a matrix of haploid cells interspersed throughout with cells containing 2 or more nuclei. The aecium becomes differentiated into a lower half of large vacuolated cells, which later die, and an upper half of smaller denser cells. In this upper area multinucleate cells are abundant. The number of nuclei varies, ranging in extreme cases to 15 or 20 per cell. With further growth and cell division the number of nuclei per cell decreases. From this mass cells grow down to form the sporogenous layer of "basal" cells. Young basal cells contain from 2 to 8 nuclei. The extra nuclei are used in forming the first spores and by the time the spore chains are well started the basal cells are regularly binucleate.

The question of the effectiveness of the receptive hyphae that grow to the upper surface of the leaf is still an open one. Aecia occur that open on the upper surface, but they are uncommon. Either fertilization of the upper receptive hyphae is rare, or those that are fertilized grow to the lower surface before developing further. So far this has not been observed.

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THE REDIA OF THE GASTEROSTOMES[1]

AN intermediate generation has been found in the life history cycle of the trematode order *Gasterostomata*, thereby bringing this form into line with normal life histories of other digenetic trematodes. The adult of this generation, the redia, is found in abundance in the lumen of the young mother-sporocysts. Young redia dissected from the mother-sporocysts are very active swimmers due to the covering of long cilia over the entire surface of the body. Older specimens indicate a loss of cilia followed by a coating of spines which are similar in character to the final adult. Two eyes are present. The redia is hermaphroditic. The testis is large, median in position with an extensible penis. In a live redia, mature active spermatozoa have been observed. The ovary is small, below the testis on the left side. Laurer's canal is long and apparently functions in cross-fertilization as a sperm-duct leading to the ovary. The vitelline complex in two lateral rows is very well developed. Eggs are shed through a short oviduct into the cavity of the mother-sporocyst and give rise to cercariae.

The origin of the redia was found to be in the gonads of the mother-sporocyst, and localized in the distal ends of the branches. The testis is large and situated below the tip of the branch previous to the expanded portion of the lumen. The ovary in the mother-sporocyst of *Bucephalus pusillum* appears in the form of "stroma." In *B. elegans* the ovary is located in a "plug" extending downwards into the lumen. This "plug" is composed of the ovary and nutritive glands, both in the form of "stroma" which, as development proceeds, extend for a considerable distance through the lumen even in older branches heavily packed with cercariae.

Spermatogenesis has been worked out in detail for all three generations; in the mother-sporocyst, redia and final adult.

It is therefore concluded that each of the three generations starts with a fertilized egg and gives rise to hermaphroditic "adults." Maturation with polar bodies and reduction is evident. There is no parthenogenesis or metagenesis. The life history of the trematodes as witnessed in this order is simple, with comparable embryological and larval stages in each of the three generations. The differences in the adults undoubtedly has evolutionary significance and is probably due to parasitism: first, within a mollusk; second, within the mother-sporocyst, and third, within the vertebrate.

Other species, not related to the gasterostomes are being studied by the author to find out how universal this method of reproduction is, among the class *Trematoda*. Material to be examined must be young before the reproductive stage is over and before the nutritive phase increases to confuse observation. Completely known life cycle material is preferable. Differential staining is advisable.

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VARIATIONS IN THE EVENING PRIMROSE INDUCED BY RADIUM

GENETICISTS are now aware that x-rays and radium are agents by which genetic changes, both genic and chromosomal, may be produced. However, in the several years since 1927, in which many investigators have published on the genetic effects of irradiation on both plants and animals, nothing, in so far as I am aware, has appeared dealing with the irradiation of the evening primrose. For the past three years the writer has been making such an investigation, using radon (radium emanation) in the treatment of *Oenothera Lamarckiana* and *Oe. franciscana*, a preliminary account of which appears here.

The method of treatment was to insert an unfiltered tube of radon parallel with the buds in a flowering cluster, thus treating buds in all stages of development at distances varying from direct contact to 4 cm. As the flowers opened after treatment they were

[1] Contribution from the Zoölogical Laboratory of the University of Michigan.