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.

The aims of *Biological Abstracts* are more praiseworthy in this respect, I think. These are, as I understand them, to enable the reader to read more, not less; to enable him to read more widely by furnishing titles and references and to read more discriminatingly by adding a brief statement of scope of work covered and conclusions drawn, and to give such indexes as to provide a dependable orienting mechanism. More lengthy "Berichte" will continue to fit into the scheme, especially in helping one keep in touch with related fields (Grenzgebiete) and other fields in which one happens to be an interested amateur.

CARNEGIE INSTITUTION, BALTIMORE

CARL G. HARTMAN

SCIENTIFIC APPARATUS AND LABORATORY METHODS

NEW TECHNIQUE FOR COLLECTING INTESTINAL ROUNDWORMS[1]

THE isolation of small roundworms from the intestinal contents of host animals is recognized as a difficult and tedious task. As the intestine loses the body heat, the mucous secretions from the intestinal glands pour into the spaces between the villi and soon all other material in the lumen of the intestine becomes imbedded in viscid, opaque mucus, which not only obscures any small nematodes present, but renders their isolation difficult. Experimental studies on the larvae of ascarids and closely related forms which do not become attached securely to the intestinal mucosa have led to the plan of keeping the host animals off feed before autopsy, of prompt removal of intestinal contents and of the use of mucus solvents. But in spite of these precautions, the isolation of the larvae has been a slow, laborious process.

During the past year while working with larvae of the large roundworm (*Ascaridia lineata*) of chickens some new features were added to the technique which so greatly facilitate the removal and isolation of the young worms that it seems desirable to make a record of them. By the new method the experimental birds are kept off feed over night, or for six hours prior to autopsy, to decrease the volume of intestinal contents. After the bird is decapitated, the small intestine (habitat of the nematodes) is quickly removed, stripped of its mesenteries and other appendages and divided into portions approximately a foot in length. Each portion is then flushed with hot water under pressure, to remove the contents before the intestinal glands become active. In flushing, one end of the intestine is held over the flushing cone (Fig. 1, *a*) and the other end inserted into an Erlenmeyer flask. The amount and pressure of the hot water admitted into the intestine are such as to distend but not rupture the walls of the intestine. This enlarges the spaces between the villi, and thus permits free hydraulic action on all the intestinal contents. These contents from each bird are placed in a glass jar and preserved in 4 per cent. formol. To remove the worms the material is decanted, stained with Jenner's stain, poured into a shallow moist chamber and examined with low-power binoculars. The white worms, which do not readily take up the stain, stand out in contrast to the blue intestinal débris.

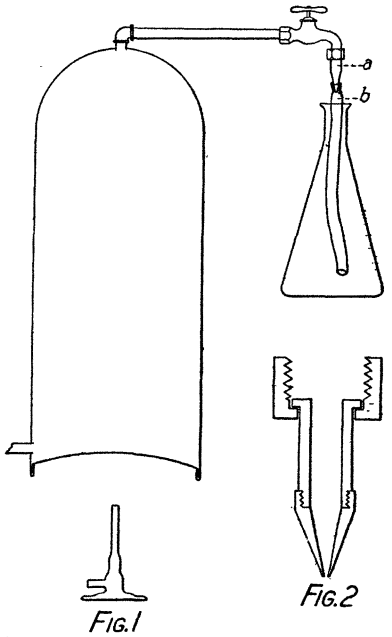

FIG. 1. Apparatus for flushing intestinal contents. *a*, flushing cone; *b*, portion of intestine showing distention due to pressure of water.
FIG. 2. Details of flushing cone.

The question of the efficiency of this method was, of course, one of the first to arise. In several preliminary trials, young worms were readily isolated from the flushed contents, but were not found in scrapings from the walls of the flushed intestines. Arrangements then were made for definite tests, and two experiments were carried out. After flushing the intestines in the usual way, they were slit open, the mucosa scraped, the material teased apart and examined with the aid of a binocular microscope.

In the first experiment, the individual chickens were parasitized at the age of five weeks by the administration, *per os*, of fifty embryonated eggs of the nematode. Eight weeks later a second feeding of embryo-

[1] Contribution No. 115 from the department of zoology, Agricultural Experiment Station, Kansas State Agricultural College.