THE LIFE CYCLE OF A TREMATODE OF FROGS

THE life history of *Glypthelmins quieta* Stafford, 1900, has been experimentally determined. The cercaria, one of the ornate Xiphidiocercariae, has been identified as *Cercaria mesotyphla* Miller, 1935. Natural infections of this cercaria have been found in *Physa gyrina* and *P. gyrina hildrethiana* in the vicinity of Urbana, Illinois.

The amphibian genera Rana, Hyla and Pseudacris have been reported in the literature as definitive hosts for *G. quieta.* In the present study experimental infections have been secured in *R. pipiens* and *R. catesbeiana.*

The cercariae penetrate the skin of the amphibian and become encysted just beneath the outermost layer. They are cast off with the shed skin. The worms reach the digestive tract of the definitive host when the host ingests the cast skin.

The eggs of *G. quieta* are embryonated when they leave the uterus and hatch apparently only when eaten by the snail host. Miricidia as well as empty egg shells have been observed in the dissected gut of snails.

Experiments involving attempts to infect the tadpoles of *R. pipiens* and *R. catesbeiana* were negative. A detailed account of this life history will be published elsewhere.

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AN EARLY REPORT OF LEAD POISONING IN WATERFOWL

THE writer recently had the privilege of visiting Harold H. Bailey, at Coral Gables, Florida, and of inspecting the extensive ornithological collection housed in Mr. Bailey's private museum.

During a discussion concerning waterfowl, Mr. Bailey stated that he had been district inspector of migratory birds for the U. S. Bureau of Biological Survey, a position authorized under the Lacey Act, during the period from 1913 to 1917. Under his supervision at that time were Virginia, the District of Columbia and parts of Maryland and North Carolina. As a part of his work in that position, Mr. Bailey said that he had done considerable work on the diseases of ducks, geese and swan, and had discovered, particularly in Back Bay, Virginia, and Currituck Sound, North Carolina, that they were being poisoned through ingesting lead shot, which remained in their gizzards until ground away, producing symptoms typical of lead poisoning, and ultimately death. He then demonstrated a large amount of material he had gathered during the years mentioned. Many of the preserved gizzards contained over one hundred full-sized No. 4 lead shot, besides partly ground remains. He also showed the reports he had received from the Virginia state chemist at Richmond, who had examined the livers, intestines and muscle of the birds collected, and had reported evidences of lead poisoning.

Mr. Bailey further stated that he had forwarded a number of birds so poisoned to the Bureau of Biological Survey for examination, and that an account of this discovery of lead poisoning in waterfowl had appeared in the Richmond papers of that time and was extensively copied.

In view of the attention now being given to lead poisoning in water-fowl, Mr. Bailey's account of these activities and discoveries of over twenty years ago was especially interesting.

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IDEST: A WORD FOR AVOIDING AMBIGUITY

I HAVE used in some of my writings regarding the chemistry and technology of cereals the word "idest," which is simply a combination of the two Latin words *id* and *est,* in order to avoid the equivocal word "or," when it was desired to indicate the equivalence or essential synonymy of two different terms. It is a frequent occurrence to find, in scientific or descriptive literature, places where one is uncertain whether the word "or" is used as a disjunctive conjunction, meaning one or the other of two or whether it indicates equivalence. Frequently the context indicates which of the two senses of "or" is intended. For example, in Gortner's "Outlines of Biochemistry," it is clear that equivalence is intended in the following: "cephalin or kephalin," "aminoglucose or glucosamine," and "myricyl or melissyl alcohol occurs," and that non-equivalence is intended in the following: "by pancreatic lipase or by emulsin," "edestin or casein dissolve," "natural or acquired immunity." In these cases and others the number of the verb, the similarity in spelling, the context, the use of added expressions such as "else," "rather," "especially," or the use of parentheses or other punctuation, as used by the careful writer, leaves no doubt which of the two senses the writer intended, but it is not unusual to find, in the literature of science, cases where a reader, who may not be informed from some other source, finds great difficulty or can not possibly determine whether equivalence or alternativeness is intended. Not being familiar with the technology of weaving, I would like to know, but can not determine, whether the author of "Silk, the Queen of Fabrics," in the sentence "Grenadine . . . fabric of open texture, made in gauze or

leno weave," meant that leno weave is another name for gauze weave or that it is a different mode of weaving. Although in writing it is possible to set off with commas or parenthesize the synonymous expression, as for example "sucrose, or saccharose, is," or to use the rather awkward and interruptive expression "that is" or the abbreviated (*"i.e."*), it seems that adoption of the Latin words combined as a single, short English word meets the demand for a conjunction which has the meaning of "is also called," "is another name for," "is equivalent to," "equals." By the use of this conjunction, "idest," the word "or" is released for use in expressing alternatives, and we may be sure of the meanings of phrases such as "Turkish idest Aleppo galls," "tannin idest gallotannic acid," "muriatic idest hydrochloric acid," "hydrobromic or hydrochloric acid," "geraniol or citronellol."

In the German language the same ambiguity exists as in English. "Oder" and "beziehungsweise (bzw.)" both may be translated (a) as the alternative "or," sometimes better using "or else," (b) as the equivalent "or," "also called" (for which "idest" is suggested), and the modified "or rather," "or to be more exact." In addition, these words have sometimes (c) the related conjunctive significance "and also," "and furthermore," "— and — respectively," and (d) "as for example."

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SPECIAL ARTICLES

THE POTASSIUM-ARGON TRANSFORMATION

MØLLER and Weizsacker[1] have calculated recently the probability that a nucleus of atomic number Z disintegrates spontaneously through the absorption of a K electron from the extranuclear system of the atom into a new nucleus of atomic number Z–1 but with the same mass number. As Weizsacker points out, the possibility of such a process raises some interesting speculations concerning the relative abundance of the noble gases and their associated alkalies. Thus besides the usual beta emission from K^{40}, namely, $K^{40}_{19} \rightarrow Ca^{40}_{19} + \beta$, there might occur, if the masses involved in the reaction turn out to be appropriate, the reaction

$$K^{40}_{19} \rightarrow A^{40}_{18}.$$

When we consider that argon is in itself a very stable element, then this reaction appears more plausible. An examination of cloud chamber photographs taken with argon shows that A^{40} has a mean life higher than 10^{12} years.

An interesting feature of this reaction is the correlation of the most abundant argon isotope with radioactive potassium. If such a reaction is energetically possible, it implies the following. First, as Weizsacker mentions, argon should be found occluded in old potassium-bearing rocks; and, secondly, the ratio of the radioactive potassium isotope K^{40} to the others K^{39} and K^{41} should depend on the past history of the sample under consideration.

Weizsacker presents evidence which indicates that the rate of this reaction may be as high as 1/3 the rate of the normal reaction, $K^{40} \rightarrow Ca^{40} + \beta$. A rate this high would require the estimates of the amount of disintegration which has occurred in geologic time[2] to be revised upwards. However, it is unlikely that it is nearly as high as 1/3. The ratio of the amount of argon in the earth's atmosphere and crust to the calcium content of the earth's crust is 1/100. If we make the assumption that part of the argon generated in the earth's crust—assumed thickness of six miles—will have diffused into the atmosphere and that both of these elements have been formed exclusively from the disintegration of K^{40}, then the ratio of their rates of disintegration must lie in the range from 1/100 to 1/700. This appears to be a more reasonable value.

Møller has calculated the rate of the reaction resulting from the absorption of a K electron. With this knowledge, it is quite easy to calculate the rate of disintegration arising from the presence of free electrons in the material. If there is one free electron per atomic volume, then the ratio of free electrons to K electrons in the nucleus should be roughly proportional to the ratio of the volume enclosed by the K shell as compared to the atomic volume, *i.e.*, roughly as $1/Z^3$. On account of the dependence of the electron concentration on external conditions, the amount of K^{40} which has disintegrated during geologic time might well have varied by a quantity of the order of 0.01 per cent. from one locality to another on the earth's crust. If such a variation in the ratio of the potassium isotopes with environment could be detected, it would furnish strong evidence for the existence of the process.

Radioactive potassium K^{40} emits two groups of beta particles with v/c values of 0.93 and 0.83, respectively. In addition, homogeneous gamma of 2 10^6 c.v. energy rays have been detected. The relative proportions of these three processes are 40, 60 and 1.08, respec-

[1] Møller, *Phys. Rev.*, 51: 84, 1937; Weizsacker, *Phys. Zeits.*, 38: 623, 1937.

[2] Brewer, SCIENCE, 86: 198, 1937.