

at Liverpool, under the direction of Captain Denham, R.N.; and twelve months' observations made at Bristol, by Mr. Bunt, by means of his tide-gauge. According to the theory of the tides, the height of the surface of the water at a given place will increase as the sine, while the time increases as the arc. Hence if the time be made the abscissa, and the height the ordinate, the curve representing one tide would be the *figure of signs*. The author on making the comparison of the empirical curve of the rise and fall of the water, deduced from observation, with this theoretical curve, finds a general agreement between them; subject to certain deviations, consisting principally in the empirical curve indicating that both the rise and the fall are not symmetrical, like the theoretical curve, in consequence of the fall being generally more rapid than the rise, and thus occasioning a displacement of the summit of the curve towards that branch of it which corresponds to the fall.

9. Researches in Embryology. Third Series.—Additional Observations. By Martin Barry, M.D., F.R.S.

Having in the paper to which the present is supplementary made known the fact that the germinal spot in the mammiferous ovum resolves itself into cells, with which the germinal vesicle becomes filled, the author has since directed his attention to the corresponding parts in the ova of birds, batrachian reptiles, and osseous fishes, which he finds to be the seat of precisely the same changes. The numerous spots in the germinal vesicle of batrachian reptiles and osseous fishes are no other than the nuclei of cells. The cells themselves, from their transparency, are at first not easily discerned, and appear to have hitherto escaped notice; but after the observer has become aware of their presence, they are, in many instances, seen to be arranged in the same manner, and to present the same interior themselves as the corresponding cells in the ovum of mammalia.

In the representations given by Professor Rudolph Wagner, the discoverer of the germinal spot, the author recognizes evidence of the same changes in ova throughout the animal kingdom. He confirms and explains the observations of R. Wagner, that in the ova of certain animals an originally single spot divides into many, and that in the ova of other animals the number of spots increases as the ovum ripens. But he expresses also the opinion that in all ova there is originally but a single spot, this being the nucleus of the germinal vesicle or cell.

The analogy between the ova of mammalia and the animal above-mentioned, extends also to the substance surrounding the germinal vesicle, which consists of nucleated cells.

10. Description of a Calculating Machine invented by Mr. Thomas Fowler, of Torrington in Devonshire. By Augustus De Morgan, Esq. Communicated by F. Baily, Esq., V.P.R.S.

The arithmetical operations performed by the machine are those of multiplication and division; the factors and product in the former case, and the quotient, dividend and divisor in the latter, being

expressed in digits of the ternary scale of notation, every digit being either -1 , 0 , or $+1$. In this system, unity being, in multiplication, only an index, the rules for multiplication and division must consist entirely in directions for the management of the signs of unity; and it is on this principle that Mr. Fowler's machine is made to act. A short account is given of the principal parts of the machine, and of the mode in which they bring out the final results. It is necessary, however, in applying it to use, to have recourse to tables, both for converting the factors and reconvertng the result; operations which introduce both labour and risk of error.

11. On the Minute Structure and Movements of Voluntary Muscles, in a letter addressed to R. B. Todd, M.D., F.R.S., &c. By William Bowman, Esq., Demonstrator of Anatomy in King's College, London, and Assistant Surgeon to King's College Hospital. Communicated by Dr. Todd.

The objects of the author, in this paper, are the following.—1st. To confirm, under some modifications, the view taken of the primitive fasciculi of voluntary muscles being composed of a solid bundle of fibrillæ. 2dly. To describe new parts entering into their composition: and 3dly. To detail new observations on the mechanism of voluntary motion.

He first shows that the primitive fasciculi are not cylindrical, but polygonal threads; their sides being more or less flattened where they are in contact with one another; he next records, in a tabular form, the results of his examination of their size in the different divisions of the animal kingdom. It appears that the largest are met with in fish; they are smaller in reptiles, and their size continues to diminish in insects, in mammalia, and lastly, in birds, where they are the smallest of all. In all these instances, however, an extensive range of size is observable, not only in different species, but in the same animal, and even in the same muscle. He then shows that all the fibrillæ into which a primitive fasciculus may be split, are marked by alternate dark and light points, and that fibrillæ of this description exist throughout the whole thickness of the fasciculus; that the apposition of the segments of contiguous fibrillæ, so marked, must form transverse striæ, and that such transverse striæ do in fact exist throughout the whole interior of the fasciculus. He next inquires into the form of the segments composing the fibrillæ, and shows that their longitudinal adhesion constitutes *fibrille*, and their lateral adhesion *discs*, or plates, transverse to the length of the fasciculus; each disc being, therefore, composed of a single segment from every one of the fibrillæ. He shows that these discs always exist quite as unequivocally as the fibrillæ, and gives several examples and figures of a natural cleavage of the fasciculus into such discs. It follows that the transverse striæ are the edges, or focal sections of these discs. Several varieties in the striæ are then detailed, and the fact noticed that in all animals there is frequently more or less diversity in the number of striæ in a given space, not only on contiguous fasciculi, but also on the same fasciculus at different parts.