Aquatic Hymenopteron.

IT may be of interest to some of your readers to know that, after years of unsuccessful search, I have at last bred *Prestwichia aquatica* (Lubbock) from eggs of Notonecta.

From one single egg there emerged no less than fourteen specimens, one male and thirteen females. This astonishing fact, besides proving that *Prestwichia* is an ovivorous parasite, beats all previous records of the number bred of allied species; but this record has since been put into complete shade. On Friday, from another egg, I bred six males and twenty-eight females; thirty-four parasites from a single egg.

After this astounding fact we must be prepared for something strange, now that the life-history of these marvellous ovivorous parasites is being worked out. FRED ENOCK.

13 Tufnell Park Road, N.

"A High Rainbow."

THE "rainbow" described by Mr. Moreland (in your issue of June 16) was evidently of the same character and origin as an inverted arc near the zenith, which occurred in connection with a mock-moon phenomenon at Birmingham, on May 31, 1895.

An illustrated description of this, by the writer, may be found in *Symons's Meteorological Magazine* for September 1895, p. 122. F. J. ALLEN.

Mason College, Birmingham, June 17.

THE ETIOLOGY AND PREVENTION OF MALARIAL FEVER.

THE study of the causes of intermittent or malarial fevers has received a marked impetus through the discovery by Laveran (*Traité des fièvres palustres*, 1884) of the presence in the blood of the affected persons of definite living bodies belonging to the protozoa. A large amount of important research has been carried on since, concerning these bodies or corpuscles of Laveran, which has yielded not only a clearer understanding of their morphological and biological characters, but has more accurately defined and placed on a firm basis the relation of these protozoa to the different known types of malarial fevers: febris quotidiana, tertiana, quartana—terms denoting the rhythm of the fever paroxysm. The researches of Laveran, of Marchiafava and Celli, of Golgi, of Celli and Guarneri, Grassi and Feletti, Councilman, Danilewsky, Mannaberg and others have definitely established that malarial fevers are characterised by and due to the presence, within the red blood discs of the patient, of parasites belonging to the group of protozoa known as sporozoa (gregarinida, coccidia and hæmosporidia); that is to say, of minute amœboid corpuscles, measuring not more than a sixth or an eighth or less of the broad diameter of a red blood disc, having entered into a blood disc pass their life cycle intraglobularly, growing in size at the expense of the blood disc, consuming the latter's substance till of the host nothing but a small mass of black pigment—the remnant of the blood pigment—is left. The final phase in the life-history of this plasmodium malariæ or hæmoplasmodium malariæ is reached when by a process of simultaneous fission its body produces a number of minute oval spores. These becoming free in the blood fluid are carried by the circulation into the different internal organs: marrow of bone, brain, and notably the spleen. Here at the proper time each spore germinates into an amœboid plasmodium, which passes as such into the general circulation, and, having invaded a red blood disc, goes through all the stages of its intraglobular growth and final sporulation. There is a good deal of evidence to show that the phase of sporulation and consequent dissolution of the central part of the parasite, not consumed by the spores themselves, is actually one of the direct causes of the fever paroxysm; at any rate, these events coincide with the commencement of the febrile attack. One of the most important amongst the many interesting facts elucidated is this, that the duration of the life cycle of the plasmodium malariæ stands in a direct ratio to, and determines the rhythm of the consecutive fever attacks in this way: in febris quartana the plasmodium finishes its cycle in seventy-two hours, in febris tertiana in forty-eight hours, and in febris quotidiana and perniciosa — so common and so virulent in tropical and subtropical regions—the whole process of development is very rapid, the plasmodia are conspicuously small and very numerous, very active, and sporulation takes place chiefly in the internal viscera, notably the spleen.

There are other details elucidated, by which the different types of plasmodium malariæ can be distinguished from one another; as by their size, the number of spores produced in each type, the character and intensity of the amœboid movement, &c., not the least important and fundamental detail being the artificial production by inoculation of the different types of fever: quartana, tertiana or quotidiana, according to whether for the inoculation one or the other or the third definite type of the plasmodium is employed. From all this it seems justifiable to assume that the different types correspond, if not to different species, at any rate to different well-defined varieties of the plasmodium malariæ. Whether or no these varieties have become "set" and permanent (form-constant), or whether they may in one or another generation, owing to alteration of the conditions of host, season, climate or other factors, undergo transition one into the other—as is maintained by some observers—remains to be seen. This, however, has become evident, that by careful microscopic examination of the blood the nature, type and severity of the fever paroxysms can be readily diagnosed and accurately determined. This is of particular value in those atypical and irregular forms of malarial fevers, where clinical diagnosis becomes difficult and indefinite, as, for instance, when there exist several generations of plasmodia in the same affected body, and when these different generations do not start at the same time, and do not finish at the same time their life cycle, as in quartana duplex and triplex.

Koch, in a recent lecture before the Colonial Society in Berlin, lays justly stress on the importance of systematic examination of the blood by experts, so as to determine the type and character of the parasite, because —and herein lies the chief burden of Koch's remarks— the accurate determination of the type of the plasmodium should guide the treatment of the case.

It is within common knowledge that the administration of quinine is invaluable in the treatment of ague, but it is equally known that in some cases its administration is either of no avail or has proved positively harmful.

Now, Koch insists on this, that since quinine has the power to arrest and inhibit the growth and development of the plasmodium, without killing it, the administration of the quinine should be so timed that it is capable of unfolding its effects at the proper phase in the life cycle of the plasmodium, that is about the time of sporulation—immediately before the onset of the fever paroxysm —or immediately after the germination of the spores into the plasmodia—that is immediately after the onset of the fever paroxysm. These phases can only be determined by accurate and systematic microscopic examination of the blood in each individual case.

Also in another direction Koch's remarks are of value, viz. in drawing renewed attention to the high probability of the view first expressed by Laveran, then maintained and expressed with ability by Dr. Manson, to the effect that, similarly to what has been proved in Texas fever of cattle for the tick, so also in human malarial fevers the mosquito (or gnat) plays an important part in the transmission and spread of the disease, being in fact the instrument by which natural inoculation is effected. Thus Koch mentions an island off the coast of German (malarial) East