at many points and practically destroyed them; thus only the stronger streams survived in the deeper valleys. The rapid erosion of cliffs has reduced the mountain sides to a relatively uniform declivity, and the peaks are defined by the intersection of slopes propagated upward from the stream lines. Glacial action is briefly referred to as having produced trough-like channels whose side walls are steeper than the preglacial valley slopes which rise above them.

THE MEUSE IN BELGIUM.

After the Meuse trenches the Ardennes, it turns eastward along the strike of the Carboniferous rocks, receiving the Sambre from the western extension of the same geological belt. On this longitudinal course, streams of considerable length are received from the valleys of the Ardennes on the south, but the divide on the north lies close to the Sambre-Meuse, except at a few points where it locally loops northward. The streams that drain these loops receive a number of barbed headwaters which flow away from the Meuse valley before turning around towards it. The barbed headwaters are explained by Cornet as having once belonged to streams that flowed continuously northward. They have been captured by side streams of the Meuse in consequence of the depth to which its longitudinal valley has been cut (*Ann. Soc. géol. de Belgique*, xxvii, 1899). The beheaded streams, northward of their diverted headwaters, and their special relations to the valleys that they occupy are not described.

W. M. Davis.

NOTES ON INORGANIC CHEMISTRY.

A paper was read by Dr. Orme Masson before the recent Melbourne meeting of the Australasian Association on the use of Iceland spar as a standard in volumetric analysis, and is reprinted in the *Chemical News*. In Masson's method the pure spar in cleavage crystals is weighed in a beaker and then treated with 20 cc. of the acid to be standardized; after the first effervescence is over the whole is heated to boiling for an hour. The now perfectly neutral calcium chlorid is decanted off, the undissolved spar carefully rinsed in the beaker, dried at 110° and weighed. The loss in weight represents exactly the strength of the acid compared with normal, as 20 cc. of normal acid dissolves exactly 1 gramme of calcium carbonate. The method presents the advantages over the usual Iceland spar method, that there is no indicator used and no titrating of excess of acid with alkali—furthermore the crystals are less hygroscopic than the powder. The method has a further advantage over other methods in that few compounds can easily be obtained in so pure a state or of so definite composition as Iceland spar.

In a recent number of the *Bulletin* of the French Chemical Society Professor Moissan has described a definite phosphid of calcium with the formula Ca_3P_2. It may be formed by the reduction of calcium phosphate with carbon in the electrical furnace, or by the direct action of phosphorus vapors on calcium. In the former case it is crystalline, in the latter amorphous; in both a dark red solid. It is decomposed by water with the formation of phosphin, PH_3, in this respect resembling a number of binary compounds of calcium, such as calcium hydrid with evolution of hydrogen, calcium carbid with evolution of acetylene, calcium nitrid with evolution of ammonia. Lebeau has also