

Memory" (1880, new edition 1910). To me, as an advocate of this theory of heredity, it comes as something new—and strange—that underlying it there should be the assumption of an inheritance of acquired characters. I would rather conclude that, like Francis Galton, this illustrious physiologist—with the "prevision" of which Pasteur so often spoke—foresaw that the individual was not at all "a chip of the old block," but that at the basis of all development there was a continuity of germ-cells. For on p. 17 of Ostwald's reprint of the original lecture Prof. Hering writes:—"From this point of view the whole individual development of a higher organised animal forms a continuous chain of memories of the development of that great series of beings whose final link this animal represents."

Like the late Samuel Butler, the writer rediscovered this theory of heredity, and except that author he was the first to advocate it, upon grounds of observation, in this country. As undoubtedly it is of all theories of heredity the theory which is capable of accounting for and explaining all the facts, I venture to ask the courtesy of the insertion of this brief account of it in your pages. In the light of this overwhelmingly important theory the "Mendelian discovery," for example, sinks into its proper place as a small but interesting episode in the history of heredity.

J. BEARD.

8 Barnton Terrace, Edinburgh, January 22.

I AM unable to agree with Dr. Beard that the mnemonic theory of heredity does not involve acceptance of the doctrine of the inheritance of acquired characters. Certainly the theory as enunciated by Prof. Semon, which formed the subject-matter of my review, is based upon such acceptance, to justify which weighty evidence is brought forward. Can an organism, or a germ-cell, be said to remember events of which it has had no past experience, direct or indirect? If, as Dr. Beard holds, neither the primary germ-cells nor their ancestors have ever formed part of the body of a higher animal, can they be supposed to remember events in the ancestral history of the race, unless, of course, they have received information as to such events (engrams) from the bodies in which they are, or were, enclosed? The power of transmitting such engrams to the germ-cells is the fundamental conception of the doctrine of the inheritance of acquired characters, as it is also of the mnemonic theory as expounded by Prof. Semon. If, however, Dr. Beard holds that the germ-plasm does not receive engrams from the body at all, but is merely a continuous stream of living matter which has the power of producing some particular type of body at intervals and under appropriate conditions, I fail to see where the idea of memory comes in, any more than in the case of the periodic waves produced by the tide.

I cannot see that the doctrine of the somatic or bodily origin of the germ-cells has any necessary connection with the doctrine of the inheritance of acquired characters. Even if we adopt the opposite doctrine, that the germ-cells form a continuous chain from generation to generation and are separated from the somatic cells at the very commencement of individual development, such a view does not seriously affect the question, for there is no valid reason for supposing that the germ-cells could be influenced by the somatic cells only through some protoplasmic connection.

Again, why should any distinction be drawn between plants and animals with regard to the problem under discussion? It would indeed be strange if the two great divisions of the organic world should differ in this respect. Of course, in the higher plants, the sexual generation (gametophyte) is very greatly reduced, but none the less a true sexual process intervenes between each asexual (sporophyte) generation and the production of the ripe seed. The case of the peach trees quoted in my review is in no way comparable to Dr. Beard's chrysanthemums, for the embryo plant within the seed is developed from a fertilised egg as truly as in the case of any animal. It is obvious, moreover, that in the case of the higher plants Dr. Beard's view as to the relations of the germ-cells cannot be maintained, for the whole sporophyte generation intervenes

between each two successive sexual generations, and the latter develop each from a single non-sexual cell, the spore, produced by the sporophyte generation after it has attained maturity. Here, at any rate, there is no continuous chain of germ-cells distinguishable from somatic cells.

Dr. Beard's views on the subject of identical twins are new to me. I was under the impression that such twins were supposed to result from the complete division of a single fertilised ovum. This, at any rate, is the view adopted by Weismann.

ARTHUR DENDY.

The "Isothermal Layer."

I AM inclined to doubt whether Commander Hepworth's suggestion (NATURE, January 25) that the so-called "isothermal layer" is simply due to radiation from the material, solid or gaseous, which circulates round the sun with an orbital motion and gives rise to the zodiacal light, can be reconciled with the configuration of the surfaces of equal temperature in the upper air which show a progressive increase of temperature from low to high latitudes. It seems more probable that this increase, and the fact that above a certain height in these latitudes the temperature no longer diminishes with the altitude, are the result of the prevalent movement, outside the equatorial belt, of the higher portion of the atmosphere from west to east with comparatively great velocity, which increases with the latitude and altitude, and extends to lower levels as the distance from the equator becomes greater. This movement, which gives the upper atmosphere greater angular velocity than the lower and the earth beneath, partially counteracts the force of gravity and causes the air to rise and expand without doing work, and therefore without suffering a decrease in temperature. At the equator there appears to be no satisfactory evidence of an "isothermal layer."

But although the radiation from the orbital interplanetary matter of the zodiacal light may not afford an explanation of the "isothermal layer," it must be taken into account as a climatic factor. Maurer has shown that the earth receives at night radiated heat to the extent of 0.37 of a calorie per square centimetre per minute. This is attributed—no doubt in the main correctly—to radiation from the carbonic acid and water vapour of the atmosphere, but some portion must have an external source. It is possible that the radiation from interplanetary material may at present be almost as inconsiderable as that from the planets or the fixed stars; but if, as we have every reason to believe, there has been a gradual approximation of this diffused orbital matter towards, and absorption in, the sun, there must have been a time when so much was present beyond the earth's orbit that the radiation received from it balanced to a considerable extent the radiation from the earth into space, and rendered not only the daily and seasonal variations of temperature, but also the permanent differences of temperature between high and low latitudes, much less marked than they are at present.

I have for some time thought that it was in this direction we ought to look for the explanation of the comparative uniformity of temperature that appears to have prevailed in different latitudes in Palaeozoic times, a uniformity that seems to have existed as much in periods of cold as of high temperature, and the absence of marked seasons even in the far north, evidenced by the fact that the remains of stems with exogenous growth show little or no trace of annual rings. In the long Arctic night, not only heat, but light, would have been continuously received from this source. How considerable, even at present, is the illumination given by the zodiacal light can only be realised by those who have travelled in moonless nights in the tropics. Even in forest country with a cloudy sky the darkness of midnight is changed about 2 a.m. to a twilight, which is quite sufficient to render the track visible until the true dawn appears.

Nordenskiöld has given reasons for believing that fine cosmic dust revolves round the earth itself as centre. If this be the case, its climatic influence in the past may have been similar, but it was probably of much less importance.

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