about. But the value to the species of the rhythmic-light pulsation of the fire-flies is not obvious, and as it is doubtful if the emission of phosphorescent light is under the control of the insect, or is merely a simple automatic process of metabolism, its synchronism is a most puzzling fact.

Dr. Hermon C. Bumpus wrote me that some years ago in riding from Falmouth to Woods Hole his attention was arrested by noticing in a field along the road a large number of fire-flies flashing synchronously.

EDWARD S. MORSE

A FURTHER NOTE ON POLYRADIATE CESTODES

THE issue of SCIENCE for February 4, 1916, N. S., Vol. 43, No. 1101, page 170, contains a note by Professor Barker referring to my article on "Polyradiate Cestodes" published in the *Journal of Parasitology,* September, 1915, calling attention to the omission of his previously reported cases of triradiate specimens of *Tænia pisiformis* and *T. serialis,* and to my error in considering that the case of triradiate *T. pisiformis* which I reported was the first on record. This is a valid criticism and it is regrettable that Professor Barker's paper should have been overlooked. None of the other criticisms made by Professor Barker, however, seems justifiable.

In the first place, in regard to the specific identification of the parasite, it has been my experience in the course of several years, during which time a large number of specimens of dog tapeworms have been examined, that *Tænia pisiformis* may be readily determined upon the basis of the gravid segments alone.

As to the other criticisms made by Professor Barker, although I attach much less importance to the results of the feeding experiments which I carried out than Professor Barker apparently supposes (for the reason that the results of a single experiment of that kind are of no great value as a rule, except when supplemented by the results of other experiments) it seems proper to discuss briefly certain points in my paper which appear to have been misinterpreted by Professor Barker.

With reference to using, in feeding experiments, material which had been in formalin for a few days, it was noted in my article that the use of such material on several other occasions had always resulted in the infestation of the experiment animals. In fact it has been found by repeated experience by myself and others in this laboratory, that the ova of *T. pisiforis* are extremely resistant to the action of formalin. Rabbits fed segments of *T. pisiformis* which have been kept a few days in a solution of formalin, not infrequently die shortly afterwards and on postmortem examination show a massive invasion of the liver with the early larval stage of the parasite.

It is a well-known fact that in the case of several species of parasites, the ova of which are characterized by a relatively thick egg shell, the eggs are affected but little if at all by formalin solutions. Ascarid eggs for example may be kept alive for months or even years, in formalin. Morris[1] when examining some human feces which contained many eggs of *Ascaris lumbricoides* and which had been preserved in a 2 per cent. solution of formalin for two years, found that some of the eggs contained actively motile embryos. Four months later there was an apparent increase in the number of eggs containing embryos. In my own experience it has been found that a formalin solution is a very satisfactory medium in which to incubate ascarid eggs, as it prevents the growth of molds, bacteria, etc., without interfering with the development of the embryos. Various other substances commonly destructive to protoplasm have been found not to interfere with the development of ascarid eggs. Leuckart[2] notes that the eggs of *Ascaris mystax* may reach complete development in alcohol, chromic acid and turpentine, while Bataillon[3] has had ova of *Ascaris megalocephala* showing living embryos after having been for six months in Flemming's solution. The latter also finds that the embryos in the eggs remain intact and active in 50 per cent. alco-

[1] *Johns Hopkins Hospital Bulletin,* Vol. 22, August, 1911, pp. 299–300.

[2] "Die menschlichen Parasiten," Vol. 2, 1 Lief., 1867, p. 212.

[3] *Arch. Entwickelungsmech.,* Vol. 2, 1901, p. 149.

hol, in a 33⅓ per cent. solution of acetic acid and in a 20 per cent. sulphuric acid solution.

Concerning Professor Barker's suggestion in regard to the uncertainty as to the previous natural infection of the rabbit used, it should be noted that in the article in the *Journal of Parasitology* I stated that it could not be positively demonstrated that the rabbit was uninfested at the time it was fed. Attention, however, was called to the fact that spontaneous infestation among rabbits from the same source was unknown, and it was considered that this was very strong evidence for assuming that the cysticerci found in the rabbit resulted from the feeding experiment. How strong this presumptive evidence was will be seen from the following:

The records of the Bureau of Animal Industry Experiment station at Bethesda, Md., show that about 5,000 rabbits have been reared and used for laboratory purposes. By inquiry among the members of the bureau laboratories where these rabbits have been used, it was learned that cysticerci have never been observed in any case except as the result of experiments in which tapeworm eggs were fed to the animals. As all these rabbits are reared under practically identical conditions and the greater number of them during and subsequent to the experiments in which they are used, are kept until death under essentially the same conditions as my experiment rabbit, it would seem that the feeding experiment with proglottids of a triradiate *T. pisiformis* was very well safeguarded by checks, and that the results though (as was noted) not conclusive, justified the statements which I made to the effect that the feeding experiment in question tended to show that normal larvæ may result from the eggs of triradiate adults, and on the other hand that it failed to demonstrate the development of abnormal larvæ from polyradiate adults. In other words, recognizing the inadequacy of a single feeding experiment, I did not draw any definite conclusions from the results. I accepted these results merely as indicating certain probabilities and placed them on record so that they would be available for reference to others who might have opportunity to undertake feeding experiments with the eggs of polyradiate cestodes.

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QUOTATIONS

SCIENCE AND COMMERCE

IN commenting on the report of the National Physical Laboratory for 1915–16, *Nature* recalls the serious anxiety caused to those responsible for the supply of optical munitions by the shortage of suitable glass at the beginning of the war, for the industry of optical glass production had tended more and more to become a German monopoly. With the aid of a grant from the Privy Council Committee for Scientific and Industrial Research, a number of inquiries were instituted. So far the main work has been directed to the production of satisfactory pots, since one of the principal difficulties in the manufacture of optical glass lies in the choice of suitable material for the pots in which it is made. Similar work on heat-resisting materials, and generally on the behavior of the rare earths and other substances at high temperatures, is of great importance in a large number of industrial processes, but for such work a technological laboratory on a large scale is needed, and will, it is hoped, be provided. Other research on chemical and other glasses has been done during the year by the National Laboratory, as well as by other institutions. The work is of the utmost national and scientific importance, and our scientific contemporary expresses the hope that the committee will spare no effort "to ensure that it is actively continued and extended, and that in the future no risk shall be run of this fundamentally important industry passing into foreign hands."

The committee is in a good position to achieve the first object, and the acquisition of scientific knowledge and the perfecting of technical methods will make the attainment of the second possible, but it will not do more; commercial organization is necessary, and also probably state action. As an example of what