and are provided with enormously long spines, many times the length of the body, which effectually prevent their being swallowed by small animals. The development of the spinous protection would seem to be correlated with the absence of a swimming-tail. Some species (Pinnotheres, Tatuira) which do not possess any of these spines show a tendency toward a modification of the telson, which has in these cases become quite broad and flat.

We may assume, then, that at one time the decapods, or the stem from which they arose, universally possessed a larval stage somewhat similar to the form known as a protozoea. As the struggle for existence became more and more severe among the Crustacea, modifications arose which took two directions. The adults became changed; and there arose in this way the different types which we know as Anomura, Brachyura, and Macrura. But at the same time natural selection had its influence upon the free larvae quite independent of its influence upon the adult. The larvae, therefore, also became slowly modified for their own protection; and from the protozoea arose the zoea types, with their infinite variety. It is quite evident that these changes may take place in the larvae without materially affecting the adult, for the circumstances bringing them about influence the larvae alone. Still it is probable that habits and form of the adult may have some influence upon the general shape of the larvae. The larva must eventually transform itself into the adult; and the more nearly it approaches the adult form, the less radical will be the change. We can therefore understand why the zoea of the walking animal, such as the crab, would develop protective apparatus, while the zoea of the rapidly-swimming Macrura would acquire organs of flight. We have therefore an explanation of the two facts, that the larvae of the greater groups exhibit a certain unity, while within a given genus the different species may widely vary. H. W. CONN.

THE EXPLOSIONS ON THE UNDERGROUND RAILWAYS OF LONDON.

THE explosion of Feb. 25, at the Victoria station, London, lends interest to the official report of Col. Majendie, on the results of an investigation of the circumstances attending the explosion near the Praed Street station, on the 30th of October last, and the one between Charing Cross and Westminster stations. The first explosion occurred in a tunnel about a hundred and thirty-eight feet distant from the station, as the 7.52 P.M. train was passing. The damage in the tunnel consisted of a vertical crater in the wall about twelve by thirteen inches, and four to six inches deep. Immediately below this crater, and extending about fifteen inches along the wall, was a horizontal crater about six inches deep, partly in the ballast, and partly in the brick footing of the tunnel. The flinty ballast in this crater was considerably splintered, and the brick footing pulverized. A two-inch iron gas-pipe ran along the wall at a height of ten inches. A length of this, measuring fourteen feet, was blown away, one end being much torn and twisted, and the whole piece bent into the form of a bow. At a distance of fifteen inches from the wall, and parallel with it, was an iron switch-rod, consisting of an inch and a quarter gas-pipe, supported on iron rollers at the level of the rails, from which it was distant two feet nine inches, the rollers being fixed on a wooden plank laid on the ballast. This board had about four feet of its length blown to splinters, and a large piece thrown upon the rail, and some of the wheels of the train passed over it. A length of the switch-rod measuring about two feet, and corresponding exactly with the portion of the gas-pipe which sustained the maximum injury, was blown out, the central part of this detached portion being split up and torn. This piece of switch-rod also bore marks of the wheels upon it. A telegraph cable, running along the wall at the height of eight feet and a half, was cut by the explosion. The walls of the tunnel were scored somewhat by the sharp *débris* blown against them, and the end of a sleeper opposite the crater, but partially protected by the ballast in which it was embedded, had a number of pieces of splintered stone driven deeply into it. The rails were entirely uninjured.

The injury to the passing train was confined principally to the last two carriages of the six composing the train. In these the greater part of the glass was broken into small fragments. Panels and partitions were shattered, the roofs and floors disturbed, the foot-boards broken, and the carriages seemed to be completely wrecked, yet no part of the framing or running-gear was injured. The gas throughout the train was extinguished, yet the apparatus was found to be uninjured. It is interesting to note, that the injury to the train was not confined to the side upon which the explosion took place, but extended also to the opposite side; and in the case of one carriage the damage was most marked on that side. Sixty-two persons were injured by cuts and contusions from the pieces of glass and *débris*, and, in one or two cases, by fracture of the drum of the ear and by severe shocks. Five of the injured were confined in the hospital for a considerable time. The breaking of the glass and putting out of the gas occurred on the surface, at the openings of the tunnel, for a distance of three hundred and fifty feet.

The second explosion, which occurred almost simultaneously with the first, took place at a point two hundred and forty-one yards from Charing Cross, and four hundred and eighty-eight yards from Westminster. As it occurred opposite a bay, the only damage done was the breaking of glass, and the extinction of the gas in both stations; the injuring of the telegraph and telephone wires for about sixty yards; the formation of a crater in the ballast, measuring about three by four inches, and one inch deep; and the 'pitting' of the walls of the tunnel, on the side of the explosion for some little distance to the right and left of the crater, and on the opposite side for a somewhat greater distance. The rails were entirely uninjured; but the ends of two sleepers, close to the point where the explosion occurred, sustained some injury.

Three hypotheses were suggested as to the nature of the explosive; viz., coal-gas, gunpowder, and dynamite. The fact that all the gas apparatus was found intact disposed of the first. The absence of all residue, and the extremely local and brusque action of the explosive, testified unmistakably to the use of an agent possessing greater detonative energy than gunpowder, while these properties are characteristic of dynamite. The finding of a piece of Bickford safety-fuze and fragments of copper, presumably from a detonator, strengthened this belief. Accepting this theory, experiments were made by Col. Majendie, together with Professor Abel and Dr. Dupré, to determine the amount of dynamite necessary to produce the observed effects, the switch-rod and gas-pipe from the Praed Street tunnel being used in similar positions to the charge which they bore there; and it was found that two pounds of ordinary dynamite would be sufficient, if properly detonated. The circumstances surrounding the explosions, however, indicated that a larger amount — probably five pounds — had been used, but that a portion had burned without explosion.

The means used for inducing the explosion was probably a suitable fuze of such a length as would burn for the desired time. This was then attached to a detonating-cap, and the latter inserted in a zinc case containing the dynamite. The assassin then boarded a passing train, and, lighting the fuze, threw the contrivance from the window, the fuze being timed to explode the cartridge under the train following. In the case of the Praed Street train the explosion was premature, and exploded under the train in which the assassin was. In the second case the explosion occurred at the time designed, but the train for which it was intended was late. In one minute more the train would have reached the spot, and the result would have been more serious.

UNIFICATION OF TIME.

A PART of the minutes of the session of the International geodetic association held in Rome last October, embracing the resolutions and discussions concerning an international prime meridian and system of expressing time, has been published. The resolutions have already appeared, but the discussions are now made public. Delegates were present from Bavaria, Belgium, France, Italy, Holland, Norway, Austria, Prussia, Roumania, Russia, Switzerland, Spain, United States, and Great Britain, and the almanacs were represented by Foerster, Loewy, and Pujazon.

The French delegates alone seemed to be somewhat opposed to the project; and their arguments, singularly enough, were not altogether unlike those that are so commonly urged against the adoption of the metrical system of weights and measures in this country.

Mr. Faye admitted the 'practical and undeniable need of a universal system of time;' but he would regret to see the suppression of all the nautical almanacs except that of England as a result of adopting the meridian of Greenwich, because 'these publications fed the sacred fire of astronomy.' "Still," said he, "the French government may be found more accessible to the proposal, if it be brought to the conviction that the reform would be advantageous from the point of view of general civilization;" which we may interpret as meaning, "if England will adopt the metric system in return." Professor Foerster thought it a strange phenomenon to see scientific men more narrowly nationalistic upon scientific questions than the nations and governments themselves. He considered it wicked to multiply repetitions of substantially the same calculations of ephemerides in the different countries merely to 'feed the sacred flame of astronomy;' or, in other words, to find support for computers.

Col. Perrier urged that the adoption of a distant meridian would be found extremely inconvenient in topographical maps; but Dr. Hirsch replied, that the meridian of Greenwich would hardly be more unfavorable than that of Paris for the eastern parts of France; and Helmholtz pointed out, that Germany, which had during a long period used the meridian of Ferro, had experienced no inconvenience from its being so distant.

Mr. Yvon Villarceau held, that any reform of the system of reckoning longitudes and time should be accompanied by a decimal division of the circle and of the day. But the idea of sweeping away the division of the day into twenty-four hours met with no favor; though the conference consented to a resolution expressing the 'incontestible advantages of a decimal division,' not of the circle, but of the 'quadrant of the circle, in extensive calculations.'

Mr. Loewy, the director of the *Connaissance des temps*, was more decidedly hostile to the change than any other delegate. He thought its advantages slight, its inconveniences considerable; and he could not consent to changing the usage of centuries in the arrangement of an ephemeris, without the most conclusive reasons. Professor Foerster in reply, holding the *Connaissance des temps* for 1884 in his hand, showed the great simplifications which would result from the change, and added, that Loewy himself had, in his direction of that ephemeris, been one of the most radical of innovators, and had certainly modified the arrangement far more than the proposed reform would do.

Notwithstanding the objections of the French members, some of whom voted against single resolutions, when the question was put, whether the body of resolutions should be adopted as a whole, it was carried unanimously, Loewy alone not voting. A very gratifying degree of accord may therefore be said to have been reached. Mr. Christie, the astronomer royal, declared his personal sympathy with the resolution expressing the hope that Great Britain might enter into the metre treaty, while explaining that he was not authorized by his government to encourage that hope. After the adoption of the resolutions, Gen. Cutts, the delegate of the coast survey and of the American government, which, it will be remem-