

## PRESIDENTIAL ADDRESS.

By E. W. Swanton.

**EDUCATION IN MYCOLOGY.**

We may suppose that Man's education in mycology began in very remote prehistoric times with experimental tasting of certain kinds of fungi, and there is no evidence that his education made any further progress in Egyptian times.

In the 5th century (B.C.) the Greek writers Euripides and Hippocrates recorded cases of accidental poisoning through eating fungi, and about two hundred years later another Greek, Theophrastus, indulged in some philosophic musings on the nature of fungi.

The oldest extant illustration of a fungus was made by a mural painter at Pompeii in the first Christian century: divested of the volcanic ash which concealed and preserved it for nineteen hundred years it has been identified with *Lactarius deliciosus*.

Though the views held at that time concerning the origin and development of fungi were very wide of the mark, yet there is evidence that the economic study of these plants was increasing. It had been ascertained that crops were liable to attack by Rust, and a spring festival, the Rubigalia, or Robigalia, was instituted with the object of propitiating the god Robigus who alone was supposed able to avert the attack. It was known that some of the larger fungi possessed medicinal properties, but the curative values were greatly over-estimated. With increased knowledge of poisonous kinds, rules and tests for distinguishing between edible and injurious species were drawn up, and remedies were devised for the ill effects of the latter; attempts were also made to neutralise the poison of fungi by employing special methods of preparing them for the table. The cultivation of edible kinds was not neglected, but we have no evidence that *Psaliota campestris* was grown from spawn. Dried fungi were used as tinder. Such in brief, was the knowledge of fungi in Roman times,\*

\* See Professor Reginald Buller's Address on "The Fungus Lore of the Greeks and Romans," p. 21 of the present volume.

and during a very long period subsequently no great advance was made.

The history of the progress of investigation in various groups of fungi has been recently outlined in our Transactions. Miss Lorrain Smith in a paper on the Micro-fungi<sup>†</sup> has indicated the results of the investigations of many "inquisitive persons" from ingenious Robert Hooke to Dr. C. B. Plowright in whom the bump of inquisitiveness was remarkably developed.

Miss Lister has given a delightful account of the Past Students of the Mycetoza and their work.<sup>‡</sup> In a quotation from the 16th century German herbalist Hieronymus Bock she shows that mycology had not made much, if any progress during a period of fifteen centuries. Pliny believed that Truffles "are a kind of earthly concretion," whilst Bock thought that mushrooms are merely "the superfluous moisture of the earth and trees, of wood and other rotten things."

Mr. J. Ramsbottom in a series of three papers dealing with the history of the classification of the Uredinales,\* Discomycetes§ and the Phycomycetes|| has provided some valuable notes on the work accomplished by mycologists since the dawn of the 16th century. He observes that "at the time of the Renaissance the whole aim of botanists seems to have been to obtain clearness as to the identity of the plants mentioned by classical writers;" and that from a historical point of view interest centres to a surprising extent "in the work of a certain few botanists no matter which group of fungi is in question." We must not forget that the work of the 16th century mycologists was done without the aid of the compound microscope. Though the magnifying property of the simple lens was known to the ancients, yet it was not until 1590 that the first compound microscope made its appearance. Zacharias Jansen, a Dutchman, is credited with the invention. It was a feeble instrument, and for a long time was accounted nothing more than a curious toy; but that its possibilities were quickly realised by English botanists is evident from the fact that some fifty years later, in 1665, appeared Robert Hooke's famous work "Micrographia or some physiological descriptions of minute bodies made by magnifying glasses with observations and inquiries thereupon." That classic volume contains the earliest known study of microscopic moulds.

† Trans. Brit. Mycol. Soc., III., p. 18.

‡ Trans. Brit. Mycol. Soc., IV., p. 44.

\* Trans. Brit. Mycol. Soc., IV., p. 77.

§ Ibid, p. 382.

|| Ibid, p. 324.

The discovery of the achromatic lens by Christopher Hall in 1729, awakened the deeper spirit of scientific enquiry which has been maintained increasingly until the present time. The possessors of that spirit are a very small minority, and in all branches of science strenuous effort on the part of those possessed of a natural gift for popular teaching is required to fan and keep alight the flame of public interest in scientific matters. Especially so is it with Mycology, which being concerned with a division of the vegetable kingdom comprising plants that are still largely regarded as uncanny, but slowly attracts adherents.

Interest in the flowering plants has always been more easily fostered, and, apart from aesthetic considerations, was largely kept going in the 17th and 18th centuries by the herbalists. Not until the close of the 18th century did it become customary to include classified descriptions of fungi in text books dealing with the British Flora. The greatest populariser of mycology at that time was James Sowerby, the author of *English Botany* (1797-1809) a work which included coloured illustrations of fungi. Sowerby must have been a born teacher, for he prepared more than 200 models of edible and poisonous fungi which he arranged in his house, and invited the public to inspect, free of cost, two days in each month. In 1844 the models were acquired by the nation, and, in a restored condition, may be seen in the Department of Botany at the British Museum.

During the first half of the 19th century the energies of mycologists were largely devoted to the description and classification of new species. Then, as now, the man in the street had no interest in dry-as-dust terminologies, exact though they may have been, and mycology made but slow progress. Later, when Darwin's mighty genius had expanded the entire outlook of the world of science, botanists realised that the primary object of investigation is the living plant, not the dried herbarium specimen; and the students of plant life are now ranged in two main groups, in one are those engaged in investigating cell and tissue, in the other the workers are striving to ascertain the evolutionary history of the plant and the influence of environment upon it.

Research work in all departments of botany yields results of national importance, perhaps such are more marked amongst Fungi because of the widespread damage that parasitic species may cause to cultivated plants. The value of the work which is being carried out by mycological researchers will be best appreciated by giving some data concerning the losses through fungus pests that have been recorded during recent years.

Prussia lost in 1891, through an epidemic of grain rust, wheat, oats and barley to the value of £20,648,147. The loss through the same cause to the wheat harvest of Australia in the years 1890-91 has been estimated at £2,500,000, a trifling sum compared with the £40,000,000 estimate of the sum total of injury caused by fungi in the United States during 1897, as given in the Year Book of the United States Department of Agriculture. Considered from the financial standpoint, the damage caused by fungus pests is exceeded only by that of war.

Some interesting statistics have appeared in the publications of the Department of Agriculture, Victoria. Writing of the Peach-leaf Curl (*Exoascus deformans*) McAlpine remarks upon the difficulty of estimating the annual loss caused by this disease. "It is greater than growers think, because a great deal of the injury really due to it is attributed to other causes. In the United States it has been estimated from reliable data that the entire annual loss is not less than £600,000."\* In a chapter on the present position of the Rust in wheat question in Australia, the same authority informs us that "in a particularly bad season like that of 1889, the loss was estimated to be for the whole of Australia between £2,000,000 and £3,000,000."† McAlpine computes that 50 per cent of the potato crop of Victoria was destroyed by blight (*Phytophthora infestans*) during 1910-11, and by way of emphasizing the ravages of this pest he points out that "in the United States it is reckoned that there is an annual loss from the disease of £7,500,000, and in New Zealand, for 1905, it was estimated at nearly £200,000.‡

A table has been published§ which gives the approximate losses through Smut to the wheat and oat crops of Victoria and certain American States.

\* Fungus Diseases of Stone Fruit Trees of Australia, p. 16.

† The Rusts of Australia, p. 64.

‡ Potato Diseases in Australia, p. 2.

§ McAlpine, The Smuts of Australia, p. 136.

Crop.	Disease.	State.	Period.	Estimated Loss.	Authority.
Wheat	Stinking Smut ( <i>Tilletia levis</i> & <i>T. Tritici</i> )	Victoria	1898	£ 50,000	Mc. Alpine
Oats	" Smut ( <i>Ustilago Avenae</i> )	Ohio	Annual	52,083	Selby
"	"	Kansas	1888	287,985	Kellerman and Swingle
"	"	"	1889	177,199	Kellerman and Swingle
"	"	"	1890	189,854	Kellerman and Swingle
"	"	Indiana	1889	166,151	Arthur
"	"	"	1890	126,115	Arthur
"	"	Michigan	1891	166,666	Harwood
"	"	"	1892	208,333	Harwood
"	"	Wisconsin	1901-3	2,812,500	Moore
"	"	United States	1880-1890	33,845,210	Swingle
"	"	" "	Annual	3,384,521	Swingle

McAlpine remarks of the Stinking Smut that in more recent years the general treatment of the seed wheat has reduced considerably in Victoria this preventable loss.

The approximate estimates that I have quoted concern the United States, Australasia and Prussia, but similar damage on a greater or lesser scale is inflicted annually in all other countries. If we give but a few minutes' reflection to the mischief that is wrought yearly in every cottage garden, we realise that Massee\* is not taking an exaggerated view in supposing that the annual loss throughout the world exceeds £150,000,000, and that probably double this amount would be nearer the truth. Every year the cottager sees his potatoes attacked by *Phytophthora infestans*; his apple trees weakened by *Nectria ditissima* and their fruit destroyed by *Gloeosporium fructigenum*: also he frequently experiences the disappointment of seeing his roses powered by *Sphaerotheca pannosa*, and his Hollyhocks rendered unsightly by *Puccinia Malvacearum*. To an equal extent the farmer and the forester have always before them disagreeable evidences of the silent work of destruction which is being carried out by fungus foes. Not a garden, farm or forest is entirely immune, the gravity of the losses has aroused wide-spread attention, and steps are now being taken in all countries to promote education in mycology, and to acquaint gardeners, farmers and foresters with the best methods of combating fungus pests.

\* Text Book of Fungi (1906), p. 218.

I have obtained from certain countries particulars as to the educational methods therein employed. First of all let us note those of our Dominions.

#### AUSTRALIA.

High Schools and Colleges are established in all the Australian States, and the diseases of plants are carefully studied. The importation of pests is checked to a very great extent by a Quarantine Act, and by a rigid system of inspection carried out under the Vegetation Diseases Act. To the operations of the former Act Australia probably owes its immunity from the numerous varieties of "Scab" disease of Potato.

There are departments of Agriculture in the various States. That at Victoria has issued monographs dealing with fungi that attack Citrus Trees, Stone Fruit Trees, Potatoes and Cereals. All were prepared by Professor D. McAlpine, Government Vegetable Pathologist, and are profusely illustrated. The illustrations include a large number of photomicrographs. These volumes indicate very clearly the rapid advance, during recent years, of our knowledge of fungus organisms.

In the preface to the volume concerned with the diseases of Citrus Trees\* McAlpine points out that up to 1898 there were not more than four species of fungi which had been scientifically determined as occurring on orange and lemon trees in Australia, in his report issued in the following year he recorded eighty two species along with their technical descriptions; of the seventy eight additions no less than fifty one were new to science.

In the monograph which deals with the diseases of Stone Fruit Trees he describes one hundred and fifteen species, about one half of them being new. This treatise contains ten coloured plates and three hundred and twenty seven other illustrations.

The volume on the Rusts of Australia contains full descriptions of one hundred and sixty one species, a notable advance on M. C. Cooke's Handbook of Australian Fungi published fourteen years previously, which enumerated seventy two species.

The monograph of the Smuts contains fifty six plates, of which thirty are reproductions of photomicrographs.

In the preface McAlpine replies to the criticism that his volume on the Rusts contains far too many photomicrographs. "The unquestioned fidelity to nature which photo-

\*Fungus Diseases of Citrus Trees in Australia, p. 7.

micrographs represent, far outweighs the seeming clearness and explicitness of an ordinary drawing. It is really astonishing how often scientific error is perpetuated, because it is based on drawings of what the author imagined but did not really see."\*

The volume which is concerned with Potato diseases contains fifty plates, chiefly from photographs. Plate XVII has special educational value in that it shews side by side the produce of treated and untreated seed potatoes. Such illustrations capture the imagination of growers, and convince them that they will be well repaid by acquiring some elementary knowledge of botanical science.

#### SOUTH AFRICA.

I am under obligation to Mr. I. B. Pole-Evans, M.A., B.Sc., F.L.S., Chief of the Division of Plant Pathology and Mycology, Union Department of Agriculture at Pretoria for the following particulars concerning the recognition that mycology receives in the Union of South Africa.

The Transvaal Government in 1905 appointed the first official mycologist. In 1911, under Union, the Division of Mycology and Plant Pathology was established in the Union Department of Agriculture, this Division was recently incorporated with the Division of Botany. Mycology is given considerable prominence in the Department of Agriculture. The headquarters of the Division of Botany is at Pretoria, and a Phytopathological Laboratory is established there which is probably one of the most up-to-date as regards equipment. It is also furnished with a large number of illustrations, both coloured and otherwise, of edible, poisonous and parasitic fungi. Specimens are exhibited in the museum attached to the laboratory. The public take full advantage of these educational advantages, and every year sees an increase in the number of enquirers. Under the Department of Agriculture mycology is given a place in the curriculum of the Agricultural Colleges and Schools, and the fungi which attack farm crops naturally receive the chief attention.

A station for the investigation of tropical and sub-tropical growths has recently been opened at Durban, and is administered from the laboratory at Pretoria, at the latter city there is a large mycological herbarium containing an extensive collection of South African fungi. Particular attention is being given to the rusts growing on economic and indigenous plants, and also to the mildews which occur thereon.

Mr. Pole-Evans forwarded a parcel of literature issued in

\* The Smuts of Australia (Ustilagineae), p. 6.

recent years by his Department. It contains valuable papers by himself, Miss Ethel M. Doidge M.A., F.L.S., Mr. Paul A. van der Byl M.A., and by Mr. Averil M. Bottomley B.A., which indicate the vigilance of these investigators in combating fungoid and bacterial disease in South Africa. Three classes of bulletins are issued, viz.: Science, Farmers, and Technical. The great majority are illustrated in black and white from excellent photographs.

#### CANADA.

Dr. H. T. Güssow, Dominion Botanist has kindly supplied the following memoranda respecting mycology in Canada.

The general public, particularly the agricultural and horticultural community, is afforded a unique opportunity in matters concerning economic mycology, by a visit to the various agricultural Experimental Farms and Stations established by the Dominion Government throughout Canada, where the effect of control measures against the ravages of fungus diseases is being demonstrated successfully every year.

The Department also maintains at the Central Experimental Farm, Ottawa, a scientific laboratory and technical staff, under the direction of the Dominion Botanist, largely devoted to researches in all phases of plant pathology, of which mycology is a part. This laboratory keeps in close touch with farmers by correspondence, and by personal instruction or demonstration carried on, if necessary, on the premises of farmers where economically important diseases occur. The laboratory also serves as a bureau of information on such matters, and the botanical staff is at the service of the public of Canada without any cost to any consultant.

Interest in the control of diseases is greatly encouraged in every possible way. Plant Pathological Branch Laboratories have been established in various parts of the Dominion. The officers in charge carry on educational campaigns, demonstrations on farms throughout their district, and in the winter months hold short courses on the control of plant diseases. They also carry on such experiments along these lines of work, and in as many different localities as advisable, in order to become fully acquainted with the behaviour of certain parasitic fungi, under the various climatic and geographical conditions existing in a country of some 4,000 miles latitude from the Atlantic to the Pacific. Facilities exist under which farmers or fruit growers reporting any particular troubles may be visited in the briefest time by a technical officer of the district to advise and assist in the carrying out of control measures.



The Central Laboratory issues annually a report of its work, of which some sixty thousand copies are distributed through the mailing list of the Department. From time to time bulletins, pamphlets and circulars are issued on special subjects dealing with the control of specific economic diseases. Editions, sometimes as large as one hundred and sixty thousand, are distributed free of cost to the interested public.

Coloured illustrations, particularly wall charts or folders of convenient size have been issued as necessity arose and widely distributed. These illustrate mycological pests. There is not at present a sufficient desire for information on poisonous and edible mushrooms to warrant the publication of coloured illustrations of such, but exhibitions of edible and poisonous fungi have been prepared and shewn in districts where there were particular demand for such demonstration. All literature published by the Departments of the Dominion Government is issued in the French as well as the English language.

Mycology is not taught as a separate subject in colleges and schools. The students of the various agricultural colleges naturally receive an elementary training in Plant Pathology as far as required when taking biological courses. There is no special chair of plant pathology endowed at any of the Canadian Universities. Mycological instruction is given to the students of botany, and the amount depends largely upon the tendencies of the professors. The Universities are fortunate to have such men as Buller, Faull and others who have distinguished themselves in mycological researches.

The difficulty of securing reliable statistics on the prevalence of fungus pests increases with the size of the country, and it can well be realised that an organisation of immense character would be required to enable the Dominion Government to collect such data with any degree of reliability. Such action has not as yet been taken, but determination of the losses due to certain epidemics have been made from time to time for certain districts and for certain crops. The staff of the Central Laboratories address from time to time public meetings on the subject of the economic importance of plant diseases as occasion arises. There are no Mycological Clubs in Canada.

#### INDIA (BENGAL).

I am informed by Mr. J. A. Blackwood that mycology has not as yet received much attention in India, though, being in charge of the Agricultural Department of Bengal solely, he does not feel in a position to state definitely what is being done in other districts.

The Bengal Agricultural Department has on its staff a Mycological Collector who works under the supervision of the Economic Botanist. Specimens of diseased crops are forwarded to him by the public from all parts of the Province for examination and advice, and whenever necessary he visits the affected tracts with his microscope to study the disease on the spot. He also attends the various Agricultural Shows and Exhibitions where he delivers lectures on the commonest fungoid diseases, exhibits specimens of diseased crops, suggests methods of prevention and treatment, and gives practical demonstration on the preparation of fungicides and the use of sprayers. A few pamphlets and leaflets, in English and Bengali, with coloured plates and descriptive letter press have been written by him, and these are distributed free on such occasions among the visitors.

Elementary botany (including mycology) does not find a place in the curriculum of any schools in Bengal. Two or three Colleges affiliated to the Calcutta University teach Botany (with mycology) up to the B.Sc. standard. There is at present no Agricultural College in the Province, the Sabour Agricultural College established by the Bengal Government some six years ago now lies in the new province of Behar and Orissa, but most of the students of this College go there from Bengal. Cryptogamic Botany is one of the subjects of study in the College, and special stress is laid upon diseases of plants. There is a two-year course in Mycology at the Agricultural Research Institute and College at Pusa. This is a post-graduate course to which eight students can be admitted every year who have passed with credit through a Provincial Agricultural College or are graduates of an Indian University.

The Pusa Institute is the chief centre of mycological work in India. It owes its inception to the generosity of Mr. Henry Phipps, who, in 1903, placed at the disposal of the Viceroy (Lord Curzon) a sum of £20,000, to which he subsequently added another £10,000, to be devoted to some object of public utility in India, preferably in the direction of scientific research. With part of the gift a Pasteur Institute was set up at Coonoor in southern India; the balance was ultimately used to establish the Pusa College and Research Institute, to which a farm of some thirteen hundred acres is now attached. The Annual Report of the Board of Scientific Advice for India contains a summary of the mycological work carried out at the College, prepared by the Imperial Mycologist, Mr. E. J. Butler M.B., F.L.S., the author of many valuable papers on economic and systematic mycology. Mr. Butler informs me that no general bulletins or pamphlets of

an educational character have been published at Pusa, but vernacular leaflets dealing with specific crop diseases have been prepared and distributed free in certain affected districts. The important "planters' crops" (tea, coffee, &c.) do not usually come within the scope of the Pusa mycological section, as the Indian Tea Association has its own mycologist (Mr. A. C. Tunstall), and the South Indian Planters' Association has a planting expert (Mr. R. Anstead) who, with some assistance from Pusa, do most of the work amongst European planters. In the Journals of these Associations, various popular articles have appeared, notably by Mr. Tunstall in the Quarterly Journal of the Indian Tea Association. There was a series, running through several numbers, dealing with the principal types of fungi, and one in the course of publication deals with the fungi affecting the roots of tea plants. A considerable number of descriptive and research papers on Mycology have been issued from Pusa and the few other centres in India where mycologists are stationed.

Excepting the few leaflets alluded to above, no mycological literature has been distributed free by the Government. The cultivators are usually insufficiently educated to understand such, and the mycologists rely chiefly on direct demonstration to get remedial measures carried out. It is pleasurable to record that some of the demonstrations have been markedly successful, for example, following one on the use of copper sulphate against Sorghum smut, the Bombay Department now issues 1-anna (penny) packets through the agency of a private firm, and expect to sell about two hundred thousand this year. The loss from this disease in Bombay Presidency alone is believed to be in excess of one million sterling annually.

Public interest in mycology is slight. Some show cases prepared at Pusa, have been sent out several times to Agricultural Industrial and other Exhibitions, but Mr. Butler does not think they have accomplished much as yet from the educational standpoint.

Bonâ fide workers in any branch of botanical science may consult the collections and library at the Royal Botanical Garden, Calcutta. There is throughout India a lack of mycological clubs to foster interest in fungi.

In passing on to allude to mycological work in the United States, France, Holland, Denmark and Norway I wish to point out that the omission of other countries—Germany, Austria, &c.,—results from abnormal conditions brought about by the World War, and not from any purposeful selection on my part. Those conditions prevented me from obtaining the direct information that I wanted.

## UNITED STATES.

Mr. C. H. Lane, chief specialist in Agricultural Education, informs me that courses in economic mycology are given at all the State Agricultural Colleges and many other higher institutions of learning, and that the educational effect of these courses is very great. In addition there are large extension forces which deal with the practical phases of parasitic fungi in their relation to crop production by means of lectures, publications\* and demonstrations. The methods appear to be much the same as those already noted for Canada. Experiment stations and universities contribute, at irregular intervals, publications on the subject of mycology; the former emphasize chiefly the economic or pathogenic importance of the species, while the university publications are more technical, and are often monographs on a single genus.

As regards the popularisation of mycology, Mrs. Flora W. Patterson, Mycologist in charge at the Bureau of Plant Industry tells me that comparatively little effort has been made in this direction. I gather, however, from the information that she has kindly supplied, that the United States does not lag behind other countries in this matter. The interest in the subject has been local rather than general, and largely confined to persons interested from the mycophagist point of view than from the systematic or technical side of the subject. In recent years the Museums of various institutions, such as the Museum of the New York Botanical Gardens, the Brooklyn Museum of Arts and Sciences, and the Botanical Museum of Harvard University have prepared exhibits of mushrooms and certain other fungi of unusual or striking appearance, with brief descriptions and notes on their economic value, habitat, time of occurrence, &c. Though the Department of Agriculture has not now any special exhibits, it encourages amateur collectors, and identifies numerous specimens sent in by correspondents or local collectors. In addition to dried specimens that office possesses a large collection of photographs and coloured illustrations; many of them were taken in the field, and convey an idea of natural habitat and surroundings. The collection includes a number of water colours and photographs prepared under the direction of Dr. Thomas Taylor, a pioneer in mycology in the United States. In 1876 Taylor was "microscopist" of the Department of Agriculture, in that year he prepared an

\* Many publications dealing with economic fungi have been issued by the Bureau of Plant Industry. They are catalogued in the Price List of United States Public Documents relating to Plants.

exhibit for the Centennial Exposition in Philadelphia, unfortunately the majority of his specimens were permitted to be destroyed. Amongst the mycological works published in the United States are several which are readily comprehensible by the amateur, they include G. F. Atkinson's "Studies of American Fungi," and M. E. Hard's "Mushrooms, Edible and otherwise."

In 1915 the United States Department of Agriculture issued a bulletin (No. 175) on "Mushrooms and other common fungi."\* It includes descriptions of one hundred and fifty nine species, many of which are illustrated (in black and white from excellent photographs), keys to the genera, a glossary of scientific terms, and numerous recipes for cooking and preserving mushrooms. The authors are to be complimented on having produced a brochure of high educational value.

Perhaps the most important of American mycological periodicals is *Mycologia*, a publication of the New York Botanical Gardens; it superseded the *Journal of Mycology* and the *Mycological Bulletin* published by the late Dr. W. A. Kellerman. For many years Professor C. H. Peck, State Botanist of New York, has been a prolific writer on mycological topics, but his active work has ceased owing to ill-health, and his large collection is not fully arranged for exhibition.

There are in several of the large cities enthusiastic mycological clubs. Their programme consists of excursions, collections and discussions, with occasional mushroom banquets. The cities Milwaukee, Pittsburgh and Boston† have very large organisations which include members interested in the taxonomy of fungi other than edible species. Cincinnati is fortunate in numbering amongst its citizens Mr. C. G. Lloyd who has by unwonted energy and liberality done much to further the progress of mycology. He has formed in that city a large herbarium of fungi, and a magnificent library of mycological literature. He has written many valuable monographs and papers which he has freely distributed amongst field mycologists in every part of the globe. His labours—they are not confined to the propagation of a knowledge of fungi—are deeply appreciated by all mycologists, and many of us feel that the world is in need of many more philanthropists of the Curtis G. Lloyd type.

\* By Flora W. Patterson, Mycologist, and Vera K. Charles, Assistant Mycologist, Office of Pathological Collections and Inspection Work.

† The Boston Mycological Club has been a member of our Society since the year 1900.—C.R.

## FRANCE.

Economic mycology receives special attention in France. The Station of Vegetable Pathology at Paris supplies free information concerning parasitic fungi, and the Inspectors of the Service of Phytopathological Inspection—in addition to their supervision duties instruct nurserymen in the knowledge and treatment of fungus diseases. At Antibes (Alpes Maritimes) and Cadillac (Gironde) the professors of Agriculture give consultations on these subjects, and some part of their lectures to farmers is devoted to vegetable pathology. Temporary organisations (Congress of Farmers and Experimental Farms) have been established at various times to teach farmers how to combat certain particularly dangerous maladies of cultivated plants, such as the Black Rot of the Vine.

A public information bureau is attached to the greater number of the Schools of Agriculture, and the agricultural press plays an important part in the diffusion of mycological knowledge. A great part of the botanical courses at the Agricultural Institute, and at the national agricultural colleges (Grignon, Montpellier and Rennes) is devoted to mycology and particularly to parasitic fungi. Parasitology also constitutes an important part in the courses concerned with the culture of plants, and especially so in connection with the Vine, for the diseases of American origin which have invaded the vineyards have given mycology supreme importance.

No general statistics are available concerning the damage caused by parasitic fungi, but the annual loss is of course very considerable. It must be remembered that the two chief fungus parasites of the Vine, *Plasmophora viticola* and *Uncinula spiralis* are each capable of bringing about the almost complete disappearance of the Vine from France.

The Office of Agricultural Information, through the direction of the Minister of Agriculture, distributes gratuitously an illustrated précis on the Diseases of Plants drawn up by Dr. Delacroix, senior Director of the Station of Vegetable Pathology. This office also publishes summaries of information supplied by the Professors of Agriculture. An abbreviated review of the collected information on the life histories of parasitic fungi is given in each volume of the *Annales des Epiphytes*.

Of the Societies that are specially concerned with mycology the Société mycologique de France takes the first place. This Society was founded in 1885, its headquarters are 84 rue de Grenelle, Paris. It furthers mycology by holding month-

ly meetings, by issuing a quarterly bulletin, by holding a national commission (founded in 1902) directed to group the efforts of all who are interested, by an annual excursion followed by a general meeting and a public exposition of the fungi that were found, and by short excursions in the neighbourhood of Paris during the autumn months. The Société mycologique de la Côte d'Or (Dijon, Côte d'Or), the Association mycologique Lédonienne (Lons-le-Saulnier, Jura), and the Société Lorraine de Mycologie (Nancy, Meurthe-et-Moselle) are affiliated Societies. The Société Pathologie végétale de France (63 rue de Buffon, Paris) was founded in 1914 under the Presidency of M. le Professeur Mangin, it enrolls those who are interested in plant diseases generally, and publishes an illustrated bulletin.

With regard to the popularisation of mycology "they order this matter better in France" than in any other country, there is abundant literature which stands unrivalled in the artistic excellence of its illustrations. One of the best known popular publications is the journal *L'Amateur de Champignons*. Eight parts appear annually.\* Two coloured plates by A. Bessin are issued with each part. In the happy combination of accuracy and very attractive method of presentment Bessin's plates occupy a unique position, whilst those of Emile Boudier in his great work "*Icônes mycologicae*" are "the most artistic and thoroughly scientific illustrations that have been published."†

I am indebted to M. Moreau, secretary of the French Mycological Society, for some particulars concerning the methods of furthering public education and interest in fungi. In the majority of towns frequent excursions are arranged during the season, these are attended by fifty to two hundred people or more. A good many chemists are interested in the subject, they assist in arranging the expeditions and in demonstrating the species. In the exhibition room the specimens are displayed on plates, and the labels for poisonous species are mounted on red cards. M. Moreau remarks upon the success which attends these demonstrations "Il n'est pas exagéré de dire que l'affluence des visiteurs est telle qu'au milieu de l'après-midi on s'écrase autour des tables." He alludes to the difficulty experienced in arranging exhibitions in small towns and villages in remote situations, but notes that no place is left unvisited. Temporary demonstrations of perhaps an hour's duration are arranged by the nearest

\* M. Léon Lhomme informs me that this publication ceased when war was declared, he hopes to renew it soon after the cessation of hostilities.

† Emma A. Rea, Notes on Fungus Illustrations, p. 226 of the present volume.

society to take place in the village schoolroom. If they fail to obtain the use of that or other suitable hall, the waiting room at the railway station or some convenient open spot is used for the purpose. The fungi demonstrated on such occasions are arranged on pasteboard plates resembling those used by pastry cooks, and the labels are prepared beforehand. The lecturer points out the dangerous species, denounces the questionable proceedings of countrymen who with imperfect knowledge, profess to be able to distinguish between edible and poisonous kinds, and replies to all questions that may be asked. M. Moreau remarks that the villagers always evince a lively interest in these demonstrations.

#### HOLLAND.

The Director General of Agriculture at the Hague asked Professor Dr. J. Ritzema Bos to furnish me with a report on what is being done to further mycology in Holland, and I am under obligation to him for some of the following particulars.

Technical mycology (*Saccharomycetes*, &c.) is taught at the Technical High School in Delft, and at the Agricultural High School in Wageningen. Instruction concerning the principal plant diseases caused by fungi is provided in the secondary agricultural and horticultural schools, but mycology is, as a rule, neglected in other schools. The Inspector of State forests has published a coloured wall chart (with descriptive letterpress) depicting four of the principal fungus diseases of forest trees, viz., *Armillaria mellea*, *Fomes annosus*, *Dasyscypha Willkommii* and *Lophodermium Pinastri*. This excellent chart is widely distributed gratuitously by the Government.

The Royal Phytopathological Service, centred at Wageningen, is concerned with the inspection of nursery stock and potatoes destined for export, and with combating fungus and animal pests in the nurseries, bulb farms, orchards &c., it is also gathering statistics concerning their propagation. This service was established in 1899, in which year certain American states prohibited the importation of bushes unless such were accompanied by an official certificate that they had been inspected and found to be free of insect and fungus pests. Mindful of their growing trade with the United States in horticultural produce, the Dutch Government instituted the Phytopathological Service for the inspection of nurseries only. Later on it became necessary to inspect parcels as well as nurseries, the American prohibition having become more severe through unscrupulous nurserymen sending parcels of uncertified material by post.



At the Royal Phytopathological Institution, which is also situated at Wageningen, research work on the diseases of plants is carried out, and reports are published annually. It is the centre of the operations of the Service, and is aided by the Director-General of Agriculture and the professors at the horticultural and agricultural colleges who act on committees in the various districts.

There is a private phytopathological laboratory (Willie Commelin) at Amsterdam, where a great number of fungi are grown in pure cultures and supplied to mycologists. The chief field club is the Netherland Mycological Society. It was founded at Amsterdam in October 1908. It is forming a standard collection in the Royal Herbarium at Leiden, but its special aim is the promoting of knowledge of the larger fungi. It issued in 1911 a pamphlet dealing with the points of difference between the virulent *Amanita mappa* and *A. phalloides* and the esculent *Psaliota campestris*; and directing attention to the characteristics of the genera *Volvaria* and *Entoloma*. The well known quartette of edible species, *Clytocybe nebularis*, *Marasmius oreades*, *Laccaria laccata* and *Boletus luteus* are also described. The coloured plates which accompany this pamphlet are not very meritorious. The Society holds an annual foray and exhibition (*Paddenstoelententoonstelling*), and publishes a report with woodcut illustrations of the most interesting species. A resumé in French accompanies it. I note, by the way, that Miss C. Cool, the Conservator of the Royal Herbarium at Leiden, appends to her paper on pure cultures of some of the larger fungi an abstract in English. The exhibitions have met with gratifying success. At the third, which was held at Arnheim, 21st to 23rd September, 1912, about three hundred and fifty species of the larger fungi were shewn, and fifteen hundred people visited the show during the three days.

#### DENMARK.

Professor F. Kölpin Ravn, Plant Pathologist to the Danish Government informs me that at the Royal Agricultural College there are three separate courses for students in Agriculture, Horticulture and Forestry. In each mycology is given an important place, and it also forms part of the curriculum in all the secondary agricultural or horticultural colleges, of which there are about twenty in Denmark. Leaflets, pamphlets, and bulletins concerning plant diseases, are distributed by the State Experimental Stations, and actual specimens are sent under separate cover. No coloured charts of fungi have as yet been published,

indeed judging by the pamphlets that I have seen, the educational value of good illustrations does not seem as yet to be properly appreciated in Denmark.

Statistics of losses through fungus pests are not available, but as the annual value of the total Danish harvest is five hundred to seven hundred million kroner, an average loss of only one to two per cent would amount to from five to fifteen million kroner per annum, a sum which conveys a clear idea of the great economic interests which are involved. Hence the popularisation of mycology receives strong Government support. The State Botanical Museum at Copenhagen arranges almost yearly, and usually in co-operation with the Danish Botanical Society, an exposition of fungi, a special feature of which is an exhibit of edible and poisonous species. There is also a Society for encouraging the study of fungi, akin to our Society. It was founded in October 1905; at the present time there are three hundred and fifty members. Four or five forays and from one to three exhibitions are held annually; the Transactions contain papers on general mycology, cultivation of fungi, domestic uses, &c. There are also fungus forays held in connection with various local natural history societies.

#### NORWAY.

I am informed by Mr. W. M. Schöyen, the State entomologist, that information concerning the common parasitic fungi of cultivated plants, is given in the agricultural colleges, and the schools of gardening and forestry. At the Government Agricultural College the state entomologist gives instruction on injurious insects, and also on parasitic fungi, amounting to from eighty to ninety hours annually. In other agricultural schools the teaching is less.

No statistics as to yearly losses through fungus pests are forthcoming. The State entomologist prepares an illustrated annual report on injurious insects and fungi. The illustrations, all in black and white, are reproduced in an economical manner, the ravages of insects and fungi being depicted side by side on the same plate. Dried specimens are used for teaching purposes, also coloured illustrations of German origin. There is but slight popular interest in fungi, and it is chiefly confined to a knowledge of certain edible and poisonous kinds.

#### DEVELOPMENT OF MYCOLOGY IN BRITAIN IN VICTORIAN AND LATER TIMES.

No serious attempt appears to have been made prior to the latter half of the nineteenth century to stimulate popular

interest in fungi in Great Britain. An educational crusade was initiated by the Woolhope Club, a few years after its establishment in 1853. This famous Club commenced in 1868 to hold autumnal forays, a plan which proved so attractive that it was quickly adopted by naturalists' clubs in various districts. It also held public exhibitions of fungi, and by means of fungus suppers, attempted to demonstrate that much good food was wasted every autumn through sheer ignorance, but whether many deaths resulted from ignorant persons following the example set by Dr. Bull and other zealous mycophagists I know not. Within a few years of the formation of the Club there was a noticeable increase in the out-put of illustrated mycological works, a sure indication of its stimulating influence. Berkeley's *Outlines of British Fungi* appeared in 1860, and Sarah Price's *Illustrations of the Fungi of our Fields and Woods* were issued in 1864 and 1865. Two large plates, by Worthington G. Smith, of edible and poisonous fungi appeared in 1867. The letter-press which accompanied them contained an amusing instance of the indiscretions which even veteran fungus-eaters may commit. The author essayed the difficult task of gathering Champignons in the dark, and sent his gathering to the cook without troubling to give it ocular inspection. Half an hour after eating the fungi he experienced violent symptoms of poisoning, which, luckily for him, were followed by vomiting. He made a fairly rapid recovery and attributed his illness to *Marasmius urens*.

Fungus exhibitions were held annually at the Royal Horticultural gardens in the sixties and seventies, and apparently were very popular. One which took place on October 14th, 1871 was reported to have been more successful than any of its predecessors, "nearly all the British edible and poisonous fungi were shewn in a living state, including several rare species,"\* and the visitors evinced the greatest possible interest in them. In 1874 three prizes of £3, £2 and £1 were offered in each of four open classes at the exhibition. That year saw the first Scottish exhibition. "Almost every county in Scotland made large contributions, and almost every fungologist in Britain contributed specimens."† The exhibits numbered about seven thousand, easily beating all previous British records. Writing in 1886 Dr. M. C. Cooke remarked that the recorded number of British species had been nearly doubled in fifteen years. No doubt the exhibitions had materially contributed towards that excellent attainment.

\* *Nature*, Oct. 12th, 1871

† *Nature*, Sept. 11th, 1874.

The rapid increase in field workers during the next decade led to the establishment of the British Mycological Society in 1896. Under Mr. Carleton Rea's inspiring guidance the Society quickly became a powerful factor in furthering education in mycology. Within ten years of its foundation it received an invitation, from the Corresponding Societies Committee of the British Association for the Advancement of Science, to apply for enrolment on the list of the Affiliated Societies of the Association; and our Secretary was informed on the 6th March, 1906, that the British Mycological Society had been placed on the list "in consideration of its local scientific work of an original character." In the following year Mr. Rea read on behalf of the Society, at the Conference of Delegates of Corresponding Societies attending the Leicester meeting of the British Association, a paper entitled "A Plea that Local Societies should give greater attention to the investigation of the Fungi occurring in their districts, with suggestions for the encouragement of the study of this group." In that paper he commented upon the inexplicable neglect of the study of a group of plants which are of such immense economic importance, and urged the establishment of continuous exhibitions in the Club Rooms or the Museums of Natural History Societies, at which prizes might be offered for the most varied or most correctly named series of specimens sent in during the course of the year. He also advocated the drawing up of local lists, and the reading of short papers to members and to the general public.

In 1911, Mr. Harold Wager F.R.S., then President of our Society, read a paper at the Conference of Delegates, at the Portsmouth meeting of the British Association, on "The Study of Fungi by local Natural History Societies," in which he advocated increased field observation, and emphasized the value of exhibitions of edible and poisonous kinds. Our members who attended the meeting and took part in the discussion which followed, reported (at Taunton in the following autumn) that a general wish was expressed that guidance be given by the British Mycological Society to local Natural History Societies in their study of the fungi occurring in their districts. A committee was formed which drew up and sent out a circular to the secretaries of over one hundred natural history societies, wherein information was requested concerning the "Silver-leaf" disease and injuries caused by various polypores. The secretaries were also asked to supply particulars of the mycological literature published by their societies. The circular probably accomplished more than appears on the surface, for though our delegate at the Dundee meeting of the British Association, subsequently re-

ported that no adequate response had been received, it must have served a most educational purpose, in directing general attention to the study of fungi, and in emphasizing its great importance to foresters and gardeners.

The Rev. W. L. W. Eyre in his Presidential Address to our members alluded to the necessity of devising methods calculated to popularize the results of mycological investigations, and to attract to our ranks those "who are only deterred from co-operating because we are reported to be *too scientific*."\* One method might be to publish a brochure, giving a concise and readable account of fungi in general, with special reference to their influences for evil. Something of the kind has been done for South Africa by Mr. Paul A. van der Byl.† Such a pamphlet would have great educational value, and if distributed to museums and field clubs throughout the country, would also serve as a dignified advertisement. The French Mycological Society, I may note, is not above advertisement, and has reproduced on post-cards many of Bessin's plates as given in Paul Dumée's well known Pocket Atlas;‡ a short explanation accompanies each illustration, and a paragraph concerning the Society appears on the front of the card.

The value of accurate coloured drawings for teaching purposes, has been well demonstrated on the few occasions, when we have had the good fortune to see Mrs. Rea's magnificent series of paintings, set out in our exhibition rooms, but I fear that the majority of us are inclined to neglect our sketch books. Dr. Plowright in speaking of the Woolhope Club meetings that took place in the later half of the sixties, remarked that the members, whether skilful draughtsmen or unskilful, would as soon have thought of going to Hereford without their paint boxes, as of going without their hats. "The point I wish to emphasize is this: that however rude a sketch may be, it has a definite value; and I would impress upon all those who attempt the study of the Hymenomycetes, that they should make coloured outlines of any species that may be new to them. The trouble is not great, but the value, as these sketches accumulate, considerable."§

There is a very large collection of sketches of fungi at the

\* "Mycology as an Instrument of Recreation," Trans. Brit. Mycol. Soc., II, 49.

† "The Nature of Fungi with reference to the Life-histories of some important Parasites." Reprinted from the "Agricultural Journal of the Union of South Africa," December, 1913, by the Union of South Africa Department of Agriculture, 1914.

‡ *Nouvel Atlas de Poche des Champignons*, 2 vols., Paris, 1905 and 1911.

§ "Notes and Comments on the Agaricini of Great Britain," Trans. Brit. Mycol. Soc., I., 37.

British Museum of Natural History. The exhibited series in the Botanical Gallery includes two large sheets of coloured drawings of some edible and poisonous kinds. Presumably the authorities intend to publish them with descriptions in the near future, for such a publication would be welcomed by the numerous public who are interested in fungi chiefly from the gastronomic standpoint.

A series of Worthington G. Smith's illustrations of Field and Cultivated Mushrooms and Poisonous or Worthless Fungi often mistaken for Mushrooms, have been reproduced with descriptive notes as one of the official Guide Books. May I suggest the desirability of pointing out in the next edition of this Guide, that with the delights of mushroom eating are associated the risk of incurring dyspepsia of an aggravated kind? There are many who cannot eat *Psaliota campestris* without experiencing disagreeable results. The idiosyncrasy may manifest itself at any period of life and under varying conditions of health. If the symptoms are at first slight the victim almost invariably attributes them to any cause other than fungus eating, and does not discover the true explanation until a second or even third attack has been experienced.

Attention might also be directed to Dumée's statement that *Psaliota xanthoderma*—a species often confused with *P. campestris*—is not easily digested; "il serait prudent d'être très réservé dans l'emploi de ce champignon, qui serait peu agréable au goût et d'une digestion difficile."\*

The Botanical Gallery at the British Museum contains—in addition to Sowerby's models of British fungi to which allusion has already been made—Worthington G. Smith's coloured drawings of British Basidiomycetes, and Miss Lister's unrivalled series of those of the Mycetozoa.

Valuable educational exhibits of forest fungi may be consulted at Kew. The mycological work which is being done at the British Museum, at Kew, and at the Agricultural Colleges is of great national importance, but it is not sufficiently realised by the public, and will not be until instruction in elementary economic botany be given, by science teachers, in the elementary and other schools. The late Sir Jonathan Hutchinson suggested, in a letter to the Times,† that valuable instruction in economic zoology and botany, might be given in rural districts through the agency of the numerous small museums, that are in a languishing condition through lack of funds. He thought that if the Board of Agriculture subsidized them, on the understanding that they actively en-

\* *Nouvel Atlas de Poche des Champignons*, I., 41.

† September 11th, 1911.

gaged in teaching Plant Pathology and Mycology, Agricultural Zoology and kindred subjects, such museums "would speedily become centres of active life in reference to agricultural knowledge," and if developed throughout the country, they "would become influential beyond calculation upon the general standard of attainment."

The suggestion was not taken up. The true functions of museums are still very imperfectly understood. The great majority of people look upon a museum, as a place either to be avoided altogether, or visited once in a way on a wet day. This erroneous conception will vanish, when museums are more freely used in the way that Hutchinson suggested. I have had abundant evidence, every year since 1897, of the great interest that a fungus exhibition may create in a small town. Undoubtedly the most popular of all our annual temporary exhibitions at the Haslemere Educational Museum is the fungus show. It is a perennial source of delight to our villagers and its reputation is steadily spreading in the district. Specimens of *Sparassis laminosa* and other uncommon species are frequently brought in from outlying villages. *Amanita muscaria* is often received with an apology—"I know it is common, but this one is so beautiful that I felt I must bring it along"—which recalls Emerson's assertion that "all men are poets at heart, they serve Nature for bread, but her loveliness overcomes them sometimes."

With woods and meadows almost within a stone's throw of its doors the Museum at Haslemere is in a position to maintain a fungus exhibition with the minimum amount of trouble, but Mr. and Mrs. Rea have demonstrated at Worcester, that in towns far less favourably situated a valuable exhibition may be maintained during the autumn months. The need of such, as popular educators in mycology, is very great. There are thousands who do not know what we mean when we speak of mycology! I have been asked over and over again to explain the term "mycological."

In June a lady visitor to the Haslemere Museum told me she had heard that I was president of a learned Society, and added "I think it is called the Mythological Society." I gravely assured her that the Society she was thinking of is concerned with facts rather than fables. After I had explained its aims and objects she said "I quite understand now, you are president of the Mushroom Society," but my unuttered thought was that she was incorrect in applying that term to a Society which is about to attain its majority!

We had pleasing evidence last autumn at Swansea, that residents in districts visited by us are wishful to avail themselves of the special help we can give in mycological

matters. Shortly before the meeting our Secretary was approached to give particulars as to the best method of preventing the spread of "Dry Rot."\* He read a short paper on the subject and it was published in the local press. It is expedient to develop the purely educational side of the Society's work. This might be promoted by making a county town our headquarters for the autumn foray, say every third year, and by arranging to give popular demonstrations. A lecture well illustrated by lantern slides might be given one evening. The exhibition should contain some special features, such as coloured illustrations of fungi, popular labels, educational photographs, and sections of diseased timber and fruit trees. It is to be feared that many visitors to our exhibitions have gone away convinced that we "spend our wit to name what most employ unnamed." There would probably be no difficulty in securing free of charge from the local Committee of Education a room suitable for the exhibition, and also a hall for the evening lecture. It would be necessary for one member to be in attendance every afternoon at the exhibition to act as guide and teacher, and to submit patiently and tactfully to cross examination by press representatives. The delegate for that honourable post could be chosen by lot every morning.

I note that four only of our twenty autumn forays have been held at county towns in England (Exeter, Hereford, Newcastle and Taunton), and three of the eight spring ones have taken place at Worcester, Shrewsbury and Chester, so there is a wide choice of towns.

The reference to county towns recalls an important work yet to be undertaken by the Society, viz., a census of British Fungi. There are at present but seven English counties where our Society is without a representative, viz., Rutland, Westmorland, Cumberland, Northamptonshire, Leicestershire, Hertfordshire and Huntingdonshire. There should be no difficulty in securing that representation, and we could then begin to investigate the comital distribution of the Basidiomycetes. It would be necessary to appoint a Recorder, also referees for each county and vice-county. The absence of an authoritative check list need not deter us from starting the work. It is an open secret that Mr. Carleton Rea is at work upon the much desired concise text book of British Basidiomycetes, and not until it appears will the time be

\* The necessity of research work in fungi which cause injuries to timber has been emphasized by Professor Percy Groom, in his recent paper on "Dry Rot," which appeared in the August issue of the *Journal of the Board of Agriculture*. He estimates that the annual loss in the United Kingdom alone through fungi causing "dry rot" amounts to millions of pounds sterling.



ripe for the publication by our Society of a "London Catalogue" of British Fungi. But in the mean time the excellent manuscript list of species observed at our Forays which has been drawn up by Mr. A. A. Pearson could be extended and used by the Recorder; some copies of the list have, through the kindness of Mr. Pearson, already been made.

The need of more research workers in Mycology is very apparent. The advance of civilisation sees an annual increase in the species of plants which Man deems useful in some way or the other. These are gradually weakened by the artificial conditions to which they are immediately subjected in our desire to get quickly a superabundant yield, and thus easily fall victims to attack by parasitic fungi. Then the plant doctor is called in to find a cure. There are two parasites of the Vine which afford striking examples of the remarkable rapidity with which fungus pests may spread among cultivated plants. The powdery mildew of the grape (*Oidium Tuckeri*) first noticed in Europe about 1845 (in which year it appeared in England) reached every vineyard in the Continent within the next six years. The downy mildew of the grape (*Plasmophora viticola*) made its first appearance in Europe in 1870, within ten years it succeeded in reaching all the Continental grape growing countries. In 1895 the latter parasite caused a loss of about twelve million hectolitres of wine in Hungary alone, and at the present time the annual loss to the world's grape crop by these two parasites is considered to amount to two thousand five hundred million. The enormous losses caused annually to cereals through Rust and Smut have already received our attention. Proportionately great losses occur annually to the Potato, Apple and other crops, and it is the obvious duty of all Governments, to provide sufficient plant pathologists, to cope quickly and effectively with any epidemics which may arise, to publish the results of research work, and to make known as widely as possible the precautionary measures that the public should take. In these matters our home Government might emulate the vigorous educational measures employed in our Dominions.

We have noted that the Victoria Department of Agriculture has published and distributed in Australia, elaborate monographs of the Rusts, the Smuts and the Potato diseases of that Continent. They were prepared by the Government Vegetable Pathologist. In this country the publication of such treatises has hitherto been left to private enterprise.

Our Board of Agriculture has issued a series of coloured illustrations of fungi injurious to fruit and forest trees, and

another which portrays edible and poisonous fungi, but the price places them beyond the reach of the majority for whom presumably they were prepared. From an artistic point of view they are inferior to similar publications which have appeared in other countries, as may be seen by comparing the figures of *Armillaria mellea* and *Fomes annosus* with those published by the Dutch Government, which, I may add, are widely distributed in Holland.

The useful mycological notes which appear from time to time in the Journal of the Board of Agriculture, are reproduced in leaflet form with an italicised footnote, which informs the public that they may be obtained post free on application to the Secretary of the Board of Agriculture and Fisheries. But a system of distribution which depends largely for its success upon the publicity gained through the subscribers to a Journal, has obvious defects. Personally I much prefer the Canadian plan of posting them to every village in the land. The Farmers' Circulars prepared by Dr. Güssow under the direction of the Minister of Agriculture at Ottawa, are distributed throughout the length and breadth of Canada. I have had many opportunities lately at the Haslemere Museum, of conversing with farmers who have thrown up their occupations—all honour to them—purposely to come over and help the Mother country in her time of need, and I gather from them that no expense is spared in their country in the production and distribution of mycological literature. In Canada they do not wait for a dangerous pest to arrive and make itself unpleasantly evident before they begin writing about it, but if there be a possibility that such may come, a warning circular is sent out broadcast, which contains a most excellent coloured illustration and references to a Bulletin in which detailed particulars may be read. One stalwart young warrior told me that Circular No.3 (a warning one which concerns the Potato Canker) is displayed in post offices in remote districts as well as provincial towns, and he was proud to mention a certain village with a population of thirty two which had not been forgotten by the Government. The Circulars have a very attractive appearance; clear type and realistic illustrations are used with good paper or cardboard, and points of special importance are emphasized by printing them in red.

The war has made us deeply conscious of dangers which arise in times of strife through neglect of Forestry and Agriculture, and there is good reason to hope that the past niggardly attitude of the Government towards these vital industries will undergo a change at an early date. The importance of mycology will then be more fully recognised,

the present system of training plant doctors will be improved, and our methods of disseminating the knowledge gained by mycological research will doubtless be greatly extended. The near future may see our post offices, public halls, museums and schools placarded with facts relating to economic zoology and botany, that it is most desirable in the national interests to impart. The fact that there are in this country to-day landowners who will not allow mycologists to explore their estates because prowling botanists may disturb their pheasants, reveals very clearly the desirability of teaching at least the elements of mycology in all schools.

Though Government intervention in these matters is urgently needed, yet public enlightenment may be largely effected by mycologists themselves. Whilst deriving great joy from adding to our stores of special knowledge, let us keep ever before us the words of the great American philosopher Emerson, "The office of the scholar is to cheer, to raise, and to guide men, by shewing them facts amidst appearances. He plies the slow, unhonoured, and unpaid task of observation—he is to find consolation in exercising the highest functions of human nature."

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