hour to any of his audience, your lecturer's efforts will not have been altogether in vain. But to each such happy individual he would express the hope that, as you have resembled Mr. Fuller in your experience of life, so may you emulate him in your liberality at death. In short, I would conclude almost in the words of old Bishop Andrews: "Unum operæ meæ pretium abs te peto, hoc autem vehementer expeto, ut mei pecatoris meorumque in precibus interdum memor sis." Which being interpreted is: "For these my efforts I beg but one thing in return, and this I beg most earnestly, viz. that you will now and then remember me a sinner against your patience and forbearance in your prayers, and that you will also be mindful of our professorships in your wills."

The following Table of the principal items of original work done by our Professors, taken in connection with their long series of laboratory notes, forms a monument of the intellectual activity, the manual dexterity, and the persevering industry, developed in the laboratories of the Royal Institution :—

DAVY

1806	Chemical Agencies of Electricity.
1807	Decomposition of Potash.
1810	Chlorine.
1812	Discourse on Radiant or Ethereal Matter.
1813	Iodine.
1815–6	Researches on Fire-damp and Flame.
1817	The Safety Lamp.

FARADAY

1820	Alloys of Steel.
1821	History of Electro-magnetism.
„	Magnetic Rotations.
1823	Liquefaction of Chlorine and other Gases.
1825–6	New Compounds of Carbon and Hydrogen.
1825–9	Manufacture of Optical Glass.
1831	Vibrating Surfaces.
„	Magneto-Electricity.
1832	Terrestrial Magneto-Electric Induction
1833	Identity of Electricities.
1834	Electro-Chemical Decomposition.
„	Electricity of the Voltaic Pile.
1835	The Extra Current,
1837–8	Frictional Electricity.
„	Specific Inductive Capacity.
1845–8	Magnetisation of Light.
„	Lines of Magnetic Force.
„	Magnetic Condition of all Matter.
„	Diamagnetism.
„	Magne-Crystallic Action,
1849–50	Magnetism of Flame and Gases.
„	Atmospheric Magnetism.
1856	Relations of Gold and other Metals to Light.
1860	The Regelation of Ice.

TYNDALL

1853	Transmission of Heat through Organic Substances.
1854	Vibrations due to Contact of Bodies at Different Temperatures.
1855	Researches on Diamagnetic Force.
1856	Slaty Cleavage.
1857–8	Physical Properties of Ice and Glaciers.
1859–63	Absorption and Radiation of Heat by Gases.
1865	Calorescence.
1866–7	Action of Heat of high Refrangibility.
1868–9	Formation of Clouds.
„	Colour and Polarisation of the Sky.
1870	Smoke and Dust Respirator.

FRANKLAND

1863–6	Synthesis of Acids of the Lactic Series.
1863	Mercury-methyl, Mercury-ethyl, and Mercury-amyl.
1864	Transformation of Organo-Mercury Compounds into Organo-Zinc Compounds.
„	Combustion of Iron in Compressed Oxygen.
1865	Synthesis of Acids of the Acrylic Series.
„	Synthesis of Fatty Acids.
1866	New Organic Radical Oxatyl.
1866	The Source of Muscular Power. Potential Energy in various kinds of Food.
1867	Source of Light in Flame. Effect of Pressure upon Luminosity of Flame.

THE GROWTH AND MIGRATIONS OF HELMINTHS

THE migration of helminths is one of the most interesting discoveries of modern zoology. These worms, generally parasitic, must often, in order to complete their growth, pass from one animal into another. This passage is of course accomplished by chance, as when one animal devours the whole or part of another, in which the helminth at a certain stage may be imbedded.

It is known that sheep attacked by sturdy, have in their brain a little worm, the *Cœnurus*. That worm when it is eaten by a dog is not digested by him, but grows in the intestine under the form of a peculiar tænia. It is also known that the tænia, or tape-worm, is generated by the growth of the human cysticercus of the pig. Very interesting researches have been made by several physiologists on that subject.

M. Villot has filled up many gaps in the history of the growth of the gordins. The gordins (Müller) are aquatic worms, whose body is very long and slim, the extremities being obtuse.

The form of the embryo is very different from that of the full-grown animal. It is a microscopic worm, cylindrical, not more than 0·209 mm. (0·00807 in.) in length, by 0·049 mm. (0·00177 in.) in breadth, and on which a head and a tail can be easily discerned. The head, as big as the body, is quite retractile; it has a triple crown of prickles, and is terminated in front by a kind of trunk or sucker, which is kept rigid by three strong needles that serve it as support; the head, in its motion of protraction and retraction, turns from its extremity to its base as a glove, and during that time the points of the prickles describe half a circle. When the head is out of the body, the point is directed backward: when it is retracted into the interior of the body the reverse takes place.

Numerous transverse folds exist on the body; they are close to one another and regular as real rings. The tail, not quite so broad as the body, is separated from it by a deep groove.

The great difference between those embryos that are free in the water and the worms which grow out of them after many migrations into the interior of several animals, deserves to be noticed. The embryo after leaving its egg for the water in which it must live, has little means of locomotion. Its tail, cylindrical and scarcely moveable, is useless to it for swimming, so that it may be driven by any current. It probably sticks to pebbles, or to the roots or stems of aquatic plants, where it waits for the larvæ, whose parasite it is to become. The author has verified these statements by putting in the same vessel several embryos with larvæ of tipulars (*Corethra, Janipus, Chironomus*), and has seen the former encyst themselves in the insects. The worm penetrates with its cephalic prickles into those larvæ, the teguments of which have little power of resistance. It continues the operation, piercing through more and more, till the membranes get solidified around it and form a real cyst, shut up at the posterior post. It continues to penetrate the body of the larvæ, lengthening its cyst and proceeds.

Those cysts do not grow normally in the interior of insects as has been believed up to this time, but in certain fishes, and particularly in the loaches (*Cobitis barbatula*) and minnows (*Phoxinus lavis*). Fishes are generally very fond of the larvæ of insects, but most especially for the larvæ of Chironomus. It is precisely in those larvæ, as we have already seen, that the embryos of gordins encyst themselves. By swallowing them, the fish swallows at

the same time the cyst which they contain. The insects and their cysts thus arrive in its intestine; the insects are digested by it, the membranes of the cysts are dissolved, and the embryos included in them are set free. The latter settle immediately in their new living abode; by their cephalic prickles they penetrate into the membrane of the intestines and encyst themselves again.

But that new cyst is not like the one that protects the embryo in the body of the insect; it is spherical or ovoid, not lengthened, and provided with a membrane not thick and opaque, but slender and perfectly transparent.

In that second state it undergoes another and important transformation and becomes a larva. The tail, hardly as long as the body, extends more and more, rolling up on itself; the body extends likewise, and the groove situated between them vanishes and the volume of the cyst increases at the same time. The worm, thus merely transformed, resembles a hematoid in its general appearance, though its unmodified head makes what is more like acanthocephalus.

When in autumn one of the above-named fishes is dissected and the intestine is laid over a glass slide, microscopical examination shows that it is strewed with numerous cysts containing embryos and larvæ of gordins at different stages of growth. The author has always found some. Sometimes they almost touch each other, so numerous are they.

The gordins offer, then, in the course of their growth, complete metamorphosis and very complicated migrations; they take successively three distinct forms, encyst themselves twice, and change three times their abode. In the embryo state they at first live in water, then in the body of several aquatic larvæ of Diptera, and in the state of larvæ they inhabit the intestines of fishes; at last, in the perfect condition, they cease to be parasites and become river worms.

There exists, however, an important hiatus in the history of the growth of these worms. How can we harmonise what has just been said with the assertion (that seems to be trustworthy) of the naturalists who have seen real gordins in the abdomen of terrestrial insects (grasshoppers, crickets, &c.)? Has there been an error of observation committed? Or would these be single individuals gone astray from the water where they had to lay their eggs? M. Villot adopts the latter opinion.

Should any one ask of what service are such curious, difficult, and apparently useless researches, it could be replied that many illnesses, some of them mortal, arise from parasites that attack certain parts of our body (the intestines, the liver, &c.); and every advance in our knowledge of the habits of those beings is a service rendered, not only to science, but also to humanity.

M. CORNU

A PRIVATE CIRCUMNAVIGATING EXPEDITION

IN *Les Mondes*, for some time past, details have been given of a proposed expedition, partly scientific and partly for pleasure, on a somewhat gigantic scale. The proposed scheme seems to be the idea of a single gentleman, M. le Capitaine Bazerque, who has been twice round the world; though it has the hearty commendation of the Abbé Moigno, editor of *Les Mondes*, and of Le Comte Pennazzi, as well as others. The scheme is called "La Caravane Universelle," and has for its main object a grand voyage for scientific exploration over the five parts of the globe. The excursion-party may be joined by men of science, and also, we understand, by artists and others belonging to all nationalities, who wish to see the world for themselves under intelligent guidance. A subscription has been opened in the various European countries and in America, to provide Captain Bazerque with a steam-vessel suitable for the expedition. The *modus operandi*, we understand, will be that the vessel shall visit in succession all the most interesting parts of the world, staying long enough at each place to enable all its features to be investigated by the *savants* and artists composing the expedition. "The material organisation of the expedition," says Count Pennazzi in commending it, "will allow those who form part of it to investigate thoroughly the rich treasures of Nature. The eastern slope of the Cordilleras, the sources and upper course of the Amazon, the Rocky Mountains, the country of the Mormons, the eastern coast of Africa, Australia, Japan, China, Indies, are among the regions whose flora, fauna, geology, and ethnography will furnish to the caravan much that is unknown to discover, and many interesting problems to solve." Verily the Count is right in calling the scheme "sympathetique et seduisant."

The organiser of the scheme intends, of course, that the vessel shall be fully furnished with all necessary scientific instruments. As concerns the material and moral well-being of his "sage companions," Captain Bazerque proposes to make the following provisions:—(1) Bi-monthly telegraphic communication between each of the members of the caravan and his family. (2) A Roman Catholic and Protestant chaplain to accompany the expedition. (3) Special and easy camping material, allowing the expedition to sojourn in the midst of countries hitherto unexplored. (4) To ensure the possibility of transit everywhere, a company of sappers will be provided, to go before and clear the way of wood; to construct rafts, bridges, to help as instrument-holders, constructors of beacons and of marks. It is supposed that 35 sailors will fulfil these and many other useful functions.

The Captain proposes to divide the scientific work of the expedition as follows:—(1) Meteorology, astronomy, and terrestrial magnetism; (2) Geography and cosmography; (3) Mineralogy, geology, palæontology, botany, zoology; (4) Anthropology, ethnology, ethnography; (5) Hygiene, medicine and surgery; (6) Photography applied to the works of man; (7) Study and collection of agricultural processes and implements; (8) Study, collection, and photographing of pottery: (9) Metallurgy and metallurgic history; (10) Dye-stuffs; (11) Histology, archæology, biography; (12) "Compte rendu anecdotique de l'expedition." In order to keep the eager world informed of the conquests of this scientific army, the bold originator contemplates the establishment of a periodical, *La Caravane Universelle*, exclusively devoted to the chronicling of its deeds. This journal will be under the care of a central editorial committee, located in Paris, we suppose, to whom will be sent, every month, collections of plants and other objects, photographs, drawings, and statistics of all kinds, together with a scientific and descriptive narrative of what is seen and done. The journal will be printed in handsome type, embellished with engravings, maps, and drawings "by the best European artists;" and each number will appear in English, French, German, Spanish, and Italian.

When we say that *Les Mondes* publishes an elaborate table, showing the states and countries to be visited, the families, tribes, and races of the Aborigines, and the conquering families, our readers will perceive that from beginning to end the scheme is thoroughly French in the ideal perfection and completeness of its conception and plan.

Much, no doubt, can be accomplished by a judicious division of labour; and if the 100 or 150 gentlemen who are expected to compose the expedition should always be of one mind, be all animated by such a love for science as to be willing to endure any hardships, be prepared to submit implicitly to the guidance of a man of perfect organising faculty, wide knowledge and sympathy, combined with promptness and decision; if each confines himself strictly to the department for which his experience and attainments fit him, and if various other important condi-