

referred to as taking place in a solar temple. Thus at Marduk's temple, E-Sagila we are told "two hours after nightfall the priest must come and take of the waters of the river, must enter into the presence of Bil, and putting on a stole in the presence of Bil must say this prayer," &c.¹ The temple then will have been probably oriented to the north.

Nor was this all; movements in relation to the ecliptic had been differentiated from movements in relation to the equator. We have inscriptions running:—

"The way in reference to Anu," that is the ecliptic with its pole at Anu.

"The way in reference to Bil," the equator with its pole at Bil.

In other words, the daily and yearly apparent movements of the heavenly bodies were clearly distinguished, while we note also

Kabal šami, "the middle of the Heavens" defining the meridian.

So far as I have been able to gather any myth like that of Hōrus involving combats between the sun and circumpolar star gods is entirely lacking, but a similar myth in relation to some of the ecliptic constellations is among the best known.

The Ecliptic Constellations.

I have already in previous articles pointed out that at On we seemed limited to Set as a stellar divinity; so soon as pyramid times are reached, however, this is changed.

I have given before the list of the gods of Heliopolis, and have shown that with the exception of Sit none are stellar. But we find in pyramid times the list is increased; only the sun gods Ra, Hōrus, Osiris, are common to the two. As new divinities we have²:—

Isis.
Hathor.
Nephtys.
Ptah.
Selkit.
Sokhit.

Of these the first two and the last two undoubtedly symbolised stars, and there can be no question that the temples of Isis built at the pyramids, Bubastis, Tanis, and elsewhere, were built to watch the rising of some of them.

The temple of Saïs, as I have said, had east and west walls, and so had Memphis, according to Lepsius. The form of Isis at Saïs was the goddess Neith, which, according to some authorities, was the precursor of Athene. The temple of Athene at Athens was oriented to the Pleiades.

There is also no question that the goddess Selk symbolised Antares.

We find ourselves then in the presence of the worship of the sun and stars in the constellations of the ecliptic in Egypt, in pyramid times, and in constellations connected with the Equinoxes; for if we are right above the Pleiades and Antares these are the stars which would herald the sunrise at the Vernal and Autumnal Equinox respectively, when the sun was in Taurus and Scorpion.

Now associated with the introduction of these new worships in pyramid times was the worship of the bull Apis.

The worship of Apis preceded the building of pyramids. Mini is credited by some authors with its introduction,³ but at any rate Kakau of the second dynasty issued proclamations regarding it,⁴ and a statue of Hapi was in the temple of Cheops.⁵

The first question which now arises is When were these constellations established in Babylonia? Is there any information?

¹ Sayce, p. 101.

³ Maspero, *op. cit.* p. 44. note.

⁵ Maspero, *op. cit.* p. 46.

² Maspero, *op. cit.* p. 64.

⁴ Maspero, *op. cit.* p. 64.

With regard to the constellations of the Bull and Scorpion, there does seem to be some information, and on this point in a subsequent article I shall have to refer at some length to Jensen's recent important book.¹

J. NORMAN LOCKYER.

(To be continued.)

*PUBLICATIONS OF THE ZOOLOGICAL STATION AT NAPLES.*²

DURING the winter of 1876, when the Zoological Station was already a fact in brick and mortar, and my late friend, Mr. Frank Balfour, had already shown by his famous work on the Elasmobranch Development how profitable its arrangements might turn out for the progress of research in morphology, I began to busy myself with the literary phase of my enterprise. From the very beginning it had been my intention to erect not merely a simple laboratory, in which a more or less long series of "Contributions to the knowledge" of all sorts of groups or problems ought to be worked out, but to create an organisation which by its own power and weight might influence the further progress and development of morphological science in the direction of greater concentration and by production of such scientific work as could hardly be taken up and still less carried through by individual effort alone. Of course the Zoological Station ought to have its own Journal, similar to the many Journals or Zeitschriften or Archives of other and perhaps less powerful institutions or societies, but I hoped to do more than that. If my ideas of, and confidence in, the future development of the Zoological Station were right, more important productions might be expected from it, and thus it became only a question of organisation and combination of means and ends to secure such a result. I had learned by almost daily experience how difficult, almost hopeless, it was to succeed with the specific determination of all the numberless organisms, worms, crustaceans, hydroids, tunicates, &c., &c., which our fishermen brought to light day by day. Even if the library of the Zoological Station at that time had been complete enough, it would have been almost impossible to ascertain the names of all these creatures, the descriptions and figures in former works being far too incomplete and too superficial to enable even specialists of all these groups to decide which name belonged to which animal. All attempts to form a well-determined collection of any group—not excluding even the larger crustaceans, echinoderms, and medusæ—failed, and sometimes to such a degree that my assistants and myself simply felt ourselves in the midst of chaos. This may sound strange to conchologists, ornithologists, and entomologists, who can rely on splendid monographs and innumerable synopsis and similar works for classification, but it is nevertheless a deplorable fact for the marine fauna of almost all the seas. And the want is greatly felt, for the marine organisms in by far the greater number of cases require not only an outside investigation by a simple magnifying glass, but microscopical examination of anatomy and development, both embryological and larval, to state definitely to which species they belong, the sexual difference being often so great as to have given occasion to create different genera and even groups for male and female of the same species, and the larval forms in many cases being so utterly unlike the adults that they have been classified in different orders! Tornaria is now known as the larva of *Balanoglossus*, whereas not long ago it was

¹ "Kosmologie der Babylonier," p. 315, *et seq.*

² "Systematik und Faunistik der Pelagischen Copepoda des Golfes von Neapel," von Wilh. Giesbrecht. XIX. "Monograph of the Fauna and Flora of the Gulf of Naples," published by the Naples Zoological Station, 1892, pp. 1-831, pl. 1-54.

supposed to belong to the Echinoderms. What can be more unlike each other than male and female of *Bonellia viridis*? How long did it take to ascertain the true relation of the so-called Hectocotylus to the Cephalopods? And only a few years ago a simple appendage of a well-known mollusc, Tethys, was described as a special genus by one of the most distinguished French zoologists. Such being the difficulties it can hardly be wondered at that, for instance, the same species of a Pycnogonid has had the honour of being described under nine specific and generic names, the greater part of them even by the same author, because he ignored that male and female differed, and that their larval stages again differed from each other and from the adult.

It was then that I planned the publication of a great series of monographs under the title "Fauna and Flora of the Gulf of Naples." Several of my assistants and myself set to work, each one selecting a group of lower marine animals. The main object of these monographs was to create a firm basis for systematical knowledge, but in the meantime I left everybody free to incorporate as much of anatomy, histology, and embryology as he thought convenient, thus giving greater variety to the monographs, and leaving the authors free to follow up those lines of research for which they had the greatest interest.

I wished to lay great stress upon illustrations. In looking over the existing iconography of the lower marine animals, and comparing them with those of terrestrial animals, the inferiority of existing illustrations of the former was apparent, and especially as regards the reproduction of the colouring of the living marine organisms. Colour in animals may have relatively little scientific interest compared with structure, nevertheless it has a meaning, and its good reproduction facilitates greatly the recognition of the species. Besides, practical reasons spoke very much in favour of good coloured illustrations as a means to facilitate the sale of the monographs, which were to be published on subscription, and as the safest way for covering the great expenses which were to be incurred.

I remember in this regard a conversation which I had with the great German publisher, Wilh. Engelmann, of Leipzig, to whom I offered the commission of all the publications of the Zoological Station. When discussing the project of the "Fauna and Flora" I asked his advice as to the number of copies to be printed, and proposed myself 500. Engelmann almost fainted when I pronounced that number. "My dear friend," exclaimed he, "you are going to ruin yourself! There is not the remotest possibility of such a number! Of such costly publications as you project hardly one hundred copies are sold, and if we print 150 copies, it will be more than enough." I remonstrated, and insisted on at least 300, and as I intended to pay all the expenses, Dr. Engelmann on his side kindly reducing the cost of commission to five per cent., I felt pretty safe, to find the necessary number of subscribers in the course of time—a confidence which was not in the least shared by Dr. Engelmann, who called me a Phantast, and a Utopian—denominations to which I had already become so much used that they made hardly any impression upon me. And I have only to regret that I did not insist on my first proposition, for the first volume of the "Fauna and Flora," the monograph on the Ctenophora by Prof. Chun, has been out of print for almost ten years, and single copies are sold at double the original price.

The secret of this success consisted largely in the magnificent plates which accompanied this and the following volumes. It is true that the high scientific standard of these monographs and the low rate of subscription for them caused their sale among all the more important libraries and universities, but the large number

of public and private libraries who subscribed to the "Fauna and Flora" did so partly out of sympathy for the Zoological Station, and partly out of enthusiasm for the splendid illustrations which accompany the greater part of the nineteen published volumes, and are executed in the most masterly way by the celebrated lithographic firm of Werner and Winter, at Frankfurt-on-Maine. In fact, it is not too much to say that the world-wide fame of this firm has partly been created by the first volume of the "Fauna and Flora of the Gulf of Naples," whose illustrations were all personally engraved by Mr. Winter himself.

It is doubtless true that the cost of production of these plates is very great; nevertheless, I may be permitted to state that the balance-sheet of the "Fauna and Flora" shows how justly I appreciated the chances when I began this large publication; and though since the last four or five years the number of subscribers has decreased, chiefly by death, the Zoological Station hopes, nevertheless, to continue the series of monographs in the same way for many years to come.

The volume which I have under review is a very fair specimen of the value of these plates, for I hardly say too much if I state my conviction that nowhere have illustrations of Copepoda been produced to rival those of Dr. Giesbrecht's volume. One can hardly look on the first five plates without wishing that some of these fantastical and splendid figures might find their way even beyond the range of scientific literature, and serve as decorative elements in art and industry, where birds, butterflies, and flowers already occupy such an enormous field.

Thirty years have elapsed since the appearance of Claus's well-known monograph of the free-living Copepoda. Many smaller, and even some larger works have been published in the interval, enlarging the field to such a degree that it seemed advisable to divide the whole group into several parts for a new monographical study. Dr. Giesbrecht selected the *pelagic* marine forms instead of the *littoral* ones, partly on account of their better qualification for anatomical and ontogenetical researches, partly because they are yet less known than the others, and lastly, because he thinks they include the more ancestral forms of the whole entomostracous crustaceans. The bulky volume lying before us forms only the first part of the monograph, treating the systematical and faunistical chapters. But as such it gives much more than its title announces, for not only have the pelagic Copepoda of the Gulf of Naples been examined, but the whole mass of forms resulting from the oceanic cruise of the *Vettor Pisani*, an Italian corvette, and captured and carefully preserved by Capt. Chierchia, so well known among biologists, are included in Giesbrecht's work. Altogether, this volume treats of 298 species of pelagic Copepoda; 125 belong to the fauna of the Gulf of Naples, whilst 229 have been captured by Capt. Chierchia all over the globe. If one compares the last number with that of the *Challenger* expedition, where only 85 species of Copepoda are reported, one can imagine with what industry Capt. Chierchia went to work, and how carefully Dr. Giesbrecht examined the material.

The descriptions of the author are extraordinarily detailed; nevertheless he obviates great bulkiness and repetition, having introduced abbreviations for homological parts of the body and the extremities, which are also adopted on the plates. Moreover, the single species are not described one after the other, as is usually the case, but those belonging to the same genus are treated as a whole, their differences being treated in a diagnosis and by the help of synoptical lists (pp. 706-766) and indication of the plates where their specific characteristics are figured, the determina-

tion is greatly facilitated. As to nomenclature and synonymy, Giesbrecht is very rigorous in favour of priority, thus restoring even many older names to species described by Claus. A complete list of all described species, with complete indication of bibliography, is to be found on pages 676-705. The 54 plates contain 2300 figures, drawn masterly from nature by the author himself, and the first five plates, as mentioned above, give an idea of the variety of colour and form of appendages which exists even among these small marine organisms.

The systematical views and arrangements of Giesbrecht differ considerably from those of former authors. It is well known that the near relationship of the parasitical with the free-living Copepoda has been recognised already by H. Milne-Edwards; but it was Zenker who established systematically the two great groups of *Natantia* or *Gnathostomata*, and *Parasita* or *Siphonostomata*, a division which hitherto has been universally accepted. Giesbrecht points out the difficulties with which this division meets when one considers natural affinities, and thinks it impossible to adopt the manifold varieties of the construction of the oral appendages as a fundamental basis for classification. He proposes to divide the whole class into two great groups—the *Gymnoplea* and the *Podoplea*. The *Gymnoplea* are to be recognised by the following characteristics:—(1) chief body division occurring between the segment of the 5th foot-pair and the genital segment; (2) abdomen without rudiments of feet; (3) 5th foot-pair of the male transformed to an organ of copulation, genital organs asymmetrical; (4) heart in most cases present; (5) female carrying rarely ovisacs; (6) extremities plentifully articulated and provided with appendages. On the other hand, the *Pleopoda* are distinguished by (1) chief body division before the fifth pair of feet; (2) this latter rudimentary never serving as copulation organ; (3) male genital openings symmetrical; (4) heart always wanting; (5) female carrying always one or two ovisacs; (6) extremities rather scarcely provided with articulations and appendages. The great group of the *Gymnoplea* is further divided into two tribes—the *Amphaskandria* (male with symmetrical antennæ: family *Calanidæ*) and the *Heterarthrandria* (male on one side with prehensile antenna: families *Centropagidæ*, *Candatidæ*, *Pontellidæ*); to the family *Centropagidæ* are to be numbered all the *Gymnoplea* of fresh water. The description of the group of the *Podoplea* only takes up a small portion of the present monograph; therefore our author does not enter into a more detailed discussion of its classification, especially as not only all the littoral forms but most likely all the parasites belong to this group; he divides the group into two tribes—the *Ampharthrandria* (first pair of antennæ of the male symmetrical prehensile organs: families *Misophriidæ*, *Mormonillidæ*, *Cyclopidæ*, *Harpacticidæ*, *Monstrillidæ*) and the *Isokerandria* (antennæ of the male similar to those of the female; genital openings of the female dorsally situated: families *Ontæidæ*, *Corycæidæ*).

The rich harvest of pelagic Copepoda made by Capt. Chierchia on the three years' expedition of the Italian corvette, *Vettor Pisani*, enabled our author not only to describe a great number of new or incompletely characterised species of former authors, especially Dana's, but it gave him the possibility of explaining his views on the geographical distribution of the group, which we will only sketch with a few words, since a larger discussion of these views is impossible on account of the necessity to enter on the general conditions of pelagic life. According to Dr. Giesbrecht there are three great districts in the distribution of the pelagic Copepoda: two arctic ones, north and south, whose boundaries are at 47° N. and 44° S., and the intermediate one. The number of species belonging to this latter one is by far the greatest, almost

85 per cent. of all known species, whilst the north Arctic contains 5½ per cent., the south Arctic 1¾ per cent. The faunistic differences between these three districts are greater than those of the three oceans; nevertheless there occur also in the Atlantic and in the Pacific species peculiar to each of them, especially in their northern parts. Pelagic Copepoda occur down to a depth of 4000 metres, and it seems that the boundaries of the above-named three districts stretch even down to these depths. Some species seem to live in very different depths, others exclusively near the surface; whether there are such that live exclusively in greater depths has not as yet been established. The character of the fauna depending more on latitude than on longitude it seems the determining causes of their geographical distribution must depend chiefly on physical agents such as light and temperature, but since the abyssal forms in the tropical parts of the Pacific are not identical with those of the northern and southern seas, which live on the same conditions of light and temperature, the difference in the three faunistic districts must be explained in part by still other causes. The distribution of other holopelagic animals seems to be identical with those of the Copepoda. According to Giesbrecht one seems to be justified in attributing the causes of the daily vertical wandering of pelagic animals to the influence of light, whilst the annual wanderings depend on temperature; besides these periodical wanderings some pelagic Copepoda seem to exist as eggs in greater depths and go slowly to the surface after their Nauplius stage.

I refrain from entering here into any greater details of the 831 large quarto pages of the volume lying before me, expressing only the hope that Dr. Giesbrecht may soon be able to publish his anatomical and embryological researches on the same group in a second volume. But as editor of the "Fauna and Flora," I may be permitted to congratulate the Zoological Station and science in general on the production of this volume, which answers fully to the programme of the whole series of monographs.

I may be permitted to state here that another big volume, treating of the *Gammaridæ* of the Gulf of Naples, and prepared by Prof. Della Valle, of the University of Modena, will soon follow the Copepoda of Giesbrecht, and will examine in a complete way these interesting crustaceans, including their embryology and anatomy. Splendid plates accompany also the work of Della Valle, and will give perhaps for the first time the varied and remarkable natural colouring of these creatures, generally only figured in outline and diagram by former authors.

After Della Valle's monograph a large, highly interesting, and most complete monograph of the *Enteropneusta* (*Balanoglossus*), by Prof. Spengel (Giessen), will be published. Most likely both these volumes will appear this year. A very large work on the *Cephalopods* by Dr. Tatta is in preparation, and its first volume, containing the classification and grosser anatomy, accompanied by most splendid plates, is nearly ready. A monograph by Dr. Bürger of Göttingen, treating the *Nemertean*s, is ready in MSS., and the *Ostracods*, by Dr. W. Müller, of Greifswald, are in the press; the *Hirudinea* by Prof. Apathy, of Klausenburg, have been in hand for five years, a botanical monograph treating the *Rhodomelææ*, by Prof. Falckenburg, of Rostock, is near completion; Prof. Ludwig will contribute several volumes on the *Echinoderms*, of which most marvellous drawings by the artist of the Zoological Station, Mr. Micoliano, have been prepared, and several other authors are engaged on other groups.

Some years ago a discussion took place at the British Association, whether it would be right to continue the grant for a table, and it was questioned whether the Zoological Station at Naples was really destined for research and not rather an educational institution; if it were necessary to strengthen the arguments in favour of the first statement, I think the enumeration of the monographs of the

"Fauna and Flora of the Gulf of Naples," either already published (Dr. Giesbrecht's monograph is the nineteenth volume published) or in preparation may convince also those who may still be doubtful in this regard.

Later, and in another article, I may be permitted to discuss some questions regarding another great publication of the Zoological Station, the *Zoologischer Jahresbericht*, a discussion which will touch some of the most vital questions of scientific organisation.

ANTON DOHRN.

BRITISH ASSOCIATION, NOTTINGHAM MEETING.

FURTHER information has been forwarded since the last issue of NATURE from Presidents and Recorders of Sections, of which the following statement is a summary:—

In Section B the following papers are promised, in addition to those already mentioned:—"The Action of Permanganate on Sulphites and Thiosulphates," by G. E. Brown and W. W. J. Nicol; "The Relation existing between Chromium and Certain Organic Acids, and some New Chromoxalates," and on "The Action of Phosphorus Pentachloride on Urethanes," by Emil A. Werner; "The Occurrence of Cyanonitride of Titanium in Ferromanganese," by T. W. Hogg; "Hydrogen Flame-cap Measurements, and the Adaptation of the Hydrogen-flame to the Miners' Safety-lamp," by Prof. Frank Clowes. A general statement of the arrangement of work in this Section appeared in last week's NATURE. The only probable alteration is the shifting of M. Moissan's demonstration to Friday, September 15, and of the Bacteriological discussion to Monday, 18.

An interesting paper is promised to Section E by Mr. Cope Whitehouse, a distinguished American citizen of New York and Cairo.

The presidential address in Section F, on "The Reaction in favour of the Classical Political Economy" will be mainly inspired by the idea that the principles and methods of the classical and orthodox economists have only been modified and supplemented, not displaced, by recent writers; and that both theoretically and practically there are signs of a reaction in favour of the older doctrines as against socialism.

The probable arrangement of work in Section H is as follows:—On Thursday, September 14, the President's address will be delivered, and a few papers on physical anthropology will be read. On Friday, 15, Dr. Hans Hildebrand, Royal Antiquary of Sweden, will read his paper on "Anglo-Saxon Remains, and the Coeval Ones in Scandinavia," and this will be followed by archaeological papers. On Monday, 18, various papers will be taken. On Tuesday, 19, Dr. Munro will describe "The Structure of Lake Dwellings," and Mr. Arthur Bulleid will give an account of "The Recently Discovered Lake or Marsh Village near Glastonbury."

Papers which have not been already mentioned in Section H are—"Anthropometric Work in Schools," by Prof. Windle; "The Prehistoric Evolution of the Theories of Punishment, Revenge and Atonement," by Rev. G. Hartwell Jones; "Pin-wells and Rag-bushes," by Mr. Hartland; and "The Tribes of the Congo," by Mr. Herbert Ward.

The Local Secretaries wish to announce that the local programme and the list of hotels and lodgings are ready for issue, and may be obtained by application at the British Association Office, Guildhall, Nottingham, until September 9; after that, application should be made at the Reception Room, Mechanics' Institution. It may also be stated that the local committee has engaged the Theatre Royal for Wednesday night, September 20, when Mr. Wilson Barrett's Company will give the new

play "Pharaoh." It is hoped that members will avail themselves of the invitation extended to them for this entertainment, and that it will induce them to remain in Nottingham, and take advantage of the excursions arranged for the following day. Other items worthy of mention are a special concert, which will be given by the Nottingham Sacred Harmonic Society on the Saturday night; and a garden-party, given by Mr. J. W. Leavers, in whose grounds some of the old rock-dwellings of Nottingham are to be seen. Geologists and naturalists will be interested to know that amongst the special local literature will be a little book entitled "Contributions to the Geology and Natural History of Nottinghamshire," which has been edited by Mr. J. W. Carr, M.A., with the assistance of local specialists. FRANK CLOWES.

SCIENCE IN THE MAGAZINES.

SCIENCE makes a poor show in the September magazines. There are, however, one or two important articles which claim attention. In the *Contemporary Review* Prof. A. Weismann writes on "The All-Sufficiency of Natural Selection," his essay being an answer to two articles by Mr. Herbert Spencer directed against Prof. Weismann's views on heredity and natural selection. The essay is not merely controversial, but also a clear explanation of Weismannism. The following is the concluding paragraph:—

I hold it to be demonstrated that all hereditary adaptation rests on natural selection, and that natural selection is the one great principle that enables organisms to conform, to a certain high degree, to their varying conditions, by constructing new adaptations out of old ones. It is not merely an accessory principle, which only comes into operation when the assumed transmission of functional variations fails; but it is the chief principle in the variation of organisms, and compared to it, the primary variation which is due to the direct action of external influences on the germ-plasm, is of very secondary importance. For, as I previously said, the organism is composed of adaptations, some of which are of recent date, some are older, some very old; but the influence of primary variations on the physiognomy of species has been slight and of subordinate importance. Therefore I hold the discovery of natural selection to be one of the most fundamental ever made in the field of biology, and one that is alone sufficient to immortalise the names of Charles Darwin and Alfred Wallace. When my opponents set me down as an ultra-Darwinist, who takes a one-sided and exaggerated view of the principle discovered by the great naturalist, perhaps that may make an impression on some of the timid souls who always act on the supposition that the *juste-milieu* is proper; but it seems to me that it is never possible to say *a priori* how far-reaching a principle of explanation is: it must be tried first; and to have made such a trial has been my offence or my merit. Only very gradually have I learned the full scope of the principle of selection; and certainly I have been led beyond Darwin's conclusions. Progress in science usually involves a struggle against deep-rooted prejudices: such was the belief in the transmission of acquired characters; and it is only now that it has fortunately been overcome that the full significance of natural selection can be discerned. Now, for the first time, consummation of the principle is possible; and so my work has not been to exaggerate, but to complete.

Two articles of scientific interest appear in the *Fortnightly Review*. One, by Mr. W. Bevan Lewis, on "The Origin of Crime," deals with drunkenness, insanity, epilepsy, and similar affections in their mutual relationship to crime; in the second, entitled "The Climbing of High Mountains," Mr. W. M. Conway enthusiastically supports mountaineering in unexplored regions. Ordinary official surveys do not supply the detailed information with regard to buttress and fold in which resides the clue of mountain structure. It is for mountaineers to make up the deficiency.