

considering that the various types of insects are descended from ancestors more or less resembling the genus *Campodea*, with a body divided into head, thorax, and abdomen; the head provided with mouth-parts, eyes, and one pair of antennæ, the thorax with three pairs of legs, and the abdomen, in all probability, with caudal appendages.

If these views are correct, the genus *Campodea* must be regarded as a form of remarkable interest, since it is the living representative of a primæval type from which not only the *Collembola* and *Thysanura*, but the other great orders of insects have derived their origin.

This ancient type may possibly have been derived from a less highly developed one, resembling the modern *Tardigrades*, a (Fig. 56) smaller and much less highly organised being than *Campodea*, which has been successively placed among the *Acari* and the *Rotatoria*. It possesses two eyes, three anterior pairs of legs, and one at the posterior end of the body, giving it a curious resemblance to some *Lepidopterous* larvæ.

These legs, however, as it will be seen, are reduced to mere projections. But for them, the *Tardigrada* would closely resemble the vermiform larva so common among insects. Among the *Coleoptera*, for instance, the vermiform type occurs in the weevils; among *Hymenoptera* in the Bees and Ants; among *Diptera* it is general. Among *Trichoptera* the larva early acquires the three pairs of legs, but as Zaddach has shown,* there is a stage, though it is quickly passed through, in which the divisions of the body are indicated, but no trace of legs is yet present. Indeed, there appear to be reasons for considering that while among *Crustacea* the appendages appear before the segments, in *Insects* the segments precede the appendages, although this stage of development is very transitory, and apparently, in some cases, altogether suppressed. I say "apparently," because I am not yet satisfied that it will not eventually be found to occur in all cases. Zaddach, in his careful observations of the embryology of *Phryganea*, only once found a specimen in this stage, which also, according to the researches of Huxley,† seems to be little more than indicated in *Aphis*. It is therefore possible that in other cases, when no such stage has been observed, it is not really absent, but, from its transitoriness, has hitherto escaped attention.

Fritz Müller has expressed the opinion ‡ that this vermiform type is of comparatively recent origin; he says, "the ancient insects approached more nearly to the existing *Orthoptera*, and perhaps to the wingless *Blattidæ*, than to any other order, and the complete metamorphosis of the *Beetles*, *Lepidoptera*, &c. is of later origin." "There were," he adds, "perfect insects before larvæ and pupæ." This opinion has been adopted by Mr. Packard § in his "Embryological Studies on Hexapodous Insects."

M. Brauer|| also considers that the vermiform larva is a more recent type than the *Hexapod* form, and is to be regarded not as a developmental form, but as an adaptational modification of the earlier active *hexapod* type. In proof of this he quotes the case of *Sitaris*.

Considering, however, the peculiar habits of this genus, to which I have already referred, and that the vermiform type is altogether lower in organisation and less differentiated than the *Campodea* form, I cannot but regard this case as exceptional; as one in which the development has been, so to say, "falsified" by the struggle for existence, to use an expression of Fritz Müller's, and which therefore does not truly indicate the successive stages of evolution. On the contrary, the facts seem to me to point to the conclusion that, though the grublike larvæ of *Colcoptera*, and

some other insects, owe their present form mainly to the influence of external circumstances, and partially also to atavism, still the *Campodea* type is itself derived from earlier vermiform ancestors. Nicolas Wagner has shown in the case of a small gnat, allied to *Cecidomyia*, that even now, in some instances, the vermiform larvæ retain the power of reproduction. Such a larva (as, for instance, Fig. 57) very closely resembles some of the *Rotatoria*, such, for instance, as *Albertia* or *Notomata*; these differ generally in possessing vibratile cilia. There is, however, one genus—*Lindia* (Fig. 58)—in which these ciliæ are altogether absent, and which, though resembling *Macrobiosus* in many respects, differs from that genus in being entirely destitute of legs. I have never met with it myself, but it is described by Dujardin, who found it in a ditch near Paris, as oblong, vermiform, divided into rings, and terminating posteriorly in two short conical appendages. The jaws are not unlike those of the larvæ of *Flies*, and indeed many naturalists meeting with such a creature would, I am sure, regard it as a small *Dipterous* larva; yet Dujardin figures a specimen containing an egg, and seems to have no doubt that it is a mature form.*

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(To be continued.)

AMERICAN SCIENTIFIC EXPEDITIONS †

THE present year will be pre-eminently characterised in the history of the United States by the number of scientific expeditions, thoroughly equipped in every respect, and fitted out for exploration in various regions of the great West; and although most of them have been already referred to in our columns, it may be well to recapitulate them in geographical order. The most northerly is the International Northern Boundary Commission, which is intended to survey the line of the forty-ninth parallel, from the Lake of the Woods to the crest of the Rocky Mountains. The survey of the eastern section of the northern boundary of the United States was completed many years ago by Colonel J. D. Graham and others, and that of the western section, from the Pacific coast to the Rocky Mountains, was brought to a close in 1860. The middle section, as was the western, is in charge of Archibald Campbell, Esq., of Washington, as commissioner, with Major Twining as chief engineer officer on the part of the United States. Dr. Elliott Coues, of the army, the well-known naturalist, accompanies the expedition in that capacity, and the work will be done in connection with a large party, equally well equipped, detailed by the British Government.

The labour of this Commission was begun in 1872, consisting in the examination of the line from the Lake of Woods to Pembina, this village being the starting-point for the present year.

The next expedition is that along the line of the Northern Pacific Railway, and will consist of a body of about 2,000 troops, under the immediate command of Colonel D. N. Stanley. This will concentrate at Fort Abraham Lincoln, on the Missouri, now representing the western terminus of the Northern Pacific Railway, and its route will be westward toward and across the Yellow Stone River. This large force is intended to keep the Indians in check, and prevent any interferences on their part with the location and construction parties of the railway. In view of the fact that this expedition passes through a rich but little-known country, abounding in objects of natural history and zoology, the president of the National Academy of Sciences memorialised the Secretary of War in reference to the appointment of a

* Unters. ub. die Entwickl. und der Bau der Gliedertiere, p. 73

† Linnean Transactions, v. xxii.

‡ Facts for Darwin, trans. by Dallas, p. 118.

§ Mem. Peabody Academy of Science, v. I. No. 3.

|| Wien. Zool. Bot. Gesells. 1869, p. 310.

* See also the descriptions given by Dujardin (Ann. des Sci. Nat. 1851, v. xv.) and Claparède (Anat. and Entwickl. der Wirbellosen Thiere) of the interesting genus *Echinoderes*, which these two eminent naturalists unite in regarding as intermediate between the *Amphelides* and the *Crustacea*.

† Communicated by the Scientific Editor of *Harpur's Weekly*.

corps of scientific men to accompany it; and this communication being favourably received, a number of gentlemen were duly commissioned. Some of these, however, subsequently found themselves unable to carry out their intention; but finally an organisation was completed, with Mr. J. A. Allen, of Cambridge, as zoologist; Dr. Lionel R. Nettle, of New York, as mineralogist and geologist; Mr. William Pywell, of Washington, as photographer; Mr. Edward Konopicky, of Cambridge, as zoological and landscape artist; and Mr. C. W. Bennett as general assistant. These gentlemen have been commended especially to the kind attentions of General Sheridan and Colonel Stanley, and will receive every facility possible for carrying on their work.

The next expedition is that of Prof. F. V. Hayden, who continues the work upon which he has been engaged for so many years. His starting-point is Denver, and the region to be explored lies south of the fortieth parallel of latitude, and extending from Green River on the west to the eastern base of the Rocky Mountains. He expects to occupy several successive years in proceeding toward the Mexican boundary. The expedition has been divided into several parties, each with its commander. The general topographical and surveying work is under the direction of Mr. James T. Gardner, so well known in connection with Mr. Clarence King's explorations. Some of the specialists accompanying the expedition are Dr. F. M. Endlich and Mr. Marvin as geologists, and Mr. J. H. Batty as zoologist.

The next survey in the geographical order of arrangement is that of Lieutenant George M. Wheeler, in continuation of the labours of several preceding years. This expedition will be divided into four main field parties, one of which will be again subdivided, and includes four astronomical and triangulation parties. Party No. 1, under charge of Lieutenant Wheeler himself, will operate in portions of New Mexico and Arizona, and will be accompanied by Mr. G. K. Gilbert as chief geologist, and Dr. Oscar Loew as assistant geologist. Party No. 2, under Lieutenant Hoxie, will be accompanied by Mr. E. E. Howell as geologist, and Mr. H. W. Henshaw as naturalist. This party will move from Salt Lake to Camp Wingate, passing through portions of New Mexico and Arizona. The third party, under Lieutenant William L. Marshall, with Prof. J. J. Stevenson as geologist and mineralogist, and Dr. J. L. Rothrock as medical officer and naturalist, will move south-west from Denver through to Wingate, and explore also a portion of New Mexico and Arizona.

The fourth, or triangulation party, will start from Santa Fé, and carry a system of triangulation west to the meridian of Fort Wingate, and thence south to the Mexican border. The first astronomical party will be stationed at Salt Lake, with Mr. J. H. Clarke as observer; the second will be on the Denver and Santa Fé line, Dr. F. Kampf, observer; the third will be on the Union Pacific and the Central Pacific Railroad lines, with William W. Maryatt as observer; and the fourth party at Ogden, with Prof. H. B. Herr as observer. Here an observatory will be constructed for receiving signals from communicating stations, with a view of establishing differences of longitude.

The expedition of Major J. W. Powell on the Colorado River, in Utah, comes next in order, this gentleman being now occupied in finishing his work and preparing his report in compliance with the Act of Congress. Major Powell had been several years in this region, and has already constructed a map of wonderful interest and great accuracy. In connection with his work he has made a very large ethnological collection relating to the Piute Indians.

The explorations of Mr. Clarence King, who has been engaged for several years in the survey of the line of the fortieth parallel, will, it is understood, be completed during

the present season by reviewing some portions of the route already traversed.

The engineer expedition under Captain Jones will also proceed from Cheyenne along the Wind River Mountains to some point on the Upper Missouri, and will be accompanied by Dr. Parry, the well-known botanist. It is also understood that a large Government party will start from Fort Ellis and proceed eastward, and form part of the Yellowstone expedition already referred to.

The exploration of Alaska will also be prosecuted in behalf of the Coast Survey by Mr. William H. Dall, who has already proceeded to the Aleutian Islands, with a view of preparing a proper chart of the same, and especially of selecting a suitable landing-place for the proposed Pacific Ocean cable. The labours of Mr. Henry W. Elliott and Captain Bryant in the islands of St. Paul and St. George, in Behring Sea, will, it is hoped, be as productive as in 1872.

Nearly all the parties referred to, while, of course, prepared for prosecuting the topographical, geographical, and astronomical service, are accompanied by competent geologists, botanists, and zoologists, and there is reason to believe that the amount of material which will be transmitted by them to the National Museum will exceed in magnitude and value that of any previous year since its establishment in 1857.

NOTES

AT a meeting of the Geographical Society on Monday evening, Sir Bartle Frere, who was in the chair, intimated that the Queen had been graciously pleased to grant a pension of 300*l.* a year to Dr. Livingstone. We are glad to see that the daily press is becoming alive to the scandal of putting off with such a paltry gift a man who has spent his life in the disinterested service of his country and of humanity: he has surely *earned* something more handsome. Sir Bartle Frere read a letter from Dr. Kirk, which stated that the East Coast Expedition was getting on well, and that its members were in good health. Dr. Dillon and Lieutenant Cameron had succeeded in traversing the wet country, and were now engaged in collecting porters on the inland side of the river. Lieutenant Murphy and Mr. Moffat were understood to be following. His arrival had done much for the assistance of the expedition. No further news had of late been received of the expedition, a circumstance regarded by Dr. Kirk in a favourable sense. A letter from Lieutenant Grandy, from the Western Expedition, was then read. In this communication the writer, in giving an account of the progress of the expedition, stated that the men were all well, and that the climate was deliciously cool.

THERE will be an Election to Five Scholarships at Jesus College, Oxford, on Tuesday, October 14. The annual value of the Scholarships is 80*l.*, and they are tenable to the close of the twentieth term from the Scholar's matriculation. Candidates must not on the day of election be full twenty-four years old. One of these Scholarships is an Open Scholarship. It will be given according to proficiency in Physical Science, combined with the Classical attainments required by the University. The Examination for this will commence on Tuesday, October 7, and it will be held at Magdalen College in company with that for a Magdalen Demyship and a Merton Post-Mastership. Papers will be set in Chemistry, Physics, and Biology; and an opportunity will be given of showing a knowledge of practical work in Chemistry and Biology. Candidates for this Scholarship, if not otherwise admitted to the Examination, are requested to call on the Principal of Jesus College, on Monday, Oct. 6; and if so admitted, to call upon him on any day in the same week, and to bring with them certificates of age and of past good conduct.