RAISING FLEAS FOR LABORATORY PURPOSES.

S. A. RIFENBURGH, Purdue University.

Fleas are so different from other insects that taxonomists have placed them in a separate order, Siphonaptera. Yet they are very common, and are to be found on practically every dog and cat, on many other mammals, on birds, and at least once they have been found on a reptile. They are instrumental in the dissemination of several diseases, among which may be mentioned bubonic plague, kala azar, tapeworm, and possibly leprosy. Thus, it is clear that every course in Zoology, Entomology, or Parasitology should include much about them. However, there are few such courses in which the students are given access in the laboratory to all the stages in their life history. Therefore, I believe that this paper should prove of interest to the members of the Indiana Academy of Science and others who are engaged in teaching these subjects.

In their life history, fleas pass through a complete metamorphosis similar to that of many other insects. The adults, male and female, live on their host a part or all of the time, according to the species. They feed upon blood once or twice a day. The small pearly eggs of which several may be laid in a day by one female, are not attached but are dropped and fall off the host wherever it may be. Thus it comes about, that many eggs fall upon the bedding and litter where the animal sleeps. In three days or more, according to temperature and humidity, these eggs hatch out into tiny white maggots. These feed upon the feces of their parents, feces of the host and other organic matter until they become about one-fifth of an inch in length. The time spent in the larval stage may vary from a week to months according to temperature, humidity and food. Meanwhile, they molt two or three times. At the end of the larval period, a cocoon is usually formed of silk and entangled objects, inside of which the pupa stage is spent. In a week or more the adult emerges.

For laboratory use, the adults can best be obtained by removing them from a cat or dog. This may be done by simply picking them out of the fur with tweezers, or the entire animal may be placed inside of an etherizing jar and both host and parasites etherized. Afterward, the fleas may be obtained by rubbing the fur and recovering them as they fall on a sheet of paper.

The eggs may be obtained from an infested cat or dog. Such an animal is confined in a small cage or box on the floor of which a paper has been spread. At the end of several hours or a day, the eggs are shaken off the paper into a suitable container.

The best way of obtaining larvae and pupae is by raising them from eggs collected as described above. A glass dish such as a crystallizing dish, about two and one-half inches high by four or five inches

"Proc. Ind. Acad. Sci., vol. 36, 1926 (1927)."

in diameter makes a good culture jar. The eggs are shaken into such a culture jar and a teaspoonful of finely chopped rat (or other) feces added and the dish covered with a piece of glass. One-fourth of a four-inch filter paper is folded until it is about four plies in thickness. This is placed between the edge of the culture jar and the cover. This filter paper is then connected to a container of water by means of a wick which is made by twisting together a few strands of woolen yarn or strands from a raveled lamp wick. The filter paper thus serves two purposes; first, it holds up the cover, allowing an exchange of air, and second, it supplies moisture. One must be careful not to allow any of the filter paper to hang down into the culture jar, as water might drip from it and drown some of the fleas. It is best to elevate the culture above the source of the water supply. The culture should not be in direct light—I usually set the culture jar inside of a cylinder of dark paper.

In a properly prepared culture at room temperature, larvae appear in about three days, pupae a week or ten days later and adults in another week or two.