metabolism were being made in a microspirometer.[1] The cells can be studied in the moist state directly or with vital stains, or can be dried on cover-glasses and stained with the usual methods. A remarkable change takes place in the staining qualities of the marrow cells when they are exposed to blood serum, either by shaking or by treating bone marrow smears or sections with blood serum. The cells take the stain intensely instead of the paler tint usually noted in bone marrow films, especially when stains such as Wright's stain are used. *Exposure to serum causes the cells to stain similar to those of the blood stream,* so that it is much easier to identify tissue cells in their genetic relation to those of the peripheral circulation. The change in the staining qualities emphasizes the marked difference in the chemical and physical environment of the cells in the tissues and those in the blood. It suggests something of the altered physiology of the cells in the bone marrow and their change in function when they enter the blood stream. It makes it appear more improbable that cells, which should mature in the tissues, ever continue their normal development when forced prematurely, under abnormal conditions, into the circulation. Dissociated cells of other organs, as the spleen, as well as tumor tissue, show changes after treatment with blood serum which enable their identification when they appear in the peripheral circulation. The mechanism of the change in staining qualities does not appear to be one of change in hydrogen-ion concentration only, although this may be one factor.

RAPHAEL ISAACS

SIMPSON MEMORIAL INSTITUTE
FOR MEDICAL RESEARCH,
ANN ARBOR, MICHIGAN

## ABERRANT HETEROTHALLISM IN A HOMOTHALLIC COPRINUS[1]

IN connection with cytological studies in the Agaricaceae, the writer has made single-spore isolations to determine the sex reactions of the species studied. Previous workers have shown that certain Hymenomycetes are regularly homothallic, whereas others are regularly heterothallic. Their results have been verified in general, but in some cases interesting exceptions have been encountered.

A form of *Coprinus ephemerus* Fries, in which the basidia are two-spored, was isolated. This form seemed at first to be homothallic, since mycelium from single spores in most cases developed clamp connections, the cells of the mycelium were binucleate, and fruit bodies were produced. Some exceptions to this behavior were observed, and by making a large number of isolations, a few viable mycelia were isolated, in which the cells became permanently uninucleate, clamp connections were not formed and no fruiting occurred. These exceptional mycelia had all the characteristics of the primary condition. When they were paired in all possible combinations, mating occurred between certain pairs, giving rise to a mycelium with binucleate cells and clamp connections.

TABLE I

SAMPLE OF THE DATA OBTAINED IN THE PAIRING OF PRIMARY MYCELIA OF THE TWO-SPORED FORM OF *Coprinus ephemerus* FR.

| | 7 | 6 | 5 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|
| 1 | − | − | − | − | − | + |
| 2 | + | + | − | + | + | |
| 3 | − | − | − | − | | |
| 4 | − | − | − | | | |
| 5 | − | − | | | | |
| 6 | − | | | | | |

Table I is a fair sample of the results obtained. It demonstrates the inadequacy of the hypothesis that one pair of Mendelian factors (Aa) determine sex in this case. If we arbitrarily assign factor (A) to mycelium No. 1, mycelium No. 2 with which No. 1 crosses, must be given the factor (a). Then it follows that mycelia 3, 4, 6 and 7 also have the factor (A). But No. 5 does not conform to this scheme because it neither crosses with (A) or (a). Obviously, there is no strict segregation into two functional sex classes and it seems probable that a functional sexual mycelium is determined by more than one pair of factors. It is definitely established, however, that in a normally homothallic form there are occasional haploid, primary mycelia, which cross in certain pairings, giving rise to apparently normal diploid, secondary mycelia.

The fruit body is also diploid, karyogamy and meiosis taking place in the basidium. Each basidium contains four nuclei just prior to spore formation. Two spores develop on the basidium and the writer has found that a spore may receive either one or two nuclei. It may be presumed that a spore which receives two nuclei of the proper kind carries the factors necessary to produce a secondary fruiting mycelium and is therefore homothallic. On the contrary, a spore which receives one nucleus does not have a complete set of sex factors, and its haploid mycelium must be crossed with another mycelium which carries the necessary allellomorphs in order to bring about the secondary condition. The cytological data are in harmony with the available cultural data. A full account of the writer's work will be published in the near future.

JOHN EUGENE SASS

UNIVERSITY OF MICHIGAN

[1] G. A. Daland and Raphael Isaacs, "Cell Respiration Studies," *Jour. Exp. Med.*, July, 1927, *46*, 53.

[1] Papers from the Department of Botany of the University of Michigan, No. 300.