coagulated into a curd known as "tofu." The tofu is pressed in wooden molds into blocks of desirable sizes, which are then arranged on bamboo trays and left in the fermentation chamber for about a month. The manufacture of sufu begins in December and ends in February. The average temperature of the fermentation chamber is found to be 14° C. After this treatment these blocks are transferred to large earthenware barrels, each having a volume of seven hectoliters. Then salt and Shoushing wine are added one after the other to the blocks, mainly for the purpose of preservation. The barrels are finally closed, covered with wooden plates and left unopened for about three months. After this procedure the blocks, having acquired a peculiar flavor, are ready for sale. The products seen on the market are usually red or white blocks 2 to 4 cm square and 1 to 2 cm in thickness. The white ones are untreated, while the red ones are colored with "hung chu," which is derived from the culture of another mold, *Monascus purpureus,* on rice.[1]

Sufu is manufactured in large quantities in the region of Shoushing in Chekiang Province and Soochow, Wushih, and Changchow in Kiangsu Province. The native manufacturers know how but not why such flavored sufu is produced. They believe that the fermentation is controlled by one of the gods, to whom they make prayers for its success.

Early in my research on sufu I found in the fermentation chamber of a factory in Shoushing gray mycelium about 2 cm in height covering the whole surface of the blocks. As I deemed this mycelium to be valuable for scientific research, I made a culture of it on the spot and brought the culture back to Nanking. The mold which produces this mycelium was isolated. It appears to be an undescribed species of Mucor for which the name *Mucor sufu* is proposed.

The mycelium produced by the mold is white at first but later becomes grayish yellow, the culture media being soybean-agar, koji-agar and tofu. There are no septa in the hyphae. Single aerial hyphae with spherical sporangia are developed from the mycelium. The sporangium when old is grayish-yellow in color and on its surface has neeedle-shaped crystals of calcium oxalate. The columella is also spherical. The diameter of the sporangium is 14.61μ to 28.42μ, and that of the columella is 8.12μ to 12.08μ. The sporangiospores are elliptical in shape with smooth surfaces and have a dimension of 4.9μ–12.58μ x 3.24μ–8.0μ. Soybean is a good medium for the culture of the mold. On bread or boiled rice the mold develops very imperfectly. For sucrose, glucose, fructose, maltose, mannose, lactose, galatose, raffinose, arabinose and xylose it has no fermentation power. It does not liquefy gelatin culture media but causes soybean juice to be slightly acidified and coagulated. On observing under a microscope a cross-section of sufu made from the pure culture of the mold on tufu, one can see that the mycelium of the mold has penetrated the sufu to the center. The optimum temperature for the growth of the mold is 29° C. The mold does not produce rhizoids. It is a mono-mucor.

From the observations recorded above I conclude that the transformation of tofu into sufu is due to the growth of this Mucor. It is also interesting to note that the mono-mucor on sufu manufactured in Shoushing in Chekiang Province and that in Soochow, Wushih, and Changchow in Kiangsu Province is all of the same species. In ancient times traveling was handicapped by lack of railway connections between Chekiang and Kiangsu, nearly three hundred miles apart. It is remarkable that the mold on sufu manufactured in these two provinces should be of the same species, a coincidence of historical as well as biological importance.

NGANSHOU WAI
NATIONAL HYGIENIC LABORATORY, CHINA

[1] For an account of experiments by Margaret B. Church on the production of this red coloring matter, see *Journal of Industrial and Engineering Chemistry,* 12: 45–46, January, 1920.

CONCERNING HETEROTHALLISM IN PUCCINIA GRAMINIS

IN 1927, J. H. Craigie[1] published evidence of heterothallism in *Puccinia helianthi,* and in 1928[2] extended the work to other rusts, including *Puccinia graminis.* He reported that, in the haploid generation, isolated mycelia produced pycnia but, in the great majority of cases, no aeciospores. If two mycelia coalesced or if pycniospores of one infection became mixed with pycniospores of another, approximately 50 per cent. of the combinations resulted in the production of aeciospores. This led him strongly to the belief that haploid mycelia and pycnia are either (+) or (−) and that the diploid generation is initiated when (+) and (−) meet.

A cytological study of infections of *Puccinia graminis* on the European barberry adds weight to this hypothesis. An isolated infection consists of haploid mycelium and pycnia. Abundant pycniospores are formed and the drop of pycnial exudate on the upper surface of the leaf is maintained for five or six weeks or even longer. Structures resembling aecia form at the normal time and place, but they

[1] "Discovery of the Function of the Pycnia of the Rust Fungi," *Nature,* 120: 116–117 and 765–767. 1927.
[2] "On the Occurrence of Pycnia and Aecia in the Rust Fungi," *Phytopathology,* 18: 1005–1015. 1928.

consist of haploid mycelium only. They grow and undergo the first differentiation into an outer half of large, rounded empty cells and an inner half of small, dense living cells. Ordinarily no spores are produced, and after further expansion the whole structure dies.

After pycniospores of different infections have been mixed, a study of the pycnia reveals the presence of binucleate cells in the upper part of the wall of the pycnium near the base of the paraphyses. Leading downwards from this area are hyphae whose cells contain either two or three nuclei, and sometimes more. Binucleate cells can be found also at the base of the pycnium. In the area between the pycnium and a young aecium, there is a mixture of many haploid and a few diploid hyphae.

The aecium begins as a loose tangle of hyphae, predominantly uninucleate, but usually including a few binucleate cells. In later stages binucleate cells are regularly present, scattered here and there in the haploid mass. As the time of aeciospore formation approaches, the centrally located diploid cells enlarge, often becoming multinucleate as they look outwards towards the lower surface of the leaf. These become the basal cells of the spore chains, which, when fully organized, consist of regularly binucleate cells. In older infections where successive aecia are forming, diploid hyphae can be found between the older and the younger aecia. As soon as aeciospore formation begins, the formation of pycniospores is checked and the pycnial exudate dries.

A more detailed study is in progress.

RUTH F. ALLEN

BUREAU OF PLANT INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE,
COOPERATING WITH THE
COLLEGE OF AGRICULTURE,
BERKELEY, CALIFORNIA

A USE OF JOURNALS BY RESEARCH MEN

A PORTION of the article by Dr. B. R. Andrews on "Budget Needs of College Teachers," in SCIENCE, No. 1802, page 20, recalls a method which contributes to the more efficient use of journals by research men. The writer has seen this system used in two different institutions with very satisfactory results, and its general adoption might be a temporary means of somewhat relieving the situation described by Andrews.

The method mentioned attempts to bring to each research man (and teacher) all the journals in which he is interested very soon after they reach the institutional library, and give him opportunity to read the articles of most immediate interest and list others for early reading.

Each man, including graduate students, in a college or in a department, if large, lists the journals which he wishes to read in the order of his preference for them. These lists are compiled by a member of the library staff or by the secretary of the department. A library helper visits the desks of all men wishing any of the journals at regular intervals, perhaps twice a week. As each journal is received by the library, it is taken by the helper on his next trip to the desk of the man most interested. As the helper makes the regular rounds, he collects all the journals which were distributed on his previous visit, and redistributes them, leaving each journal on the desk of the man whose name is next on the list for that particular journal. It takes a helper four to five hours a week to distribute the journals, from two or three to fifteen per man, to thirty-five men twice a week.

The fact that a research man has the journals in which he is most interested, or as many of them as are taken by the institutional library, coming to his desk and remaining for a limited time is an opportunity and a stimulus to keep abreast of the developments in his particular field.

J. L. ST. JOHN

STATE COLLEGE OF WASHINGTON

FUNCTIONS OF REVIEW JOURNALS

THERE has recently come to hand from an enterprising German publishing house a prospectus of various medical review journals or "Referatenblätter" (Zentralblätter, Zeitschriften, Berichte, Jahresberichte). These journals are excellent for the purposes for which they were originally intended—several Berichte I should not like to do without. They enable one to read more discriminately; but that they might be considered short-cuts or "royal roads to learning" had not occurred to me. Hence my surprise on reading on page 4 of the prospectus referred to the following paragraph:

> . . . Die Zentralblätter sollen den Bezug der ausländischen Litteratur, wenigstens für die deutschen Leser, überflüssig machen, und es wird besonders darauf gesehen werden, dass die *wichtigen* ausländischen Arbeiten so ausfürlich referiert werden, dass ein Einblick in das Original im allgemeinen entbehrlich erscheint.

One wonders whether biological literature is not thus behaving like the legendary dragon-fly that swallowed itself, beginning at the abdomen. Can one afford to ignore the basic journals, including the German ones, or shall we discount the statement of the prospectus as an overenthusiastic expression of nationalism? To my notion there is no danger to the substantial biological literature, for after all a review is a review, a Referat a Referat. One can not afford to get one's information second hand in any field of research; hence the value of review journals will always be limited.