

server whose researches may have been omitted, to attribute the neglect to the disturbing influence of recent events. The earth and her satellite are treated at some length, and the questions of the moon's influence on the earth's atmosphere, the winds, weather, and magnets, are fully discussed. The chapter on meteorites is very interesting. We are told, on the authority of Miller and Haidinger, that the earliest mention of meteorites is probably in Iliad xv. 18—22, where the anvils spoken of by Jupiter are supposed to refer to these phenomena. Livy mentions a shower which some think may have been a star shower; and the famous black stone in the Kaaba, at Mecca, is said to be undoubtedly a meteorite of great antiquity. Numerous analyses of meteorites are given, and tables are added containing full details of all those which are recorded to have fallen from the earliest times. There are similar tables with regard to comets and star-showers; and finally we have two well-executed plates of the appearance of different sun-spots, and a chart of part of the moon's surface. We should like to see an English edition.

The Theoretical Astronomy of Dr. Klinkerfues, director of the Royal Observatory of Göttingen, is a reproduction of lectures delivered by him in that University. This is the first part of the work, and its object is to give an explanation of the means by which the courses and positions of heavenly bodies are determined. It is not adapted to the general reader, but will prove a useful companion to the mathematician who wishes to obtain an insight into astronomical methods of calculation. Several very good figures accompany the text.

G. T. A.

Kuklos; an Experimental Investigation into the Relationship of Certain Lines. By John Harris Part I. (Montreal, 1870)

IN a review of Prof. Bretschneider's History of Early Geometry we have mentioned some clever attempts to square a circle, made at a time when this problem engaged the attention of the first mathematicians. Then, however, as at present, there existed circle squarers of a different kind, who excel only in demonstrating their own ignorance. A fine specimen is preserved by Simplicios. Some persons had heard of square numbers which are at the same time cyclical, that is to say, the last figure in the square number is the same as that of the root, as 25 and 5. Nothing, of course, could be more evident to them than that a number which is both square and cyclos must be a measure for the circle. Mr. Harris ranks almost as high, only he does not give his conclusions in quite so short a form. His book is to consist of four parts in quarto, of which the first contains merely a preface, preliminary arguments, and on the last page an introduction. In the preface the author excuses the haste in which the publication has taken place, with the remark that if his researches are of value they cannot be brought early enough before the public,—if a failure “the communication itself would not be worth the additional labour bestowed on improving its form.” This latter conclusion we willingly grant. It is only to be regretted that Mr. Harris has not had the same opinion of the time he spent in writing this communication and preparing the numerous and long figures which fill ten large plates.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.]

Pangenesis

MR. GALTON—by acting upon the conclusion that the supposed gemmules supposed to be detached from the cells of the body at different periods of life in the case of the higher animals swarmed

in the blood prior to their supposed collection and union to form the reproductive element—favoured the provisional hypothesis of Pangenesis, for he indicated a not improbable manner in which the very improbable phenomena involved in the hypothesis might actually occur.

But Mr. Darwin, in NATURE for April 27th, writes to explain that he maintains that the gemmules must be “thoroughly diffused”—I conclude, suspended in the fluids which circulate freely in every part of the very substance of all the tissues of the body. The supposed gemmules must be much more minute than the smallest particles that can be seen by the highest magnifying powers used in these days, and must be invisible to the eye when made to appear five thousand times larger than their real size. They must be capable of *diffusion*, and, as is suggested by Mr. Darwin, much as chemical substances are *diffused*.^{*} But the terms of the hypothesis would imply that the gemmules are actual particles *suspended* and not *dissolved* in the fluids.

It is not very encouraging to those who work, to discover after having performed numerous and well-devised series of difficult, laborious, and troublesome experiments honestly to test the value of a hypothesis, that they have been investigating a shadow, and to be then informed that the results they have obtained have little or no bearing on the question at issue. The “experiments are extremely curious,” says Mr. Darwin, and the experimenter “deserves the highest credit for his ingenuity and perseverance.”

It would, of course, be possible to remove from one animal portions of tissue which, according to the hypothesis, *must* contain the supposed gemmules, if they exist, and graft the pieces of tissue upon another. If the experiment was successful, and the offspring exhibited any of the characters of the variety from which the graft was taken, the opponents of Pangenesis would admit the doctrine at once, but if the results were again of a negative kind, would Mr. Darwin consider that his hypothesis had “received its death blow?” It would certainly be as easy to defend it as it is at this time. Nor do I believe it possible to obtain a series of experimental results which would lead the supporters of Pangenesis to abandon the hypothesis. A firm belief in hypothetical gemmules, which cannot be rendered evident to the senses, is not likely to be shaken.

Depend upon it, neither the well-devised experiments of Mr. Galton, nor any other experiments that may be devised, will overthrow this doctrine. The provisional hypothesis of pangenesis is perfectly safe, and will withstand every attack that may be made. It cannot be successfully assailed. Like many favoured hypotheses of these days, it can neither be proved to be true nor positively shown to be false, and it is open to anyone to ground his belief in the truth of this and other doctrines upon the fact that they have not been and cannot be disproved. For undoubtedly gemmules *may* be formed in the manner supposed; if formed, they *may* be detached; if detached, they *may* pass through the tissues; they *may* then collect together, and *may* form reproductive elements. Each one of the countless millions of sperm elements produced in such profusion during so many years of life *may*, indeed, be formed by the union of millions of gemmules which, after meandering through the various textures of the body, marshal themselves in order in one particular locality. From the vast company thus supposed to have collected, we *may* conceive, by the light of imagination, the formation of regiments composed of multitudes of individual gemmules of the same kind; and further, it is not difficult to imagine that each individual gemmule of every regiment *may* move away and unite with thousands and tens of thousands of others, to form at length that marvellous compound and complex speck of matter less than the ~~width~~ of an inch in diameter, which constitutes the active material of each small reproductive particle. This is one way in which the properties of the spermatozoon may be accounted for. Nor is it beyond the power of the imagination to picture the orderly arrangement and rearrangement of such vast hosts of potential molecules as is supposed. No confusion, no jostling of one another, no struggling would be seen, for each molecule takes its appointed place, in obedience to its own properties, knowing of course the position it is to occupy in the complex ranks at each different period of its life's progress, and, never ambitious of discharging a higher function than that which it is destined to fulfil, performs the important office of transmitting certain peculiarities, important or trivial, useful or useless, from the existing to a new being.

^{*} In NATURE for May 1st, Mr. Francis Galton very properly remarks that the term Mr. Darwin should have employed is “dispersion” not “diffusion,” and there are other critical remarks which appear to me equally just.

We may be led from the consideration of the broad facts nature to conceptions of the most abstract kind, without being conscious of the slightest gap between the facts of Science and the creations of the Imagination. In these days the utmost skill is often displayed in hiding and ignoring or denying the hiatus by which the arguments deduced from the results of observation and experiment are separated from those which are based upon the fictions of the fancy. But, unhappily, the gulf cannot be filled up, or bridged over. It may be obscured by mists and clouds, but, though it be lost for a time, it is sure to be rediscovered and its limits studied by the curious and unphilosophical.

Nowadays analogical argument is employed very freely without any attempt to show, in the first place, that there is any real analogy between the facts upon which the reasoning is based. In order to convince people that a hypothetical gemmule may move long distances through all sorts of tissues, it is only necessary to show that actual matter, millions of times as large, does burrow a short distance through certain textures. Mr. Darwin remarks that it cannot be objected "that the gemmules could not pass through tissues or cell-walls, for the contents of each pollen grain have to pass through the coats both of the pollen tube and embryonic sack."

He might have advanced in his support the fact of fungi traversing tissues, of entozoa of various kinds burrowing long distances through the textures of the living body, and many well-known instances of a similar kind. But such facts do not strengthen the hypothesis of Pangenesis in the slightest degree. They were known before it was advanced, and the objection controverted has not been raised in the form indicated. We know that a thing infinitely larger than the hypothetical gemmule does pass through tissues, but do the gemmules really exist, and do they pass through? Certainly, if they exist, they may pass, but, as I have indicated, there are other matters invalidating the hypothesis besides the question of the gemmules traversing the tissues. Pangenetic gemmules might pass everywhere. They might leave the body, collect in the atmosphere and coalesce, and the compound particle formed might easily wriggle itself back again into the organism through the chinks between the cuticular cells. Such gemmules might move anywhere, up and down and in and out through any cell wall. They might pervade solids and fluids and gases. The pangenetic gemmule cannot be seen or tested, neither can its presence or absence be proved in any way. The phenomena adduced by Mr. Darwin in support of his hypothesis can be demonstrated; but the pangenetic gemmules are of the imagination alone, and the analogy between the actual facts and the supposed facts is surely but an analogy of the imagination. The facts alluded to no more support the pangenetic hypothesis than does the demonstration of living germs in the air support the hypothesis of life in the blue sky. It is possible to supply many arguments stronger than those adduced in support of the hypothesis, nay, perhaps, stronger than any Mr. Darwin himself has yet advanced in favour of Pangenesis; but yet other considerations appear to me greatly to preponderate against the acceptance of the doctrine. Mr. Darwin admits that "from presenting so many vulnerable points" the life of his hypothesis "is always in jeopardy;" but is it not this very jeopardy which lends interest and enchantment to many a hypothesis, and sustains it in the estimation of those who delight in conjectural information and scientific speculation?

LIONEL S. BEALE

MR. DARWIN, in his letter to NATURE of April the 27th, says: "The fundamental laws of growth, reproduction, inheritance, &c., are so closely similar throughout the whole organic kingdom that the means by which the gemmules (assuming for the moment their existence) are diffused through the body, would probably be the same in all beings, therefore the means can hardly be diffusion through the blood." Now, if in the vegetable kingdom pangenetic gemmules are able freely to be "diffused" from cell to cell by endosmosis, we should expect that in the case of grafts, where certainly such diffusion goes on between the cells of the stock and the scion, a bud borne upon the graft would certainly be affected by the gemmules arising in the root and stem of the stock. Yet we all know that the pips from a pear grafted on a quince stock will not give rise to a hybrid between a pear and a quince, neither will the stone of a peach which has been grafted on a plum stock grow into a tree whose stock bears plums, while the extremities of its branches bear peaches.

A. C. RANFORD

Noises at Sea off Greytown

IN NATURE, vol. ii. p. 25, Mr. Dennehy gave an interesting account of a peculiar vibration, accompanied by sound, which is perceivable at night on board all (?) iron steamers which anchor off Greytown, Central America; and in subsequent pages I have read with great interest various speculations as to its origin, which is ascribed (1, the probable solution) to troops of Scienoids (with reservation) by Mr. Kingsley (p. 46); (2) to musical fish or shells, by Messrs. Evans and Lindsay (pp. 46 and 356); and (3) to gas-escape from vegetable mud and sand, by Mr. Malet (p. 47); whilst Mr. Dennehy himself suggests the possibility of some galvanic agency.

I remarked upon this vibratory phenomenon in a communication published in the *Field* newspaper of October 26th, 1867, signed "Ubique," after having heard it myself when on board the Royal Mail steamer *Danube* (Capt. Reeks) during the nights of the 12th, 13th, 14th, and 15th of May, 1867; the new moon occurring on the 4th of the same month. As my statement serves to confirm Mr. Dennehy's report, I may be forgiven for giving it in full.

After giving an account of the sudden appearance of a huge white shark in the deep sea when a man fell overboard, I proceeded to state as follows:—"On embarking on board the *Danube* steamer, lying at anchor in the roadstead off Greytown on the 12th May, 1867, I was informed that the ship was haunted by most curious noises at night since she had arrived, and that the superstitious black sailors were much frightened at what they thought must be a ghost. The captain and officers could make nothing of it, and it afforded a great matter for discussion. On inquiry I found out that other iron ships had been similarly affected. Curiously enough this noise was only heard at night, and at certain hours. Some attributed it to fish, suckers, turtle, &c., others to the change of tide or current; but no satisfactory conclusion could be arrived at. When night came on there was no mistake about the noise; it was quite loud enough to awaken me, and could be heard distinctly all over the ship. It was not dissimilar to the high monotone of an Æolian harp, and the noise was evidently caused by the vibration of the plates of the iron hull, which could be sensibly perceived to vibrate. What caused this peculiar vibration? Not the change of current and tide, because, if so, it would be heard by day. Like everything else that we cannot explain, I suppose we must put it down to electricity, magnetism, &c. If this should meet the eye of any of the officers of the above-mentioned steamer, or others who have noticed this phenomenon, I should be glad to hear whether this effect still continues, or if any satisfactory conclusion has yet been arrived at. I may add that from the hold of the vessel the grunts of the toad-fish could be distinctly heard. I hope that the above notice may lead to some answers from your various correspondents."

This brief notice drew forth a rejoinder from a correspondent (November 23, 1867) who had noticed a somewhat similar sound.

"The singular sound noticed by 'Ubique,' I have also heard without knowing its origin. One moonlight night in 1854, on board a steamer anchored near the Tavoy river (Tenasserim) we were struck by an extraordinary noise which appeared to proceed from the shore about a quarter of a mile off, or from the water in that direction. It was something like the sound of a stocking loom, but shriller, and lasted perhaps five or six seconds, producing a sensible concussion on the ear like the piercing scream of the cicada; and this gave an impression as if the vessel itself were trembling, or reverberating from the sound. One or two Burmans on board said simply, the noise was produced by 'fishes,' but of what kind they did not describe. It was repeated two or three times. I never heard it before or after the occasion referred to, nor have I ever met with any allusion to this singular phenomenon until I perused 'Ubique's' communication in the *Field* of the 26th ult. The steamer in my case, I should add, was a wooden one."

Mr. Evans, in his letter, speaks of the rapid silting up of Greytown harbour this still continues, and the passage over the bar, which is continually shifting, is often a matter of great difficulty, and indeed often so dangerous that the Royal Mail Company will not undertake to allow their own boats to land, and passengers have to land in the local canoes at their own risk. The Nicaraguan Government, however, propose to carry out Mr. Shepherd's plan of diverting the waters of the San Juan river from the Colorado mouth to the Greytown channel, hoping thereby to scour the harbour clear.