family prevail upon him to make a journey. Every day he repeated his motto: "There are only two fine things in life: studying mathematics and teaching mathematics." On the other hand, we see him occasionally in a state of irritability and bad temper. His rivalry with Fourier sometimes assumed an undesirable form and in his polemic with Fresnel he was also often harsh and unjust. We can understand that the insufficient mechanical arguments by which Fresnel had tried to support his hypothesis could have offended him as a mathematician. But it is strange that he had no eye for the physical proofs produced in hundreds of experiments. However, the close study of Fresnel's ideas had a very strong influence on Poisson's later work, though he never admitted this. In his paper of 1830 on the propagation of sound in elastic bodies he pays equal attention to the transverse and to the longitudinal waves.

More than anybody else Biot had identified himself with the views of the emission theory, and its extension for the phenomena of polarization was essentially his work. Like Poisson, he started a polemic with Fresnel which, however, did not present much of interest. Nevertheless, Biot was the only one of the group who in later years, long after Fresnel's death, succeeded in a complete acceptance and assimilation of his theory. In 1846 Fresnel's brother, who was preparing for print an edition of Augustin's collected writings, had to examine some posthumous manuscripts in collaboration with Biot. In this connection he relates the following episode:

> Mr. Biot, after having expressed in warm words his high appreciation of Augustin's personality and his regret of not having come in closer social contact with him, dwelt with much emphasis on his scientific work. After a few moments' hesitation he proceeded with more animation as if moved by overwhelming thoughts: "What a marvelous power of intuition did your brother show in his fruitful concept of transverse vibrations!" One can imagine my surprise and emotion at this exclamation of the famous old man whom I had always regarded as one of the greatest fanatics of the Newtonian theory.

In the later development of optics it became known through the work of Maxwell and Hertz that the vibrations of light are not of a mechanical, but of an electromagnetic nature. Fresnel's theory was not affected by this as it implies only the existence of vibrations and their transverse character. Another crisis in our ideas of the nature of light is taking place at present, but under the name of the principle of correspondence we are still using and will continue to use the whole body of Fresnel's analysis. Again, as in Maxwell's time, the mathematical theory remains practically unchanged and only its physical interpretation is under discussion.

There is not much to say about the outer circumstances of Fresnel's life. As a governmental engineer he was assigned to the department of lighthouses in view of his optical propensities. These duties were not a sinecure. Important progress in the construction of searchlights is due to Fresnel, and his writings on this subject fill one of the three volumes of his collected papers. Taking into account that he acted at the same time as examiner at the École Polytechnique, it is astonishing how he could afford the necessary energy and time for his enormous scientific work. His health, always delicate, could not resist this strain. In the last years of his life frequent indispositions did not leave him time enough to divide it between science and official obligations. Devoted to his duty he decided in 1824 with a heavy heart to give up the main part of his scientific work. In the beginning of 1827 he was obliged to petition also for relief in his office by allowing him an assistant in the person of his brother. But it was too late: four months later he expired at the age of thirty-nine in the arms of his mother.

Fresnel's contemporaries did justice to his personality and to his scientific fervor. They were not able to appreciate the greatness of his work, which became apparent only to posterity, as the relative height of mountains can be judged only from a distance. I thought to-day a good opportunity to let pass before your eyes Fresnel's life and the fight he had to lead for his ideas a hundred years ago.

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THE CONDITION AND NEEDS OF SYSTEMATIC MYCOLOGY

THE subject of mycology is of such vital concern not only in connection with its many practical and important relations to human industry and activity, but also in the fundamental problems of biology, as to deserve much greater and more careful attention from student and teacher, as well as from the general scientist, than it receives at present.

Interpreted in its broader sense as including the study of bacteria and yeasts, as well as the multitude of parasitic and saprophytic fungi, mycology is of vast economic and scientific significance. The bacteria in relation to plant and animal diseases, the yeasts in connection with important industrial processes and the parasitic fungi in their relation to agriculture by the destruction of growing crops, stored food and other products, merely constitute a few of the important practical aspects of the subject. With respect to purely biological problems, such as phylogeny and evolution, the fungi offer especially favorable material for research, as various aspects and

phases of these problems can be attacked with greater hope of success by using organisms of simple structure, which can be easily and rapidly grown under artificial conditions that permit of the most rigid control and measurement.

Notwithstanding the great significance of the fungi, students of their taxonomy have been and are comparatively few, and they are often but poorly prepared for their work. The vast number of fungi concerned, of which nearly one hundred thousand supposed species have been described, and the many pleiomorphic and minute forms offer numerous and perplexing problems in the way of identification and classification. However, the facilities for thorough study in this field have increased rapidly in recent years, and with our present laboratory, library and herbarium equipment, and the increased opportunity for travel and collection, little excuse can be found for the hasty and superficial work frequently published.

What is the reason for the present dearth of investigators and students in this vast and interesting field and the inferior quality of much of the work? In Europe, general students of fungi and amateurs are much more numerous than in this country. This seems to be due, in part at least, to the better textbooks and field manuals available. In our haste for specialization in this field, as in others, the needs of the general botanist, the student and the amateur are overlooked or neglected.

Adequate and effective progress in mycology, as in all other sciences, depends upon the stimulation of interest in those who may be able to contribute toward it either in the way of research, field observation and the collection of material, or in general interest or moral and financial support. In order to secure such interest and cooperation, professional mycologists must have high ideals of research and service, in addition to a broad and thorough knowledge of the subject, which should be made available to all that desire it.

Attractive and reliable books on the taxonomy of the fungi are greatly needed, especially such as are adapted to the use of the student and general botanist, as well as comprehensive and thoroughgoing monographs. These can be properly prepared only by those who have devoted many years to the study of the subject in field, laboratory and herbarium and have had exceptional facilities in the way of literature and specimens.

Two great deterrents to students, as well as to general botanists and other plant scientists, are the lack of uniformity and stability in the use of Latin names and the endless subdivision and duplication of genera and species. With the continuous changing of names by different workers, in addition to the shifting interpretations and applications made of the same name, it is impossible for the student or general worker to take up the subject with any degree of interest or satisfaction. Accompanied as this is by the constant destruction of generic and specific landmarks and by the avalanche of so-called genera and species that exist only in the mind of the describer, it is not strange that mycology languishes.

It is patent that these two handicaps must be at once diminished, and ultimately removed, if mycology is to command respect and scientific support and render the practical service that it should. The selfish and myopic interests of a few specialists can not be allowed to override those of the much larger group that needs and would welcome a scientific and usable systematic mycology. New objectives and new methods with broader training and experience are demanded, and these can be secured only by building upon the best practice and knowledge already available.

Unfortunately, there are still fundamental differences of opinion as to how the problems of nomenclature can be most quickly and satisfactorily settled. Since the late nineties, priority of publication has been somewhat generally adopted as the basis for a choice of names. However, after a thorough trial this method has proved a failure, for reasons that have been given elsewhere.[1] Some have suggested that the nomenclature of the latest monograph of a group should be followed. This gives no greater promise of securing the desired result, because the monographer usually selects names according to individual preference or adherence to some particular code. Monographers are much given to expressing their individuality through changes of names and rarely if ever do two monographers of a group employ the same nomenclature, so that neither uniformity nor stability is reached by such a plan.

In view of this situation, we believe that the quickest and simplest method of securing stability and uniformity in the use of the names of fungi is to follow general usage. This may at first appear to be an indefinite and uncertain basis, as there is at present considerable difference in practice in different cases and by different mycologists. However, we feel that a committee of mycologists familiar with the principal systematic mycological literature of the world could prepare a list of species and genera on this basis that would be acceptable to the majority of users. When fixed by the citation of a particular species as the nomenclatorial type of each genus and a particular specimen as the type of each species, a fairly uniform and satisfactory nomenclature of the fungi should be assured.

[1] C. L. Shear, "Failure of the Principle of Priority to secure Uniformity and Stability in Botanical Nomenclature," SCIENCE, 60: 254–258, September 19, 1924.

Such a committee should also have some jurisdiction over the systematic units, especially genera and species. The constant multiplication of these is much more subversive of uniformity and stability than the mere changing of names.[2] Even the specialist finds it sufficiently discouraging to have to remember two or more names for the same unit, but when the unit is also wiped out, whether it be genus or species, by the superficial methods of current segregation, the result is chaos. If the units thus produced were a consequence of thorough field and experimental study and were capable of practical application, the values obtained might outweigh the confusion introduced, but this is practically never the case, and a bad situation is made worse by the complete neglect of evolutionary and phylogenetic values, which should be paramount in any taxonomy worthy the name. The best usage of conservative taxonomists since the time of Linnaeus affords the only possible basis for making mycology of definite and far-reaching service and for converting it into a real science based upon evolution and relationship.

Unless it adopts these objectives as its own, systematic mycology with its perpetual changing of names and its futile splitting and duplication of genera and species will fall into even greater disfavor and will continue to be ignored by general botanists and specialists in other lines of plant science and to be regarded with apathy by student and amateur alike. If those who regard the best usage as a feasible basis will support the plan suggested, order may yet be brought out of the present chaos of names and units, and the time and energy of mycologists can be devoted to the many basic problems that are in such great need of thoroughgoing research.

C. L. SHEAR
F. E. CLEMENTS

SCIENTIFIC EVENTS

EXPEDITION TO CENTRAL AMERICA TO STUDY THE HOOKWORM DISEASE

PLANS have been completed for a research expedition to Central America under the leadership of Dr. W. W. Cort, professor of helminthology at the Johns Hopkins School of Hygiene and Public Health, for the purpose of improving control measures used in combating the hookworm disease. The expedition is part of a program of cooperation which is being carried out between the department of medical zoology at Hopkins and the International Health Board of the Rockefeller Foundation.

This year's commission to Central America will be divided into two groups, one of which will go to Panama and the other to Nicaragua. One group, which will sail from New Orleans about the first week in June, will consist of Dr. D. L. Augustine, assistant professor of helminthology at Harvard University, and Dr. W. A. Riley, professor of animal biology at the University of Minnesota. The other group, which will leave New York for Nicaragua the latter part of May, will consist of Dr. N. R. Stoll, associate in helminthology in the Johns Hopkins department of medical zoology; Harold Brown, assistant in helminthology at Hopkins, and Dr. Maurice C. Hall, chief of the zoological division of the U. S. Bureau of Animal Industry.

Dr. Cort will divide his time between the two groups so as to coordinate the work.

This expedition will be the fourth taken under Dr. Cort's direction. In 1921 a commission was sent to the Island of Trinidad, in the British West Indies, by the Rockefeller Foundation, to make a scientific study of diseased localities there. The following year Porto Rico was the chosen field of investigation, and in 1923 a commission was sent to China, where fourteen months were spent in research work.

In both Nicaragua and Panama, the commission will be assisted in its work by officers of the health department, a number of local physicians, and staffs of native technicians trained in campaigns against disease.

The two parties of investigators will continue their work throughout the summer and will return early in October.

NATIONAL RESEARCH FELLOWSHIPS IN THE BIOLOGICAL SCIENCES

THE Board of National Research Fellowships in the biological sciences, at its recent meeting on February 27, made the following appointments and reappointments for the year 1926–27:

REAPPOINTMENTS

J. N. Couch—Botany
W. N. Ezekiel—Botany
H. W. Feldman—Zoology
T. N. Jenkins—Psychology
M. F. Metfessel—Psychology
Nellie M. Payne—Zoology
A. M. Showalter—Botany
Lee E. Travis—Psychology
Mildred Trotter—Anthropology
Conway Zirkle—Botany

NEW APPOINTMENTS

C. Dale Beers—Zoology
David Brunswick—Psychology
Kenneth Cole—Biophysics

[2] F. E. Clements, "Research Methods in Ecology," p. 12, 1905; "Ecologic View of the Species Concept," *Am. Nat.*, 42: 253, 1908. H. M. Hall and F. E. Clements, "Phylogenetic Method in Taxonomy," p. 2, 1923.