of limits, of being much more direct, and not exposed to any attack, even specious. Instead of analysing the idea of continuity he studies two successive states of a continuous function; and continuity only comes in so far as that the difference between these two states may become as small as we choose without ever becoming *nil*, as seems to be the case in limits; or infinitely little, in the old signification of the word, a signification simply absurd."

We simply name, in conclusion, the following zoological lists, which make up the greater part of the volume:—Monography of the Malabrides, by M. de Marseul; Synopsis of the Scolytides, by M. Chapuis; and new or little known Araneides from the South of Europe, by M. Simon.

SCIENTIFIC SERIALS

Zeitschrift für Ethnologie (1873). The fifth number of the journal for last year is of less than average importance to English readers, since the principal article—a most valuable and comprehensive one on the descriptive ethnology of Bengal—is a translation of Colonel Dalton's digest of the official reports drawn up by the different Commissioners of the province, and published at the cost of the Indian Government. This work, which supplies information that can nowhere else be found in regard to the tribes occupying the Brahmaputra and Gangetic valleys, must henceforth be considered as indispensable to every student of Indian ethnology, and the editors of the *Zeitschrift* have done good service in making it known to their readers. In an article on a proposed improvement in the methods of craniometry now in use, Dr. Jhering passes in review the difference in the values of the indices, proposed by Blumenbach, Retzius, Broca, and others, for the definition of Dolichocephalic and Brachycephalic types. His three main propositions are briefly these:—1. All cranial measurements must be projected in a line that is parallel or vertical to the horizontal base of the cranium. 2. The most important maximum and minimum dimensions should be obtained *per se*, and without reference to distances from definite anatomical points. 3. For all parts not in the medial plane, the percentage of lengths and heights must be given at the points where such parts intersect these diameters. Dr. Jhering thinks that it is time finally to set aside the theory transmitted from Blumenbach, and through Retzius to the present day, that every race possesses at once a special language, and a special type of cranium. According to his view it is never possible to determine with certainty from the form of the skull the precise race from which an individual has sprung, and in his opinion the problems which ought to engage the attention of future students of craniology are the determination of the *mean* cranial type of each race; and the definition of the limits within which each special type varies among different races. Finally the author wishes to show that craniology is not competent to determine questions of race, but is merely to be accepted as an auxiliary science to anthropology. The learned missionary, Th. Jellinghaus, to whom we are already indebted for many valuable contributions to our knowledge of the languages spoken by the outlying tribes of our vast empire in India, gives in this number a short account of the language of the Munda Kohls of Chota Nagpore. The peculiarities of their tongue seem to be a distinct dual for all three persons: the formation of the plural and dual by the addition of an abbreviated form of the third personal pronoun; the insertion of the letter *p* with the vocal accent for the formation of the plural and dual of certain nouns and adjectives; the interpellation of the letter *n* in the root-syllable of the verb to form the abstract noun. The units of the Munda Kohls' numeral system are 10 and 20. The author describes these people as kind and simple in their social relations with one another. Herr Virchow draws attention to a specimen of a synostolic cranium as the form has been figured and described by J. B. Davis in his work on "Synostolic Crania among Aboriginal Races of Man" (Haarlem, 1865). As this skull belonged to a rachitic child, and similar skulls, in which the calvaria was entirely obliterated, and the cranial bones were thickened outwardly, are preserved in the Berlin and other Pathologico-Anatomical collections, and were taken from rachitic subjects, Herr Virchow considers that such forms must be held to be quite independent of ethnological peculiarities, and that their occurrence amongst savage or aboriginal races must be ascribed to the frequent presence amonst them of rachitism—a fact to which Pruner-Bey has already drawn attention. We canno close our notice of the contents of this number without mentioning an interesting communication by Dr. Brehm in regard to his experience—based on an eight years' acquaintance—of the habits of the Chimpanzee under confinement. The last individual which fell under his notice, and which died at the age of four from pulmonary disease, showed, in many respects, an aptitude of comprehension, a docility and a capability of practising the ordinary usages of daily life which made the animal an interesting and wholly unobjectionable inmate of Dr. Virchow's house, where he ran about with little more surveillance than would have been awarded to a human child of the same age. The result of the learned author's experience of this, and other individuals of the race is, that although not human, there is *very much* of the element of humanity in the Chimpanzee.

Poggendorff's Annalen der Physik und Chemie, No. 9, 1873.—This number commences with a theoretical examination, by the editor, of the action of Holtz's electrical machines of the "second" kind, those being meant which have two discs rotating in opposite directions, whereas in the "first," and more common kind, one disc rotates while the other is stationary. The author's view is, not that there is suction, by the conductors, of the electricities expanded in the insulators, as commonly supposed, but conversely, that electricities separated in the conductors, through induction, stream over to the insulators. In this way, both modes of excitation, by induction and by inflow (*Einströmung*), are explained on one principle. The same holds good for machines of the first kind.—M. Julius Thomsen continues his "Thermo-chemical Researches," investigating here the action of four agents of reduction, and seven of oxidation.—Dr. Müller describes a new tangent galvanometer and rheostat, free from the disadvantages of not being equally available for currents of all degrees of intensity, and of waste of time in use. The galvanometer differs from ordinary ones in the arrangements for reading and deadening; and, in the rheocord, to neutralise heating effects with strong currents, the wires are surrounded by distilled water.—There are four papers referring to the "horizontal pendulum;" in two of which M. Zöllner describes the instrument as he constructs and uses it, giving several observations made with it, which indicate its great sensitiveness. In a third paper he represents that the idea was first conceived by Lorenz Hengler, a writer in "Dingler's Polytechnisches Journal" in 1832; while in a fourth note on the subject, Prof. Safarik produces evidence of the same fact, and also shows that the bold idea of demonstrating the variations of gravity and of cosmic attractions by terrestrial observations in one place, had already been expressed and experimented on by Gruithuisen, some fifty-two years before Zöllner, viz., in 1817.—M. von Bezold communicates the first part of a valuable paper on the law of colour mixtures, and the physiological primary colours; and Prof. Clausius discusses a new mechanical proposition with reference to stationary motions.—In a note translated from the Italian, the question is considered by Prof. Roiti, Is the electric current an ether current? He argued that if this were the case, then the velocity of propagation of light in a body traversed by a galvanic current must be altered by the direction of this current. In his experiments he caused rays from two parallel slits to pass through two cell-divisions, respectively, of a rectangular glass vessel containing sulphate of zinc solution (the thickness of the dividing wall being equal to the interval between the slits). Interference fringes were obtained at the exit of the rays. Four electrodes being inserted, so that a current passed in opposite directions in the two cells, this had no effect in displacement of the fringes. M. Roiti concludes that if the galvanic current were an ether current, it must have a very small velocity, less than 200 metres per second, which does not agree with the phenomena of galvanic electricity.—Prof. Mach's paper on the stroboscopic determination of the pitch of tones, deserves the attention of musicians and others.

Der Naturforscher, Nov. 1873.—Among the botanical notes in this number is one on the age and mode of growth of woody plants in Greenland. M. Kraus finds that these plants often attain great age (150 years, *e.g.* in the case of some willows), but that the annual increase of thickness is extremely small, 1·5 mm. at the maximum.—Some experiments described by M. Godlewski prove that formation of starch in chlorophyll granules is not possible without access of CO_2; that the liberation of starch from these granules may occur in bright light; that we cannot, from absence of starch, infer there is no process of assimilation; and that the cause of change of form in etiolated plants does not

lie in the suppression of the assimilative process. Mr. Sorby's observations on the colour of plants are also given.—In physics and chemistry, we have an account of experiments by M. Meyer as to the influence of access of air on alcoholic fermentation, MM. Favre and Valson's researches on work done in saline solutions, those of M. Edlund on the electromotive and thermoelectric forces of metallic alloys with copper, those of MM. Mach and Fischer on reflection and refraction of sound, Prof. Maxwell's lecture on molecules, and other papers.—In a physiological paper, entitled "The internal mechanics of nerves," some additional light is thrown by M. Bernstein on the electrotonic state investigated by Pflüger, and a hypothesis is offered, to account for the phenomena. There are also biological papers on the apparatuses for production of sound in insects, and on the deep-sea fauna of the Swiss lakes.—We further note an interesting lecture by M. Sandberger, on a portion of the geological history of the *Oberrheinthal*; and a quantity of valuable information in the *Kleinere Mittheilungen*.

Journal of the Franklin Institute, Dec. 1873.—In this number are given two reports of the Committee on the mode of determining the horse-power of steam boilers. A division of opinion is indicated, a minority in the Committee holding, that the horse-power of boilers for stationary engines is properly defined as the capability to evaporate a cubic foot of water per hour from and at the temperature of 212° F. and there is no reason for modifying its normal value; while the majority (4 against 3), consider, that, in view of variations of capacity of the same boiler under varied conditions, the discontinuance of the term horse-power, as descriptive of the size and capacity of the boiler, is advisable; purchasers and makers should, instead, describe fully and in accurate terms, the evaporative capacity of boilers poposed, and the conditions under which they are worked and tested. Considerations are urged in support of each of these views.—Mr. Richards continues his "Principles of shop manipulation, for engineering apprentices;" this part treating chiefly of the various kinds of motive machinery.—A paper read by Mr. Ransome before the Franklin Institute gives an account of the improvements which he has introduced into the manufacture of artificial stone.—We also find notes on a new hydraulic railway car-brake, by Mr. Henderson, and on the stability of towers and chimneys, by Mr. Evans.—Among the "Items and Novelties" reference is made to some important results obtained by Prof. Thurston, from experiments at the Stevens Institute of Technology, as to the behaviour of metals under stress. The following deduction was repeatedly confirmed:—Metal strained so far as to take a permanent set, and left under the stress producing it, gains in power of resistance up to a limit of time, which in these experiments was about seventy-two hours, and to a limit of increase which has a value, in the best iron, of about 20 per cent., where the applied force is 80 per cent. of the ultimate breaking force.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, Jan. 8.—Dr. Hirst, F.R.S., president, in the chair.—Mr. J. W. L. Glaisher read a paper on the transformation of continued products into continued fractions. The paper had its origin in a remarkable continued fraction for π given by Prof. Sylvester in the Philosophical Transactions for 1869, viz.:—

$$\frac{\pi}{2} = 1 + \cfrac{1}{1 + \cfrac{1\cdot 2}{1 + \cfrac{2\cdot 3}{1 + \cfrac{3\cdot 4}{1 + \cfrac{4\cdot 5}{1 + \&c.}}}}}$$

which is there shown to be equivalent to Wallis's formulæ—

$$\frac{\pi}{2} = \frac{2\cdot 2\cdot 4\cdot 4\cdot 6\cdot 6\cdot 8\cdot 8\cdot \ldots}{1\cdot 3\cdot 3\cdot 5\cdot 5\cdot 7\cdot 7\cdot 9\cdot \ldots}$$

Prof. Sylvester arrived at his result by means of a complete solution he had previously found of the equation of finite differences

$$U_{x+1} = \frac{U_x}{x} + U_{x-1}$$

(a "shaving" as the discoverer remarked from his method of "reducible cyclodes") whereas the present paper arrives at the result by a direct transformation.—Prof. Clifford spoke upon the foundations of the differential calculus and of dynamics. The points dwelt upon were—all continuous quantity is expressed by lines, therefore every fluxion is really velocity or the method of fluxions and the beginning of kinematic is the same; he then dwelt upon Newton's definition of tangents and Hankel's remark, and pointed out the necessity of a modification of the definition, traced out certain analogies to the methods of Euclid and Archimedes (definition of fourth proportional and of area), and closed his remarks with a proof of the composition of velocities.—The secretary read a note from Prof. Crofton on a method of treating the kinematical question of the most general displacement of a solid in space.—Mr. Perigal made a few remarks on the subject of link trammels (in connection with Prof. Sylvester's recent paper), in the course of which he stated that Peaucillier's lozenge-trammel is a modified reproduction of Jopling's "double cranks" trammel, invented about 1822. The statement was impugned by Prof. Sylvester and Mr. S. Roberts.—The following papers were taken as read:—On Hamilton's characteristic function for a narrow beam of light, by Prof. J. Clerk-Maxwell.—Preliminary account of investigations on the free motion of a solid in elliptic space, by Prof. Clifford.

Geological Society, Jan. 7.—Prof. Ramsay, V.P.R.S., Vice-President, in the chair. The following communications were read:—1. "The Origin of some of the Lake-basins of Cumberland."—First Paper. By J. Clifton Ward, F.G.S. After referring to the fact that the question of the origin of lake-basins cannot be satisfactorily discussed unless the depth of the lakes and the heights of the mountains are brought before the mind's eye in their natural proportions, the author sketched out the physical geography of the lakes under discussion (Derwentwater, Bassenthwaite, Buttermere, Crummock, and Loweswater), and pointed out what must have been their original size and shape before they were filled up to the extent they now are. These lakes were not moraine-dammed, but true rock-basins. The belief that the present Lake-district scenery was the result of the sculpturing of atmospheric powers, such as we see now in operation, varied by climatal changes and changes in the height of the district above the sea, was enforced, and the opinion given that the work of elaboration of the lake-country scenery has been going on ever since Carboniferous or pre-Carboniferous times. When all the evidence was considered—the fact of the lake-hollows under examination being but long shallow troughs, the thickness of the ice which moved along the valleys in which the lakes now lie, the agreement of the deepest parts of the lakes with the points at which, from the confluence of several ice-streams and the narrowing of the valley, the onward pressure of the ice must have been greatest,—the conclusion was arrived at that Prof. Ramsay's theory was fully supported by these cases, and that the immediate cause of the present lake-basins was the onward movement of the old glaciers, ploughing up their beds to this slight depth.—2. "On the Traces of a Great Ice-sheet in the Southern part of the Lake-district and in North Wales." By D. Mackintosh, F.G.S. In this paper the author brought forward the evidence which seems to him to establish the existence in the southern part of the Lake-district of a "valley-ignoring and ridge-concealing ice-sheet." He gave a table of the direction of ice-marks observed by him in the Lake-district, and stated that about Windermere and Ambleside the general direction is nearly N.N.W., round Grasmere between N.W. and N.N.W., north-west and west of Grasmere in upland valleys and on high ridges about N. 30° W., south of Grasmere and in Great Langdale N. 35° W., and in the Coniston district a little W. of N. In many places he recognised an uphill march of the ice. The author also referred to the glaciation of North Wales, some of the marks of which, observed by him in a district south of Snowdon, seemed to him to indicate the southerly movement of a great ice-sheet capable of ignoring or crossing deep valleys.—3. Notes on some Lamellibranchs from the Budleigh-Salterton Pebbles. By Arthur Wyatt Edgell, F.G.S.

Linnean Society, Jan. 15.—Mr. George Bentham, F.R.S., in the chair.—Dr. Hooker, Pres. R.S., exhibited a very beautiful series of specimens of Fossil Copal, the product of *Trachylobium Hornemannianum*, some specimens of Recent Copal from the same plant, and some fruits of a *Momordica*, all fowarded from Zanzibar, by Dr. Kirk, F.L.S., for the Kew Museum.—Before proceeding to the regular business of the Society, the president again read, and explained the purport of, the alterations in the Bye-laws agreed to by the Council. The