accurately, in the fossa rhomboidea, or fourth ventricle, which is remarkable for being of greater proportionate size early in development, and afterwards undergoing retrogression. At an early stage we only need to conceive a slit to be made in the nerve tube at the bottom of the fossa rhomboidea, in order to furnish a suitable passage into the alimentary canal. His first reason for regarding the vertebrate mouth as a modern structure is that it arises so extraordinarily late in development. The embryonic body is almost completely framed, all the great systems are established, the circulation is in active operation, while as yet there is no mouth. Again, the mouth does not arise in the position in which it permanently remains in the great majority. It undergoes considerable shifting forwards. Only in the Selachians and Ganoids does it retain its primitive situation. Moreover, the study of development is steadily tending to establish the idea that the mouth of Vertebrates is homodynamous with the gill-clefts. It is limited, like them, by a pair of arches, lies just in front of the first pair of gill-clefts, arises simultaneously with them in the embryo, and opens into the alimentary canal. A glance at the ventral surface of a Ray shows the likeness of the mouth to a pair of coalesced gill-clefts. Consequently, it becomes probable that the present mouth-opening once existed and functioned as a gill-cleft; that at a certain period in the ascending development, both the old and the new mouths supplied nourishment, that the latter gained the predominance, and that finally the old mouth became aborted.

The next problem attacked is the origin of the gill-clefts. A very elaborate account is given of the supposed process by which the external gills and segmental organs of Annelids were metamorphosed into the gills and gill-clefts of Vertebrates and the skeletal elements connected with them. The great difficulty which Dr. Dohrn confesses in this matter is the connection of the inner extremities of the segmental organs with the wall of the alimentary canal. But if this be granted it is comparatively easy to understand how the shortening and widening of the segmental organs might give rise to gill-cavities such as those of the Selachians. The process by which Dr. Dohrn conceives that the limbs of Vertebrata might have been developed from two pairs of gills in Annelids is a great evidence of ingenuity, though it is to be expected that it will be viewed rather incredulously.

It follows from the view of the origin of Vertebrates thus expounded that Amphioxus loses much of its interest, for there is no place for Amphioxus among Annelids, nor among the primordial Vertebrates; it lacks almost all that they possess. Yet nothing can be gained by excluding Amphioxus from the Vertebrates; for it is so connected with the Cyclostome fishes that it cannot be placed at any great distance from them; while on the other hand it is so related to Ascidiens, that the latter must be included among the Vertebrata.

Dr. Dohrn then proceeds with a long argument to show that the Cyclostome fishes are degenerate from a higher type of fishes, and that Amphioxus is a result of still further degeneration. He shows how their mode of life necessitates many of the modifications they have undergone; and that the diversities of the details of structure in Cyclostomes are inconsistent with their being viewed as representing stages in upward development. Finally, the larva of Ascidiens is represented as a degenerate fish—a degenerate Cyclostome possibly—which carries to the extreme all the departures of the latter from the fish-type. The most important element in this degeneration results from the fact that Ascidiens, instead of being attached to fishes or to any objects from which they can derive nutriment, are fixed to stones, plants, &c., or to such parts of animals (cephalothorax of crabs, tubes of tubicolous annelids) as do not afford them nourishment. Consequently they have lost the old mouth in the organ of attachment, homologous with that of all Vertebrates, and

have developed a new one, homologous with the nasal passage of *Myxine*. Thus we can explain the astonishing fact that the mouth-opening of the Ascidian-larva has a communication with the fore-wall of the so-called cerebral vesicle. It is the last vestige of the openings in the nasal sacs by which the olfactory nerves entered.

The most patent objection to Dr. Dohrn's view about Amphioxus is that it fails to account for the development of a many-segmented respiratory apparatus as a degeneration from a higher animal with a small number of gill-arches. It would appear far more reasonable to suppose Amphioxus to be a degeneration from a much lower elevation than the Cyclostome type, viz., from some stage where the respiratory apparatus retained the multi-serial character derived from its Annelid forefathers.

The keynote of the author's reasonings is to be found in the principle of Transformation of Function (*Funktions-wechsel*), on which he lays great stress. He states it as follows:—The transformation of an organ happens through a succession of functions being discharged by one and the same organ. Each function is a resultant of several components, of which one constitutes the chief or primary function, while the others are lower or secondary functions. Diminution of the importance of the chief function with increase of the importance of a secondary function, alters the entire resultant function; the secondary gradually rises to be the chief function, the resultant function becomes different, and the consequence of the whole process is the transformation of the organ. This principle is considered to be a complete answer to the difficulty so strongly insisted on by Mr. Mivart, the incompetency of natural selection to account for the incipient stages of subsequently useful structures. Dr. Dohrn's statement of his principle does not strike us as very different from Mr. Darwin's ("Origin of Species," 5th edition, p. 251), though a little more definitely stated. Mr. Darwin says: "The same organ having performed simultaneously very different functions, and then having been in part or in whole specialised for one function; and two distinct organs having performed at the same time the same function, the one having been perfected whilst aided by the other, must often have largely facilitated transitions." The illustrations given by Dr. Dohrn of the steps by which the anterior extremities of Crustacea became applied to mastication, how the mouth of Vertebrates originated from a pair of gill-clefts, how the respiratory apparatus of Tunicates originated from that of Vertebrates, &c., are, however, exceedingly interesting.

An English translation of Dr. Dohrn's pamphlet could not fail to be serviceable to the large number of students who take an interest in the genealogical problems of morphology.

G. T. BETTANY

MAGNETIC OBSERVATIONS IN CHINA *

THE first annual report of the magnetic observations at this new observatory has just reached Europe, and it contains results of considerable interest to those engaged in the study of terrestrial magnetism.

The position of Zi-ka-wei is $31^{\circ} 12' 30''$ N., and 8h. 5m. 45s. E. of Greenwich, being rather less than four miles to the S.W. of Shang-Hai. The observatory is in possession of an excellent set of instruments for determining the absolute values of the magnetic elements, procured by the kind assistance of the Director of Kew Observatory, and a set of self-recording magnetographs by Adie, verified at Kew, have just been erected in a suitable building. The observer, the Rev. M. Dechevrens, S.J., spent a considerable time at Stonyhurst Observatory previous to his departure for China, in order to make himself thoroughly acquainted with the methods of observation, and with the use of the instruments.

The observations in the report extend from April 1874 to March 1875, and furnish the following data for the epoch Oct. 1, 1874:—

* "Observatoire Météorologique et Magnétique de Zi-ka-wei." Chine, Magnétisme Terrestre, 1874-5.

Declination $1^{\circ} 54' 72''$ W.
 Dip $46^{\circ} 15'$
 Total Force 10.04850

The value of the declination is very reliable, as it depends on observations taken every half hour from 6 A.M. to 6 P.M. on four days each month in 1874, and on eight days a month in 1875. The dip results from six complete observations, and the horizontal component of the intensity was determined twice a month in 1874, and every week in 1875.

Previous dip observations at Shang-Hai, by Sir E. Home in 1843, and by Capt. Shadwell in 1858, give $-2'2''$ and $-3'4''$ as the secular variation for 1851 and 1862, the latter differing but slightly from the present variation in England.

Comparing the monthly means of the horizontal force for the winter and summer of 1874-75, we find an excess of 0.00074 in favour of the winter, when the sun is nearest the earth. The extreme variation is only 0.00577 , and both maximum and minimum occur in the summer months.

From a limited number of night observations it appears that the range of the declination needle is much more confined, whilst the sun is below the horizon than during the day hours. The diurnal variation is regular throughout the year, but the daily changes in winter are less simple than those of summer. The following are the mean results for the separate seasons:—

	Mean.	Min. at	Max. at
Spring	$1^{\circ} 50' 49''$	9 A.M. $1^{\circ} 47' 33''$	2 P.M. $1^{\circ} 54' 3''$
Summer	$1^{\circ} 49' 39''$	8 .. $1^{\circ} 45' 45''$	2 .. $1^{\circ} 53' 3''$
Autumn	$1^{\circ} 59' 35''$	9 .. $1^{\circ} 58' 9''$	1 .. $2^{\circ} 1' 10''$
Winter	$1^{\circ} 58' 51''$	9 .. $1^{\circ} 57' 32''$	1 .. $2^{\circ} 0' 5''$

The time of the principal minimum is more constant than that of the maximum, the latter being anticipated by one hour in winter.

A sudden change from $1^{\circ} 50' 13''$ on Sept. 21 to $1^{\circ} 56' 51''$ on Sept. 26, 1874, seems to require further confirmation (which it did not receive in 1875) before it can be considered as more than accidentally connected with the passage of the sun through the autumnal equinox.

The monthly mean value of the declination is greatest in November and least in June, and the absolute maximum and minimum were:—

$2^{\circ} 3' 49''$ at 11 h. 15 m. A.M. on November 8,
 and

$1^{\circ} 41' 58''$ at 9 A.M. on June 29.

giving a yearly range of only $21' 51''$, whilst the secular variation amounts to $+5' 85''$. The value on Nov. 8 was also evidently increased by some irregular disturbance.

The comparison of the yearly means for the different hours with the hourly means for each season, shows that the sun's position with regard to the equator has a decided effect on the magnetic declination, as increase and diminution in summer invariably correspond with diminution and increase in winter.

In discussing the hourly velocity of the needle, it is found that the acceleration is greatest between 10 and 11 A.M., when the magnet is near its mean position, and that the A.M. maximum velocity is an hour earlier, and the P.M. maximum an hour later in summer than in winter, the greatest velocity being about $1'' 5$ per minute.

The mean amplitude of the daily excursions of the declination magnet is $7' 88''$ in summer against $3' 68''$ in winter, June giving the maximum mean amplitude of $9' 06''$, and December the minimum of $2' 95''$. The value of $1' 92''$ in February appears to be exceptional. The greatest extent of a daily oscillation in the course of the twelve months was $11' 05''$ on June 1, and the least $1' 13''$ on Feb. 20, giving a maximum yearly variation of $9' 92''$.

The changes of the magnetic elements appear to be remarkably small throughout, and very free from irregular disturbances. The care with which the observations are taken, and the efficient way in which they are discussed, are an earnest of the plentiful harvest we have every reason to expect from this land once so famous, but hitherto so neglected by modern science.

Stonyhurst Observatory, April 13

S. J. PERRY

THE CHALLENGER EXPEDITION

WE have great pleasure in availing ourselves of the permission to publish the following correspondence which has passed through our hands, and in congratulating the staff of the *Challenger*, on having deserved so weighty

a testimonial of success. It is an additional assurance that their three years' labour has not been in vain, that so many distinguished men of science have been impelled to speak of it in such terms, as well as a guarantee to the British Government that they did a wise thing in equipping the expedition; we hope it will be an encouragement to the latter to continue to deserve such golden opinions.

To the Editor of "Nature"

Vienna, June 12, 1876

SIR,—After having followed the reports of the naturalists of H.M.S. *Challenger* with the utmost interest, we beg leave to ask you kindly to transmit this simple but sincere expression of a hearty welcome and of thankful admiration to these distinguished gentlemen, as well as to the officers and the crew of this gallant ship, which has been called to render such prominent services to science. Yours most respectfully,

EDW. SUSS, M. P. Prof. University,
 Vienna,
 C. CLAUS,
 G. TSCHERMAK,
 F. STEINDACHNER, Director of the
 Imper. Zoolog. Museum,
 Dr. FR. BRAUER, Custos of the
 Imper. Zoolog. Museum,
 E. V. MARENZELLER,
 Prof. Dr. J. HANN,
 F. KARRER,
 TH. FUCHS, Custos am k.k. Hof.
 Min. Cab.,
 PELZELN, Custos am k.k. Zoolog.
 Cabinete.

To this the following reply has been made by Sir C. Thomson:—

To the Editor of "Nature"

20, Palmerston Place, Edinburgh, June 23, 1876

My dear Sir,—I received your note and enclosure last evening. Will you allow me through you to express on my own part and on that of my colleagues Civilian and Naval on board the *Challenger*, our deep gratification at the kind way in which the leaders of Natural Science in Vienna have expressed their approval of our efforts to extend the limits of knowledge in Physical Geography?

We hope that the Empire, which by the most instructive voyage of the *Novara* immediately preceded us in a similar line of research, may be among the first to aid in filling up the rich details of the new zoological region of which we have been able hitherto to supply only an outline.

I am, my dear Sir, yours very faithfully,

C. WYVILLE THOMSON,
 Director of the Civilian Scientific Staff
 of the *Challenger* Expedition.

ABSTRACT REPORT TO "NATURE" ON EXPERIMENTATION ON ANIMALS FOR THE ADVANCE OF PRACTICAL MEDICINE¹

III.

Experimental Researches on Anæsthesia Local and General.

THE revival of methods for rendering surgical operations on men and animals perfectly painless, while it has been one of the greatest of the advances of modern medical art, has not been without its alloy. The present generation can scarcely appreciate what were the scenes of the operating theatre before the introduction of anæsthesia. The present generation that is not medical cannot appreciate now what is the scene at an operation when the agent employed to prevent pain proves an agent of death. One surgeon I know has been present at six of these fatal catastrophes under and from anæsthetics. Such an experience shakes the strongest heart. Here is a human being talking cheerfully and resigning himself with full confidence to his medical friends. The operation to be performed may be the act of seconds

¹ Continued from p. 152.