researches of Mr. Murray, Dr. H. R. Mill, and others, that all these necessary correlations actually existed, although hitherto some of them had been looked upon as mere curious and inexplicable coincidences.

But if the fold or wave rules in the arrangement of the forms of the earth-surface of the present day, it must of necessity rule also in corresponding planetary surfaces, both in space and time; and the author gave it as his opinion that it afforded an equally natural and plausible explanation of cycles, systems, and transgressions of the geological formations, and of the surface (for example) of the planet Mars.

The final conclusion which the author drew from a consideration of the known facts and phenomena was, that the wave or fold appeared to be the natural unit of classification of all the grander forms of the earth-surface. The recognisable surface undulations of the present earth-surface are, broadly speaking, the surfaces of corresponding waves or warpings of the outer parts of the earth-crust, in part obliterated by erosion, &c., and in part masked by deposition. In the crust-wave, its divisions, modifications, combinations, and intersections, we seem to find the key to the dissymmetries, the harmonies, the contrasts, and even the supposed anomalies of the surface features of the globe. Upon the surface of the earth, the crust-deformation expressible in terms of this unit seems to be the paramount factor. Denudation, deposition, earthquake movement, volcanicity, and even the surface forms and distributions of the main land and water areas, appear to be all subordinated to this ruling element. As the minor undulations stand related to the major undulations as subordinates, it is probable that not the slightest local change can be brought about without disturbing to that extent the balance of parts, and so leading to a readjustment of the equilibrium of the whole. The fold theory, however, affords us merely a natural and convenient means of classification of surface form, and in the meantime does not concern itself with the mode of origin of these forms. It is a theory, not of causes, but of the most natural grouping of effects.

SCIENTIFIC SERIALS.

American Journal of Science, April.—Further studies of the drainage features of the Upper Ohio basin, by T. C. Chamberlin and Frank Leverett. The general view adopted is that of Carll, according to whom the present drainage system of the Upper Ohio basin has been formed by the union of several pre-glacial systems that formerly flowed into what is now the Lake Erie basin. These were blocked up by the ice of the earlier glacial period, which invaded their lower courses and forced them to flow over low divides and unite to form a common south-westward flowing system nearly parallel to the border of the ice. The evidence for reversals and displacements of river beds is given in detail, and four hypotheses are presented to account for them. They all greatly emphasise the importance of the first glacial epoch, and indicate that, while the last glacial invasion was very much more pronounced in its apparent effects, it was, after all, much the smaller factor in the glacial period.—An apparatus to show, simultaneously to several hearers, the blending of the sensations of interrupted tones, by Alfred M. Mayer. A short brass tube is cemented in a hole in the bottom of a glass flask. When the tube is closed the flask resounds powerfully to a tuning-fork of suitable pitch vibrating near its mouth. When the tube is open the resonance is very feeble. The opening and closing is effected by a perforated disc rotating in contact with the brass tube. At a certain velocity the interrupted sounds blend into the sound of the tuning-fork, the velocity giving an indication of the amount of residual sensation.—The appendages of the pygidium of *Triarthrus*, by Charles E. Beecher. Further studies of the Yale Museum specimens have enabled the author to make out the main characteristics of the appendages of the caudal shield. At the pygidium, the endopodites preserve the slender, jointed, distal portion found at the thorax, but the proximal part is composed of segments which are considerably expanded transversely, thus making a paddle-like organ, the anterior edge of which is straight, while the posterior one is serrated by the projecting points of the expanded segments. These points bear small bundles of setæ. The specimens from which these details are gathered are very perfectly preserved. The author proposes next to describe the structure of the under side of the head, and then to review the present enlarged knowledge of *Triarthrus*, with its bearings upon the position and affinities of the Trilobites generally.

Bulletin de l'Académie Royale de Belgique, No. 2.—The sense and the period of the Eulerian movement, by F. Folie. The sense of the Eulerian movement of the pole of inertia round the instantaneous pole is direct; that of the movement of the instantaneous pole at the surface of the earth is retrograde. The period of the latter is 321 days; for an integral number of years, a direct and somewhat slower motion may be substituted for this, giving the commonly accepted period of 423 days. But the shorter period is free from the geometrical objections attached to the latter.—The influence of pressure upon specific heat, taken below and above the critical temperature, by P. de Heen. The law governing this influence is analogous to that determining the relation between pressure and compressibility. Little variable at first, the specific heat rises with increasing pressure up to a certain limit, and then diminishes.—On the phenomenon of beats in luminous vibrations, by Dr. J. Verschaffelt. Prof. Righi showed in 1878 that if two rays are brought to interference whose periods are only slightly different, fringes are obtained which move with such velocity that a number equal to the difference of frequency passes each point of the screen in one second. Righi realised this practically by means of a rotating Nicoll prism and Fresnel's mirror. The principle applied by Dr. Verschaffelt is that of Doppler, according to which a motion of the source with respect to the ether changes the wave-length of the light emitted. The retardation was produced by a moving wedge of quartz cut parallel to its axis, and placed at 45° between the crossed Nicolls of a polarising microscope.—On absorption by the bile ducts, by Célestin Tobias. Ligature of the thoracic canal suppresses absorption of acids and biliary pigments, as pointed out by Harley. But it does not affect that of sodium ferrocyanide, of strychnine, or of atropine at the surface of the bile ducts. Sodium iodide is not absorbed at all. Whether the absorption is lymphatic or sanguine depends upon the nature of the substance.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, April 13.—Prof. A. W. Rücker, F.R.S., President, in the chair.—The President invited discussion on Prof. Henrici's paper on calculating machines, and said a description of Mr. Sharp's harmonic analyser, giving direct readings of the amplitude and epoch of the various constituent simple harmonic terms, had been sent in. This machine requires no adjustments to be made before using. The amplitude is given by the length of a line joining the initial and final positions of the point of contact of a roller with a rotating disc, whilst the epoch is determined by the angle which this line makes with the plane of the roller in its initial position.—Prof. Perry congratulated Prof. Henrici on the success attained with his analysers. Referring to planimeters, he said the average error made in working out indicator diagrams with Hine and Robertson's instrument was only about one-third that made with Amsler's. After pointing out the great importance of Fourier's series to practical men, and especially to electrical engineers, he said that in studying reciprocating motions, such as those of pistons, valve gears, &c., it was most useful to resolve the motion into its fundamental harmonic motions and its overtones. In this way remarkable differences could be seen between various motions which have the same fundamental, and which are usually considered equivalent. In the *Electrician* of February 5, 1892, he had published the numerical work for a given periodic curve developed in Fourier's series, and he now exhibited a graphical solution done by one of his students, who was probably the first to carry out the late Prof. Clifford's idea of wrapping the curve round a cylinder and projecting it on different planes. Prof. Henrici had, he said, based the construction of his first analyser on Clifford's method, but used the Henrici principle (viz. $\int y \sin\theta\, d\theta = \int \cos\theta\, dy$, when integrated over a complete period) to explain the later machines. As a matter of fact the first machine in which the coefficients were determined by an Amsler planimeter carried by a reciprocating tangent plane, was a beautiful example of the Henrici principle, and he, Prof. Perry, saw far greater possibilities before it. The defects in the first instrument were mechanical ones, and could be got over by in-

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