The fundamental position has, I maintain, not been shaken, either by mathematical physics or geological facts. The more the theory is tested by the light of practical geology the more remarkable is the explanation it affords of the associated phenomena of sedimentation and mountain-building; denudation and faulting. Furthermore, no other theory yet brought forward attempts to offer an explanation of more than one set of these phenomena, namely, those of compression. Normal faulting cannot be accounted for by compression, yet the rival theory of tangential pressure on the crust through the shrinkage of the earth's nucleus provides for compression only. Contraction, by which I have shown that normal faults are produced, is not part of the machinery of any other theory than the one associated with my name.

I ask geologists to bring to the consideration of these great problems clearness of vision, for, usually, a single aspect only is examined, the rest being left in an impenetrable haze.

I trust I have now brought sufficient evidence before you to show that a broad examination of the formations of these islands, and their associated physical phenomena, throws a good deal of light on the problems of mountain-building, and that their remarkable relations are well worth more detailed examination than I have been able to give them in this address.

NOTICES OF MEMOIRS.

I.—Notes on some Tarns near Snowdon. By W. W. Watts, M.A., F.G.S.[1]

DURING a recent visit to North Wales, the writer has taken the opportunity of examining a few of the tarns in the immediate vicinity of Snowdon, including the two small lakes in Cwm Glas, Glaslyn, and Llyn Llydaw.

In the hollow of Cwm Glas there are two tiny tarns named Ffynnon Frech and Ffynnon Felen; both lakes drain over a barrier of rock, but in a rainy season the upper one appears to find a second outlet over the long, low col to the east, so that in this state it has the two outlets depicted on the six-inch map. The upper lake appears to be a portion of a bending valley dammed at both ends by scree and stream-débris, and thus compelled to find an escape over the rocky side. The lower lake is confined in a rock-basin, as rock occurs at its actual outlet and at every point where any former outlet might have been possible. The lake is, however, so shallow that its occurrence in a basin of rock is perhaps of little consequence.

The neighbouring hollow of Cwm Dyli, as is well known, contains three lakes, the highest being Glaslyn, the next Llyn Llydaw, and the lowest Llyn Teyrn. Glaslyn is bounded on all sides by live rock, except at and near its outlet. This exit is over moraine, which, however, is evidently not very deep, for rock makes its appearance just below, and in such a way as to almost compel belief

[1] Read before Section C of the British Association at Ipswich, September, 1895.

in a complete rock bar. Beside the present course of the effluent stream is a parallel strip of moraine running down towards Llyn Llydaw, but living rock soon appears in this in such a way as to show that if there be any old channel in this direction it must be exceedingly narrow and tortuous. If this lake be not contained in a true rock-basin it must be very shallow, or else must have found exit by a gorge quite as narrow as those found at the end of some of the Swiss glaciers.

Immense quantities of moraine material occur on the south-east side of Llyn Llydaw, but a careful examination of the map and the ground shows that only two possible outlets exist, that now used for this purpose, and a second which is occupied by bog resting on moraine, and gives rise to a small stream which is joined lower down by the outlet of Llyn Teyrn. The moraine is, however, only a thin skin on the surface of rock. The present outlet shows live rock 40 or 50 feet below the level of the lake, and the second possible exit at a rather less distance below the same level. If the moraine were stripped off, there is little doubt that this lake, like Glaslyn, would show a basin of rock which would hold water, unless it is very much shallower than is generally supposed to be the case.

II.—On Pitch Glaciers or Poissiers. By Prof. W. J. Sollas, D.Sc., F.R.S.[1]

PITCH and the ice of glaciers strikingly resemble each other in behaving as solids or liquids, according to their manner of treatment. On the sudden application of force they break like brittle material, but behave as fluids when subjected to gradual pull or pressure. Hence it is possible to employ pitch in the construction of working models of glaciers in order to obtain an insight into those internal movements of actual glaciers which are beyond the reach of direct observation. The study of glacial deposits has shown that many erratic boulders were transported, during the Glacial period, from lower to higher levels, and left stranded on the flanks of mountains some hundreds of feet above their source.

This standing difficulty in the way of physical theories of glacier-movement has been explained by the study of pitch models, which show that the lower layers of material on approaching an obstacle are carried up in an ascending current. The inference, which is confirmed by other kinds of observation, is that similar movements take place in actual glaciers. Further, a glacier sometimes overrides its terminal moraine without disturbing it; and in an experiment this was exemplified, for pitch flowed for several months over a ridge of loose material without carrying a particle of it away. A remark made by Professor Fitzgerald to the effect that viscosity seemed merely to retard, not to alter the nature of, the movement, in the cases described, led the author to experiment with less viscous material, such as Canada balsam and glycerine, with concordant

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results. A trough containing balsam flowing upwards over an obstacle under its own head of pressure was shown by the lantern upon the screen.

A raised model of Ireland had been constructed, and the directions of ice-movement as determined by the Rev. Maxwell Close indicated upon it by arrows; on allowing water streaked with colouring matter to flow over it from two areas supposed to represent the great gathering grounds of snow of the Glacial period, the water had taken paths, as shown by coloured streaks, corresponding to those taken by the ice as shown by the arrows, a concordance in every way remarkable.

REVIEWS.

I.—The Geological Survey.

THE Report for the year 1894 of Sir Archibald Geikie, Director-General of the Geological Survey of the United Kingdom and Director of the Museum of Practical Geology, has reached us somewhat late in the present year. This is the more to be regretted, as the Report contains (in addition to the statistics relating to field-work, museum-work, and publications) a record of the chief scientific results obtained during the year.

Of the entirely new area in course of survey, that of the Isle of Man first calls for notice in the account of work done in England and Wales. There Mr. G. W. Lamplugh has discovered certain conglomerates in the Skiddaw Slate group, which he believes to have been produced by the breaking up of sandy slates and grits under intense shear strain. Unlike ordinary crush-breccias the included fragments often assume the characters of pebbles, rounded by attrition. The subject has been fully brought before the Geological Society, so that further reference here is not needful. No fossiliferous zones have as yet been determined in the Skiddaw Slates. With regard to glacial phenomena, the general march of the ice during the height of glaciation is noted to have been from some point west of north. It is stated that a bed of fine warp or silt in the glacial series of Kirk Michael may prove to be of some economic value: it has been used locally as a fuller's earth.

In areas that are being re-surveyed, those of the South Wales and other coal-fields are, without doubt, the most important. Portions of Glamorganshire, Brecknockshire, and Monmouthshire are being mapped by Messrs. J. R. Dakyns, A. Strahan, and W. Gibson, and in these (as in all other) areas where the Geological Survey is now engaged, the six-inch Ordnance Maps are utilized in the work. It is interesting to learn that, on the eastern border of the great coal-field, the several subdivisions of the Old Red Sandstone at present observed, appear to pass into each other, from the red marls and sandstones with cornstones up to the red sandstones, quartz grits, and conglomerates. The Carboniferous Limestone Series, as is well known, exhibits marked variations in the thickness of its