

(5) A fifth set of verifying facts are such links of relationship between the various Aryan languages as geographically spoken in historical times, such links of relationship as appear to postulate a common speech in that very area above indicated, and where an ancient Aryan language still survives along with primitive Aryan customs. For such a common speech would have one class of differentiations on the Asiatic, and another on the European side, caused by the diverse linguistic reactions of conquered non-Aryan tribes on primitive Aryan speech, or the dialects of it already developed in those great river-partitioned plains.

(6) A further set of verifying facts are to be found in those which lead us more and more to a theory of the derivative origin of the classic civilizations, both of the Western and of the Eastern Aryans. Just as, between the Dnieper and the Carpathians, and between the Oxus and the Himalayas, there were such conditions as must have both compelled and invited to pass from the pastoral into a partially agricultural stage; so, in passing southward from each of these regions, the Aryans would come into contact with conditions at once compelling and inviting to pass into a yet higher stage of civilization. And in support of this all the facts may be adduced which are more and more compelling scholars to acknowledge that in pre-existing Oriental civilizations the sources are to be found, not only of the Hellenic and the Italic, but of the Iranian and the Indian civilizations.

(7) Finally, if the Hellenic civilization and mythology is thus to be mainly derived from a pre-existing Oriental or "Pelagian" civilization, it is either from such pre-existing civilizations, or from Aryans such as the Kelto-Italians, migrating northward and southward from Pelagian Thrace, that the civilization of Western and Northern Europe would, on this hypothesis, be traced: and a vast number of facts appear to make it more probable that the earlier civilization of Northern Europe was derived from the south than that the earlier civilization of Southern Europe was derived from the north.

The three conditions of a true solution of the problem either of Semitic or of Aryan origins appear to be these. First, the locality must be one in which such a new race could have ethnologically, and secondly philologically, arisen as a variety of the Archaic stock of white races; and thirdly, it must be such as to make easily possible the historical facts of dispersion and early civilization. And I venture to submit the above sets of facts as not inadequately, perhaps, supporting the South Russian "speculation as to the origin and home of the Aryan family."

J. S. STUART GLENNIE.

The Shealing, Wimbledon Common, September 22.

Mr. Dixon's Mode of Observing the Phenomena of Earthquakes.

MR. HAROLD DIXON'S letter in NATURE of Sept 18 (p. 491) is exceedingly interesting to seismologists. On two occasions he was able to make the only kind of observation which is of any value unless seismographs are actually employed; he has been able to make these in England, where earthquakes are rare, and I know of no record of such definite information being given by any of the trained observers in Japan, where earthquakes are so numerous. It requires great coolness to make such observations at such a time.

Seismographic records show that even in destructive Japanese earthquakes the vertical displacement of the ground is usually less than one millimetre, so that the mere *difference* in vertical displacement observed by Mr. Dixon between two points in the same room must have approached five hundred times the greatest *absolute* vertical displacement in Japan. Mr. Dixon truly says that, if the displacement observed by him had been due to the movement of the hill itself, it must have meant a good deal, for it would have meant some hundreds of thousands of times the greatest vertical earth movement recorded by any seismograph.

When I say that Mr. Dixon's letter is interesting, I make the assumption that what he observed was not merely what anybody observes who raises his head when looking at a distant hill through a window.

JOHN PERRY.

31 Brunswick Square, W.C., September 24.

Butterflies Bathing.

IN NATURE of August 21 (p. 402) is a note taken from the *Victorian Naturalist* describing an observation made by

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Mr. G. Lyell, Jun., of Melbourne. He states that several butterflies (*Papilio macleanus*) were seen to enter the water backwards, remain partly submerged for about half a minute, and then fly off to the hill-sides refreshed with their bath. The heat of the weather is given as the cause of their action.

I should like to suggest that the insects were probably engaged in *depositing their eggs*. Perhaps some one who has the opportunity will ascertain if the larva of this butterfly is aquatic, or feeds on plants growing at the water's edge.

G. A. FREEMAN.

St. Olave's Grammar School, Southwark.

Surface-tension and Surface-viscosity.

IF an oiled needle be placed on the surface of pure water, it will be supported, but if it be washed in a solution of potash, it will sink. In the first case the effect cannot be due to the surface-tension, which is much diminished by the oil. Has the viscosity of the oil anything to do with it? Also in the case of a soap-bubble, is the effect due to viscosity, and not to surface-tension; and what is the difference between surface-tension and surface-viscosity? They are both, no doubt, due to cohesion, but it is difficult to form definite conceptions of the two properties. Would any of your readers kindly answer the above questions, and give references to any works bearing thereon? Maxwell's "Theory of Heat," on capillarity and viscosity, does not seem to throw any light on the matter.

W. P. O.

Leicester, September 25.

ON STELLAR VARIABILITY.¹

II.

I HAVE before stated that the variability phenomena observed in stars of the Groups I. and II. and VI. are produced by the same cause; all differences in the details of the effects being due to the different physical nature of the central body. In Groups I. and II. it is a swarm of meteorites with which we have to deal; in Group VI. it is a condensed star of low radiation surrounded by a dense atmosphere containing carbon in some combination.

In both cases the bodies are normally dim; in Groups I. and II. they are so because the meteorites when undisturbed are relatively free from collisions; in Group VI. they are so for the reason stated above, the star being on the verge of extinction.

I insist upon this dimness, because the dimmer the central body the more important becomes the luminosity caused by, or set up in, secondary swarms. Further, such variability as we are now considering is unknown in the case of the hotter stars.

It is clear that phenomena produced in either group by the action of two swarms should strongly resemble each other, and that if it be found that this explanation holds good in one case it should be found to hold equally good in the other. It is to be expected then that phenomena observed in each may throw light upon the other, and that the view advanced may be tested by the differences observed.

Let us consider two hypothetical cases, to start with, in Groups I. and VI.

In Group I. we have a condensing nebula the light of which when undisturbed is say 6 mag. Round this there revolves a cometary swarm say in six time units. At periastron collisions occur which raise the light of the combined swarms to 3 mag. There is also another similar swarm revolving in say twelve time units. The conditions are such that this second swarm produces a smaller disturbance which only raises the light to $4\frac{1}{2}$ mag. We will assume the periods to be exactly commensurable, and the apastras to occur together. It is obvious that alternate minima will be raised by this second revolving swarm, but the maxima will be constant.

In order to put results of this nature into diagrammatic form we must consider that we are dealing with certain

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