intervals of rest. And the greatest eruptions have generally indicated the last phase of long periods of moderate activity, periods that escaped the notice of the early writers. The true history of Vesuvius could not have been written until after the establishment of the present observatory. The seismograph of the observatory gives the most accurate indications of the eruptive attempts (*dei conati eruttivi*) of the mountain and of the degree of its dynamic activity."

Two other facts require to be alluded to before we close the history of Vesuvius in 1879. The one is the alleged discovery by Prof. Scacchi of a new element in the yellow and green incrustations found on the lava of 1631. The former of these he believes to be vesbiate of aluminium, the latter vesbiate of copper. The element is named *Vesbium*, from an old name of Vesuvius mentioned by Galen. The subject requires further investigation before we can assert with any confidence that a new element has been discovered.

The second fact is that the Vesuvius railway, from the base to the summit of the cone, more than 1,000 feet, with an average slope of 32°, has been commenced, and is progressing thus far favourably. The work is slow, but labour is cheap; we saw fifteen men dragging a single beam of wood up the cone. We are inclined to regard the whole thing as a very hazardous commercial undertaking. For to begin with, if the company charges 20 lire for each ascent, it will be ong before a fair interest can be paid on the original one and the working expenses. Moreover, the prorty is itsccre, a stream of lava on the south-west side of the cone would destroy the line at once, and a violent earthquake would throw all the machinery out of gear. G. F. RODWELL

THE CRAYFISH[1]

"COMMON and lowly as most may think the crayfish, it is yet so full of wonders that the greatest naturalist may be puzzled to give a clear account of it." These words from von Rosenhof, who in 1755 contributed his share to our knowledge of the animal in question, are cited by Prof. Huxley in the preface to the careful account of the English crayfish and its immediate congeners, which forms the latest volume of the International Scientific Series. The book is not designed for "general readers," those somewhat luxurious but presumably intelligent persons for whom so much scientific knowledge is chopped and spiced at the present day. It is, as we gather from the author's statement, intended as an introduction to serious zoological study, for those who will turn over its pages, crayfish in hand, and carefully verify its statements as to details of structure with scalpel and microscope. To these and also to those who are already well versed in crustacean anatomy, the book will have great value and interest; to the latter more especially, as showing how in the careful study of one organism we are "brought face to face with all the great zoological questions which excite so lively an interest at the present day," and as an exhibition of that "method by which alone we can hope to attain to satisfactory answers of these questions."

A crayfish is treated in this volume from the point of view of "science," and in the first pages we have some excellent observations (recalling earlier remarks of the author's in the same sense) directed to clearing up that mystery which good people will insist on throwing around that ever-more-widely-heard term. "Common sense," says Prof. Huxley, "is science exactly in so far as it fulfils the ideal of common sense; that is, sees facts as they are, or, at any rate, without the distortion of prejudice, and reasons from them in accordance with the dictates of sound judgment. And science is simply common sense at its best, that is, rigidly accurate in observation, and merciless to fallacy in logic." In the preceding quotation Prof. Huxley is (in a legitimate and intelligible way) using the word "science" in place of "that quality of mental activity by which science is produced." Immediately afterwards he speaks of science as the product of certain mental operations, in a passage which possesses great beauty whilst setting forth fundamental but neglected truths as to the source and scope of human knowledge. "In its earliest development knowledge is self-sown. Impressions force themselves upon men's senses whether they will or not, and often against their will. The amount of interest which these impressions awaken is determined by the coarser pains and pleasures which they carry in their train or by mere curiosity; and reason deals with the materials supplied to it as far as that interest carries it, and no farther. Such common knowledge is rather brought than sought; and such ratiocination is little more than the working of a blind intellectual instinct. It is only when the mind passes beyond this condition that it begins to evolve science.

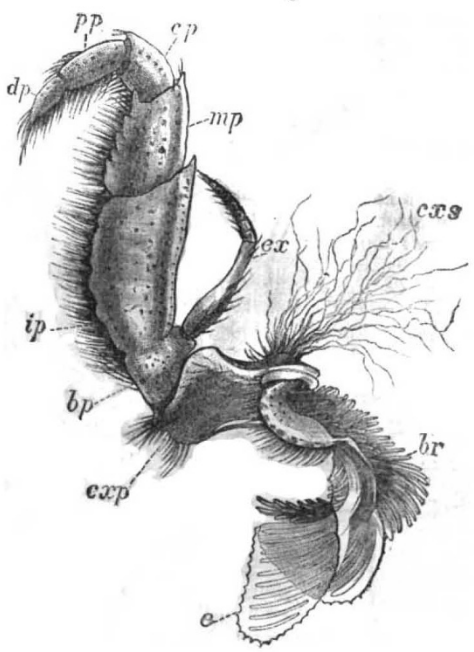

FIG. 1.—*Astacus fluviatilis*.—The third or external maxillipede of the left side (× 3). *e*, lamina, and *br*, branchial filaments of the podobranchia; *exp*, coxopodite; *exs*, coxopoditic setæ; *bp*, basipodite; *ex*, exopodite; *ip*, ischiopodite; *mp*, meropodite; *cp*, carpopodite; *pp*, propodite; *dp*, dactylopodite.

When simple curiosity passes into the love of knowledge as such, and the gratification of the æsthetic sense of the beauty of completeness and accuracy seems more desirable than the easy indolence of ignorance; when the finding out of the causes of things becomes a source of joy, and he is accounted happy who is successful in the search, common knowledge passes into what our forefathers called natural history, from whence there is but a step to that which used to be termed natural philosophy, and now passes by the name of physical science.

"In this final state of knowledge the phenomena of nature are regarded as one continuous series of causes and affects, and the ultimate object of science is to trace out that series, from the term which is nearest to that that which is at the farthest limit accessibel to our that to of investigation.

"The course of nature as it is, as it has been, and as it will be, is the object of scientific inquiry; whatever lies beyond, above, or below this, is outside science. But the philosopher need not despair at the limitation of his

[1] "The Crayfish; an Introduction to the Study of Zoology." By T. H. Huxley, F.R.S. (London: Kegan Paul, 1880.)

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field of labour; in relation to the human mind nature is boundless; and though nowhere inaccessible, she is everywhere unfathomable."

It is, then, with the object of arriving at a satisfactory conclusion as to the crayfish's place in nature, and to educe from the study of it such conclusions as may tend to throw light on the place in nature of other living things, that the reader is supposed to enter upon the consideration of the facts which Prof. Huxley lays before him.

No pains have been spared in the illustration of the text—the woodcuts (eighty-one in number) reflecting great credit both on the artist for his skill, and on the publisher for his enterprise. We have, after a general disquisition on the natural history of the crayfish (by no means the least interesting in the book), two devoted to

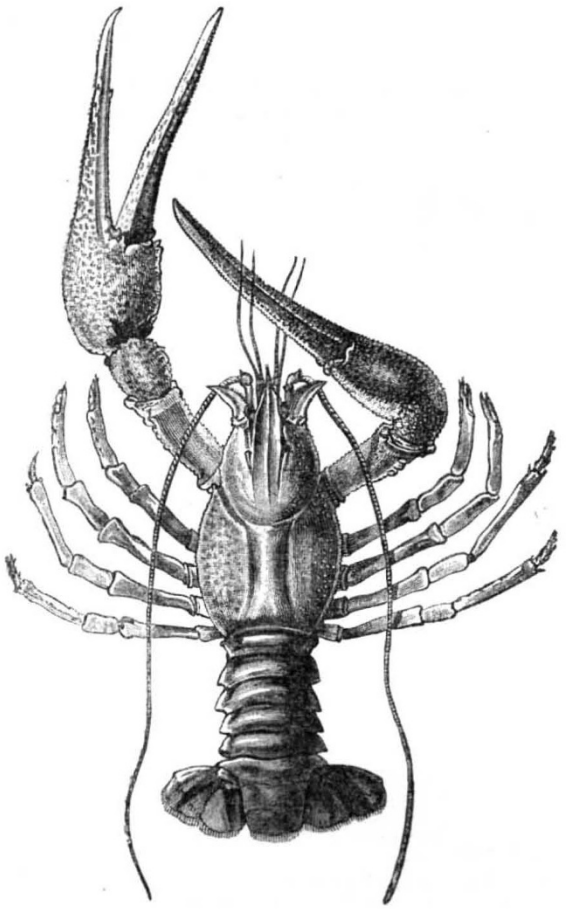

FIG. 2.—*Astacus leptodactylus* (after Rathke, ½ nat. size).

the consideration of the crayfish as a mechanism—in fact its physiology. Here a good deal of the anatomy is given and considered from the point of view involved in the question "What does it do?" Then we have the morphology of the English crayfish—the structure and development of the individual minutely set forth, even each joint of each leg, and each tuft on each gill, and each group of hairs, being described and figured. We are enabled by the courtesy of the publishers to reproduce one of these highly-finished engravings representing the most fully-developed of the crayfish's limbs (Fig. 1), and some others which give a fair notion of the excellence of the illustrations of Prof. Huxley's book.

To this follows a chapter in which the English crayfish is compared in a variety of points with crayfishes of other lands, such as those of Russia (Fig. 2), of Australia (Fig. 3), and of North America (Fig. 4), with lobsters and prawns, and it is explained how the amount of likeness and difference between these various but closely similar animals may be expressed by the method of classification in groups. Finally we have a chapter on the geographical distribution of crayfishes, and the facts therein narrated, together with those adduced in the previous chapter, enable the author to sketch the probable pedigree of crayfishes, that is, to *refer them to their causes*, viz., to the action of such physical agencies as flowing rivers, land and climatic barriers, brought to bear upon successive generations of the offspring of *marine* lobster-like ancestors which had a wide distribution in the earlier tertiary and later mesozoic periods, and before taking to fluviatile life had separated into two dis-

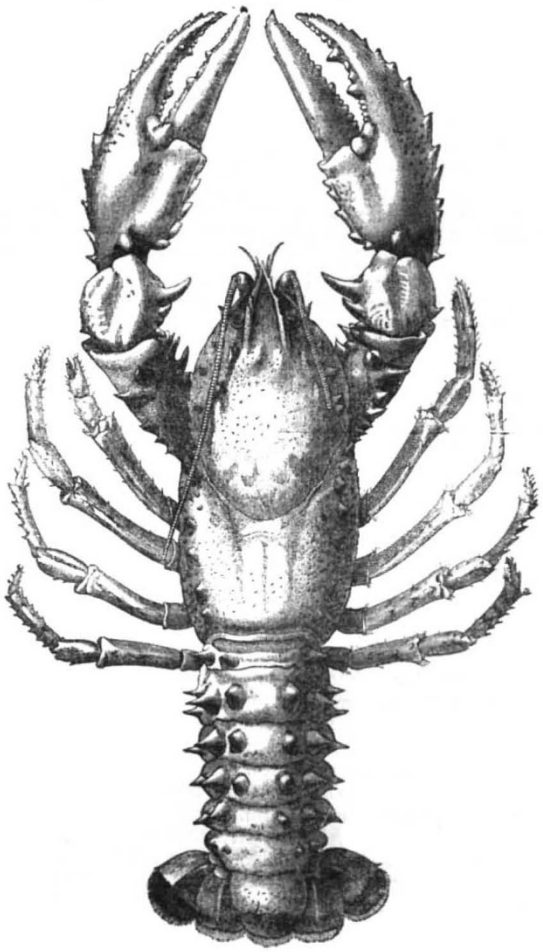

FIG. 3.—Australian Crayfish (⅓ nat. size).

tinct races characterised by differences of form, the one giving rise to the crayfish of the northern hemisphere (the Potamobiidæ), and the other to the crayfishes of the southern hemisphere (the Parastacidæ).

The novel portion of this book (novel at least to those who do not study the transactions of learned societies) is that in which Prof. Huxley details the very interesting results which he has obtained by a minute examination of the gills attached to the bases of the legs and sides of the body in all crayfish and allied forms. Three series of these gill-plumes may be distinguished according as they are attached to the leg, to the joint-membrane, or to the side of the body (Fig. 5). An ideally perfect crayfish would have all three series complete on each ring of the body in the branchial region (including the region occupied by the three pairs of maxillipedes and

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the five pairs of walking and nipping legs). But no such realisation of the ideal can be found in Astacine nature, any more than in that of the higher Catarrhines. In some crayfish more or less of the leg-gills are suppressed; in others, the body-gills; in others, the joint-gills; and so ringing the changes on the combination of these elements, it is possible to construct clearly-distinguished groups amongst the crayfishes of many climes, which at first sight seem to differ very little from one another. Further, Prof. Huxley shows that crayfishes and lobsters differ from prawns, shrimps, and crabs, in having villous gills instead of laminated gills, in being "trichobranchiate" in place of "phyllobranchiate."

It will probably not be welcome news to some of our readers that the English crayfish is in all probability not entitled to the current title of *Astacus fluviatilis*. This name appears to belong to a larger species, sometimes called *A. nobilis*, hardly distinguishable from the English one, which in France lives side by side with it. The smaller crayfish, which alone occurs in England, is known as *A. torrentium*. This specific title will, it is to be feared, have to be adopted, although it by implication casts a slur upon the River

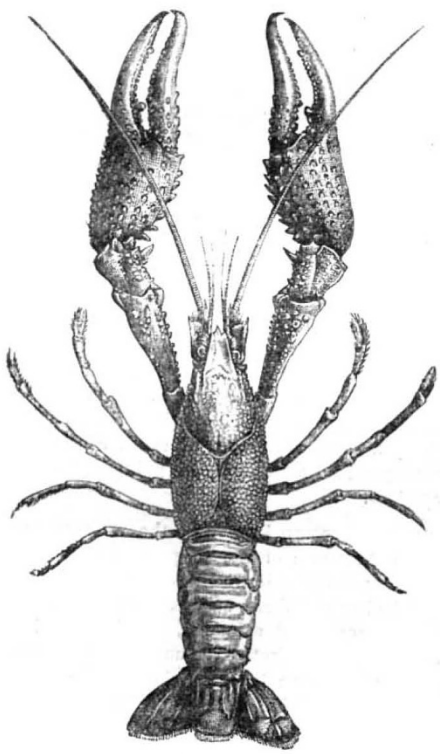

FIG. 4.

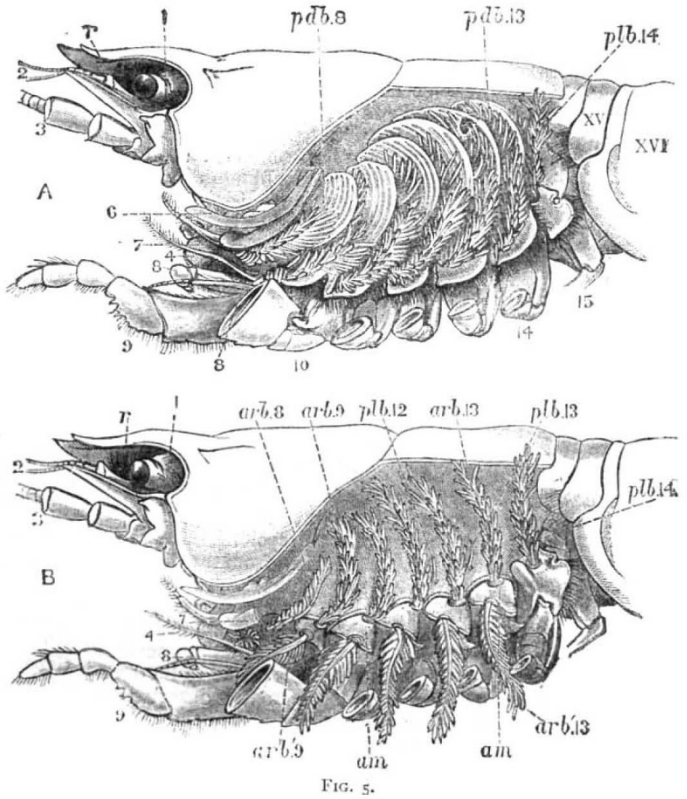

FIG. 5.

FIG. 4.—*Cambarus clarkii*, male (⅓ nat. size), after Hagen. FIG 5.—*Astacus fluviatilis*.—In A, the gills, exposed by the removal of the branchiostegite, are seen in their natural position; in B, the podobranchiæ are removed, and the anterior set of arthrobranchiæ turned downwards (× 2): 1, eye-stalk; 2, antennule; 3, antenna; 4, mandible; 6, scaphognathite; 7, first maxillipede, in B the epipodite, to which the line points, is partly removed: 8, second maxillipede; 9, third maxillipede; 10, forceps; 14, fourth ambulatory leg; 15, first abdominal appendage; xv., first, and xvi., second abdominal somite; *arb.* 8, *arb.* 9, *arb.* 13, the posterior arthrobranchiæ of the second and third maxillipedes and of the third ambulatory leg; *arb'.* 9, *arb'.* 13, the anterior arthrobranchiæ of the third maxillipede and of the third ambulatory leg; *pbd.* 8, podobranchiæ of the second maxillipede; *pbd.* 13, that of the third ambulatory leg; *plb.* 12, *plb.* 13, the two rudimentary pleurobranchiæ; *plb.* 14, the functional pleurobranchiæ; *r*, rostrum.

Isis. *A. fluviatilis* has red tips to its legs and a rostrum which differs by a notch or two from that of *A. torrentium*. Further, and this is very curious, *A. torrentium* never has been found to be infested by that very interesting parasite (more interesting even than the crayfish itself), the crab-leech, Astacobdella, or Branchiobdella, whilst it is quite abundant on the *A. fluviatilis*, at any rate in some rivers (*e.g.*, the Saale, in North Germany).

A. fluviatilis is largely eaten in France, attaining to the very respectable size of 5 inches or so in length, whilst our smaller *A. torrentium* is neglected from this point of view. We can recommend it, however, when boiled in salt and water, as nearly if not quite equalling the prawn.

The poisonous properties of the flesh of crayfish might perhaps be considered as justly falling within the scope of the first chapter of Prof. Huxley's treatise. As in the case of many mollusca and some true fishes, there appears to be a substance present which acts as an irritant poison upon the human organism, and to its action some persons are more liable than are others, whilst certain conditions of the crayfish seem to favour the development of a large amount of this poisonous body. A case was recently reported in a French medical journal, of the poisoning of six persons who partook of a dish of crayfishes—in one case with fatal result.

E. RAY LANKESTER

FOGS

THERE are fogs and fogs,—from the one extreme of the dry fog of continental meteorologists which merely blurs the sky with a bluish-tinted mist and shears the sun of its brilliancy as it nears the horizon, so that the eye can look on its disk undisturbed, to the other extreme of our genuine London fog which at times condenses to a consistency so thick as to give point to the sketch in *Punch* some years ago, representing a street-boy springing into the air, exclaiming "I am monarch of all I survey."

Fogs appear under widely different conditions. Thus the waters of the Arne occasionally appear for some distance after issuing from their icy cavern, like a steaming

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