SPECIAL CORRESPONDENCE

BARRO COLORADO ISLAND BIOLOGICAL STATION

DR. THOMAS BARBOUR, chairman of the executive committee of the Barro Colorado Island Biological Station in the Panama Canal Zone, has submitted to the Division of Biology and Agriculture of the National Research Council the fifth annual report of the station, covering the period March 1, 1928, to February 28, 1929.

Dr. Barbour reports that the following institutions have continued their usual $300 table subscriptions: American Museum of Natural History, Harvard University, Missouri Botanical Garden, the Johns Hopkins University and University of Michigan. The Smithsonian Institution has also subscribed to a table. In transmitting the announcement of the institution, Dr. Alexander Wetmore, assistant secretary, wrote as follows:

> It is particularly pleasant to have our name associated with the work of this laboratory, since I have been watching closely the work there and feel that it is highly important. In fact, from the standpoint of studies of tropical humid forests, I know of no place in the world that is equal to it in value of results obtained at the present time. I look forward to much in the future.

In addition to the table subscriptions, several donations, both of money and of equipment, were received from private individuals. The most important contribution in the way of equipment has been that of a new boat twenty feet long provided with outboard motor, which was given to the station by Mr. and Mrs. George M. Whitehouse.

The Standard Fruit and Steamship Company, which operates several fast steamers between New Orleans and the Canal Zone (direct), has agreed to give the very lowest rates possible to scientists coming to the station. This will be the same rate as that accorded to employees of the Panama Canal, which is $75.00 each way.

In addition, the United Fruit Company continues to give the laboratory each year several complimentary passes from New York and return for visiting investigators, the only expense on the part of investigators being a charge of $5.00 a day for subsistence. Particulars regarding such passes may be obtained from Dr. Barbour (Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts).

The Panama Railroad Company, through the kindness of the governor of the Panama Canal, who is also president of the company, continues to make available a $50.00 rate each way between New York and the Canal Zone. Application for this rate when coming to the Canal Zone should be made through the chairman, and through the curator, Dr. James Zetek, for the return trip.

The governor of the Panama Canal has kindly extended to scientists and members of their families the same rates at the Gorgas Hospital as are accorded to families of employees of the Panama Canal.

The main laboratory building of the station has suffered serious damage from the attacks of *Coptotermes niger,* the most destructive termite in Panama. Replacements have been made, using redwood in place of fir and other timbers hitherto used. Redwood seems to be proving almost completely immune to termite attack.

Experimental work to determine the resistance of various woods and treatments to termites has been in progress ever since the laboratory was established, and certain of these studies by Snyder and Zetek are attracting much attention. This year the Forest Products Laboratory of the U. S. Department of Agriculture has sent to the station, for testing, 130 large pieces of wood treated in various ways.

About a score of scientific workers have been accommodated at the station for longer or shorter periods during the last year. Among them may be mentioned Dr. Frank M. Chapman, Professor E. R. Dunn, Dr. Herbert N. McCoy, Dr. Frank E. Lutz, Professor A. M. Chickering, Dr. Phil Rau, Professor W. H. Weston, Dr. Thomas E. Snyder and others. In addition many visitors registered at the station during the year.

Ten papers have been published during the year as a result of various investigations carried on at the station, and several other papers are now in press.

The station is carrying on bravely, but needs financial assistance. American biologists ought to make a concerted effort to put the laboratory upon a sound footing. In the meantime, thanks to the generosity of Dr. Barbour, Dr. Fairchild and other donors, the station offers a unique opportunity to those who would work in the American tropics.

VERNON KELLOGG
PERMANENT SECRETARY,
NATIONAL RESEARCH COUNCIL

SCIENTIFIC APPARATUS AND LABORATORY METHODS

TWO COMMON FLY SPECIES EASILY REARED IN THE LABORATORY

INTEREST attaches to forms easily reared throughout their life cycles in the laboratory, because of their possible value both in the classroom and in research work. During a study of certain insects found about sheep manure, the ease was noted with which two species of *Leptocera* (*Limosina*) were carried through from generation to generation in milk bottles or shell vials, when sheep dung was used as food. The two species studied, *Leptocera longicosta* and *Leptocera ordinaria*,[1] belong to the family Borboridae, formerly in the old family Muscidae, and are not distantly related to the Drosophilidae. In size also they approximate the smaller fruit flies, *L. longicosta* being 2.0–2.5 mm in length, and *L. ordinaria* 1.5–1.8 mm. At Princeton summer temperatures the former completes a life cycle in eleven to fourteen days, the modal period being twelve days, while the latter is shorter at nine to ten days. They are handled in transferring after the manner familiar with fruit flies, being positively phototropic and withstanding etherization well. It is probable from our observations on nearly a dozen generations that they may be maintained indefinitely by successive transfers. While only two species are here discussed, additional species of the same family were encountered in our catches out-of-doors, *viz., Leptocera frontenalis, Borborus equinus* and *Sphaerocerus subsultans,* and they are probably susceptible to similar handling.

These small flies of the genus *Leptocera* are numerous about dung, especially sheep dung, during apparently the whole of the summer season. They are easily captured in the field with a sweeping net, or at the windows of barns, where they gather in large numbers at the top of the window-panes, and may be collected by taking advantage of their positive phototropism. *Leptocera* spp. are distinguished from the other members of the family Borboridae[2] by the fact that the fourth and fifth wing veins are incomplete or obsolescent beyond the discal cell, as shown in the accompanying text figure. *L. longicosta* may be readily separated from *L. ordinaria* by the shape and vestiture of the scutellum. The scutellum of *L. longicosta,* which is truncated at the rear giving it a trapezoidal outline, bears four long scutellar bristles and many dorso-scutellar bristles. That of *L. ordinaria* is shorter and rounded at the rear, and while possessing the four rather long scutellar bristles, lacks entirely any dorso-scutellar bristles. Additional characters include the slightly smaller size of *L. ordinaria,* as already mentioned, and the fact that individuals of this species retain a lighter coloration on the lower part of the head and thorax up to several days after emergence, whereas in *L. longicosta* a nearly uniform dark coloration may appear within an hour. Eye color in the former species is red; in the latter nearly black. Some variation has been noted in these characteristics, however.

[1] We are indebted to C. W. Johnson, of the Boston Society of Natural History, for species classifications, and to C. Jaynes, D. V. M., for certain preliminary observations on the breeding of one of these species.

[2] Williston, "North American Diptera," 1908 (3rd ed.), p. 316.

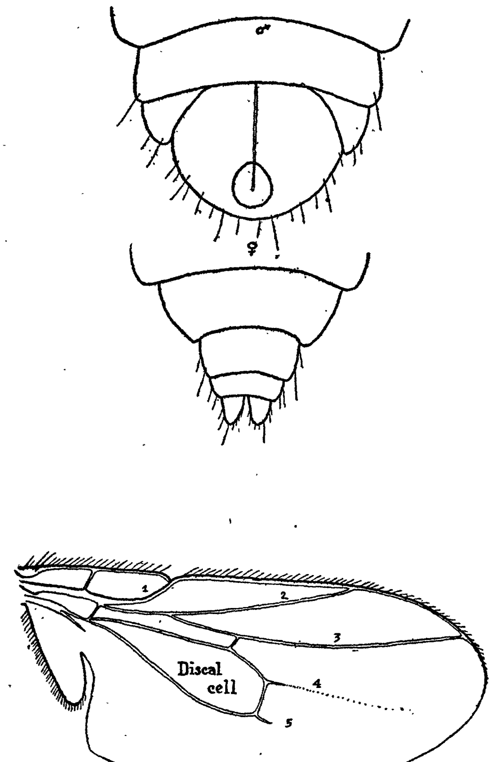

FIG. 1. Above: Posterior abdominal segments of male and female *Leptocera* spp. Below: Wing venation in *Leptocera* spp.

Sexes are easily determined with the aid of a hand lens or dissecting microscope in accordance with the characters illustrated in the text figure. Occasionally the anal plates of the female are not visible. Slight pressure on the abdomen of an etherized individual with a camel's-hair brush will force the anal plates beyond the edge of the last segment, if the individual be a female.

In breeding the flies we have used sheep dung, although it appears probable that other food materials ("decomposing organic matter"[2]) may be used. Our method was to collect sheep pellets, preferably fresh samples, which were first crushed in water and then boiled. This resulted in sterilizing the dung to a large extent as well as permitting it to be brought to a certain desirable consistency. After cooling, pint milk bottles were about one fourth filled with the cooked dung and plugged with cotton, after which newly emerged flies were transferred to them. Flies for breeding were allowed to remain in the bottles seven or eight days, by which time the females have laid most of their eggs.

In an experiment, one male and one female *L. longicosta,* newly emerged, were placed in each of twenty-four shell vials (length 7.5 cm, diameter 2.0 cm), upon the boiled dung food. Four females produced no progeny, but in the other twenty vials twelve days after the parents had been transferred to them the new generation began to emerge and was removed daily. The parent flies were placed in fresh vials after eight days in order to keep them separate from the offspring. Parent females lived up to twenty-three days, males up to twenty-four days. The number of progeny from the twenty fertile females ranged from seven to 393, average 146.5 ± 14.7, with a ratio of 116 males to 100 females, the total count being 1,573 males to 1,356 females. Apparently virgin females produce no progeny, following the usual rule among the Muscidae.

It seems to us possible that *Leptocera* spp. as representatives of a fly family, the Borboridae, which are widespread if not cosmopolitan in nature upon the dung of mammalia,[3] with their small convenient size, short life cycle, easily satisfied food conditions, capability of continuing their life histories in the now familiar laboratory milk bottle, and apparent hardihood in withstanding repeated etherization, combine a group of characteristics which might well make them utilizable material for investigations in insect physiology, genetics, etc. It may be mentioned in addition that members of the Borboridae, both larvae and adults, are reported as hosts of herpetomonads.[4]

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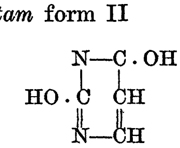
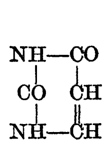
SPECIAL ARTICLES

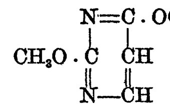
THE SYNTHESIS OF PYRIMIDINE-NUCLEOSIDES

THE pyrimidine "uracil" can be expressed structurally either by a *lactim* or a *lactam* construction as represented by formulas I and II, respectively. The *lactam* form II


I


II

is the stable configuration. Corresponding to these two constructions we have also the alkyl derivatives of uracil, of which the methyl compounds expressed by formulas III and IV are the simplest dialkylated representatives. Both forms can be obtained without difficulty.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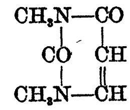
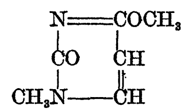

IV

We now find—(1) that the *lactim-ethers* represented by formula III can easily be transformed by molecular rearrangement into their isomeric *lactam-isomers* IV, and (2) that this change is a progressive one and is subject to experimental control. Complete transformation of the dimethyl ether III to the pyrimidine IV is accomplished by heating the lactim-form slightly above its boiling point. A partial and selective rearrangement is brought about at ordinary temperature by treatment with methyl iodide, and under such conditions only one *lactim* grouping is destroyed leading to the formation of a 3-nitrogen derivative. The pyrimidine III interacts, for example, with methyl-iodide to form 2-oxy-3-methyl-6-methoxypyrimidine V. The same type of change can also be brought about by interaction of 2, 6-diethoxypyrimidine with methyl-iodide giving 2-oxy-3-methyl-6-ethoxy-pyrimidine VI. Hydrolysis of the compounds V and VI with acids leads to the formation of 3-methyluracil VII. The corresponding rearrangements in the purine series are now under investigation.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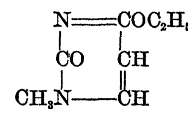
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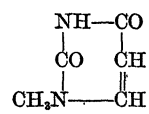
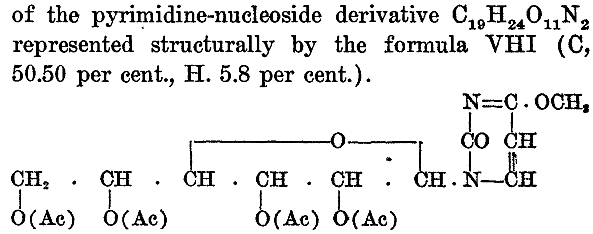

VII

The ease of molecular rearrangement of *lactim* constructions in the pyrimidine series, the quantitative nature of these transformations, and finally the definiteness of change leading always to the formation of 3-nitrogen compounds, led us to a study of the behavior of the dimethoxypyrimidine III towards bromotetraacetyl-glucose. We now wish to report in this preliminary paper that this bromide interacts normally as an alkyl halide with the *lactim* compound III, at a temperature of 50°, giving an excellent yield of the pyrimidine-nucleoside derivative $C_{19}H_{24}O_{11}N_2$ represented structurally by the formula VHI (C, 50.50 per cent., H. 5.8 per cent.).


VIII

[3] Howard, "A Contribution to the Study of the Insect Fauna of Human Excrement," *Proc.* Wash. Acad. Sciences, 1900, 2: 541–604.

[4] Patton and Cragg, "A Text-book of Medical Entomology," 1913, p. 311.