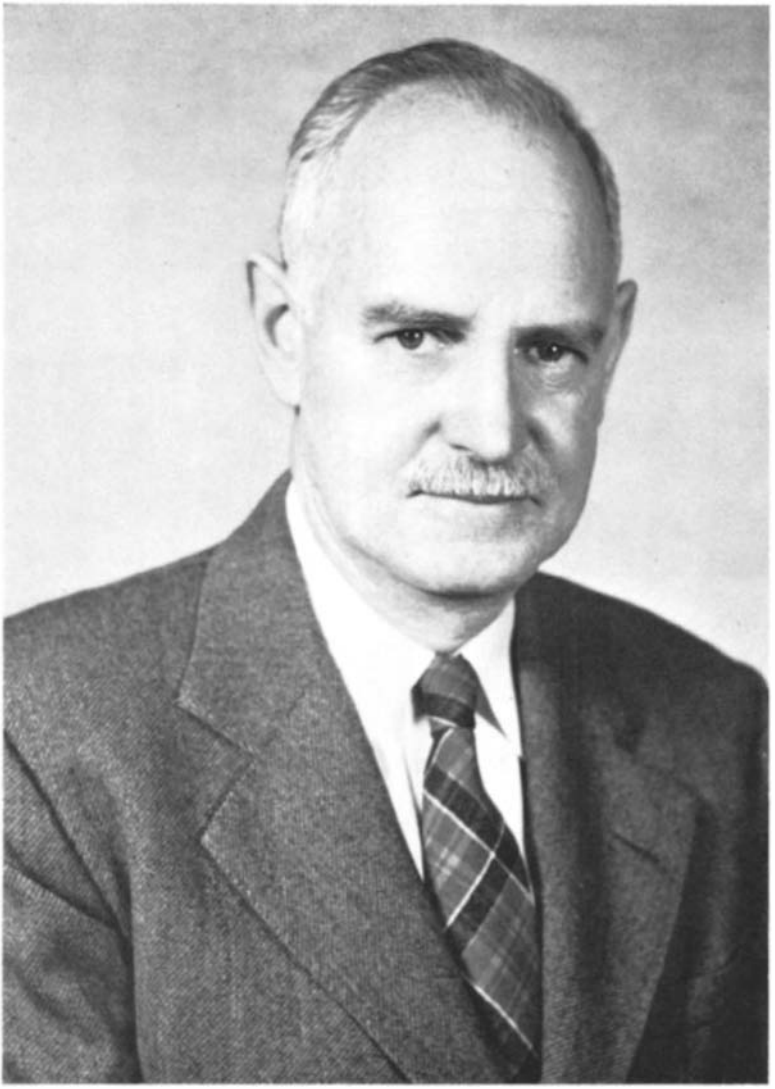

# A PERSPECTIVE ON PLANT PATHOLOGY

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When I was invited by the editor, a good friend for over 40 years, to write the prefatory chapter for this volume, I was honored but also a little overwhelmed. My predecessors include some of the most noted philosophers in our science, and all, I believe, are teachers. I am not a teacher. Perhaps, therefore, my perspective will be different. Truly I agree with Professor Muskett (24) that "I struggled to find a proper response," and with Professor Bailey (12) that such honored persons "should be assigned texts." Not having been assigned a text, I shall simply do what the editor asked, give you my personal perspective of plant pathology as I have seen it labor to respond to pressures both from within and without our profession.

The changes during the first 60 or 70 years of plant pathology before my day are admirably covered in the historical accounts of Whetzel (26), Large (15), and Keitt (14). While most historians consider deBary the father of scientific plant pathology, it is interesting to note that the Englishman, Marsh (22) cites the Reverend M. J. Berkeley, a mycologist of England, and Whetzel of German ancestry, promotes Julius Kühn, a practical plant pathologist of Germany. By any account, however, the science would be 110 to 120 years old. Of the last 50 years, I have some personal knowledge. I shall discuss that.

*Why did I become a plant pathologist?*—Perhaps I must answer first the question, why did I become a plant pathologist? I think that in general, one becomes a plant pathologist (*a*), because he falls under the influence of an enthusiastic person who stimulates his interest in the field, (*b*) because he is a farm boy who has a natural awareness of plant diseases, and (*c*), of course, just plain chance. But everyone must answer specifically for himself. Here is my answer.

I was born on a tiny coral island in the mid-Atlantic, a 12th generation Bermudian. Fifty years ago it was agreed in my family that I would follow my father's footsteps to the Ontario Agricultural College in Canada. About this time and shortly before, various plant pathologists, mostly from the United States Department of Agriculture, had visited Bermuda to observe the recently recognized leaf roll disease of potatoes. In fact, in 1918 one of the first articles to be published on virus diseases in *Phytopathology* was that on potato leaf roll by Paul A. Murphy of Ireland and E. J. Wortley, the Director of Agriculture in Bermuda. The visiting plant pathologists were the first scientists I had ever seen.

The journal, *Phytopathology,* with its unpronounceable name, created in

me an impression of great awe. I would become a plant pathologist and publish in *Phytopathology.*

During the summer of 1921, between my sophomore and junior years in college, I returned for the first time to Bermuda for a vacation. By then my father had succeeded Wortley as Director of Agriculture and had invited Professor H. H. Whetzel of Cornell University to come to Bermuda on sabbatical leave.

That was a memorable summer. I worked with "Prof." Whetzel as we came to call him so affectionately. Whetzel was one of the most enthusiastic and best teachers of his day. Had he been an entomologist, a plant breeder, or even a marine biologist, I probably would have followed him. In any case, this I did upon my graduation from Guelph in 1923. Because of my Bermuda background I might have become a potato pathologist or perhaps even a virologist. In fact my summers at Cornell were spent as a potato inspector. However, during the winters Whetzel asked me to do a little testing of fungicides for a few industrial sponsors and so by chance I went into the field of fungicides.

In due course, armed with a brand new Ph.D., a new model A Ford, and a new wife, I headed southeast for a new job at the Boyce Thompson Institute to work on the nature of fungicidal action. The group leader was Frank Wilcoxon, a physical chemist, and our work together lasted until World War II. Frank was just as stimulating and instructive as Whetzel, and in the environment of this new Institute I profited much. Perhaps the most gratifying remark I have ever heard was made to Frank and me by the late John W. Roberts of the U.S.D.A. who commented, "You made research on fungicides respectable."

The moral, if any, to be drawn from this little personal story of mine is that we must expose young people who are potential plant pathologists to stimulating teachers if we wish to keep our profession growing in stature and esteem. Naturally, there is also the need for good teachers: in sum, to provide the right environment.

We move now from why I became a plant pathologist to an examination of how plant pathology has transferred its emphasis with the needs of the times. From there we shall examine briefly the size and quality of our profession in the U.S.A.

*From mycology to biochemistry.*—Perhaps I can best illustrate the adaptability of plant pathology by the enormous change in emphasis in my day from mycology to biochemistry. The plant pathologists that came to Bermuda and fired my enthusiasm were primarily mycologists. They were interested in the Fungi That Cause Plant Disease—the title of a text popular at the time. Fitzpatrick was a giant in the land and so were Arthur and Clinton and Stevens and Shear.

Professors nowadays must attempt to stir interest in their prospective students with the mysteries of biochemical plant pathology and how they can attain fame there.

The shift in emphasis reflects our efforts to follow ever farther back along the chain of events in the causation of plant disease. First we asked what organisms produce disease. Then we asked what enzymes are produced by the organisms that produce disease. And now we ask what produces the enzymes that are produced by the organisms that produce disease.

The change from mycology to biochemistry is a pretty obvious trend in plant pathology, but we need to dig data from the records to uncover other, perhaps less obvious trends in our field. Two rather ready sources of data are at hand—the abstracts of papers at the annual meetings and the Directories published by The American Phytopathological Society beginning in 1953.

The abstracts of papers given at the annual meeting of the Society provide data for earlier years. I have analyzed these at 10 year intervals from 1948 back to 1918 (3, 6, 8, 10), which quite by coincidence is the year of my conversion to plant pathology. The data are displayed in Table I. Since the war-time meeting of 1918 was a small one, I have combined it for the meetings for 1917 and 1919 (2, 4).

There were approximately 100 abstracts for each of the four decennial meetings. This is admittedly a small sample, but I believe adequate to establish major trends. A few papers had to be classified into two fields of interest, e.g., spraying experiments to control potato blight.

It was my honor and pleasure to initiate and edit the publication of the first Directory of the Society during my terminal year as Secretary of the Society in 1953 (16). Subsequent directories have become available at five-year intervals (17, 18, 23).

While editing the first three Directories, I pursued my avocation by asking the members of the Society to list their "Fields of interest." This they did in their own words and without restrictions. Their statements for the 1958 Directory were tabulated in a President's Column (20), and for 1963 in the Directory for that year. A tabulation for 1953 has been made for this chapter and data for all Directories are included in Table II.

In 1968 the new editor, Dr. Mirocha (23), wisely requested each member to check a list of specific diseases and other fields of interest, or to use his more definite expression, "Areas of Expertise." While this was somewhat more restrictive for a check list, it encouraged at the same time the checking of some 50 per cent more areas per member than had been indicated previously. The areas or fields listed in Table II follow those of 1968 with several modifications, mainly the addition of diseases of field crops, of forage crops, or other crops, and of pathological anatomy and histology to give a better integration with the previous Directories. In all, a total of 47 fields of interest appear in Table II.

In the following discussions it should be understood that while the absolute number of abstracts or workers in a given field, e.g., cereal diseases, may be increasing or decreasing, it is the interest relative to the total effort in all fields of plant pathology that is important.

TABLE I

COMPARATIVE FIELDS OF INTEREST
1918–1948

| Fields of Interest | No. per 100 Abstracts in: | | | |
|---|---|---|---|---|
| | 1918 | 1928 | 1938 | 1948 |
| Diseases of Cereal Crops | 19 | 16 | 5 | 7 |
| Deciduous Fruits & Nuts | 11 | 8 | 9 | 8 |
| Fiber Crops | 1 | 1 | 1 | 0 |
| Forage Crops | 0 | 0 | 2 | 2 |
| Forest & Shade Trees | 8 | 1 | 9 | 4 |
| Grasses & Turf | 1 | 0 | 0 | 0 |
| Legume Crops | 3 | 3 | 4 | 3 |
| Market & Storage | 0 | 1 | 0 | 3 |
| Ornamentals & Nursery Crops | 4 | 4 | 5 | 4 |
| Potatoes | 8 | 2 | 4 | 5 |
| Small Fruits | 0 | 0 | 4 | 1 |
| Sugar Crops | 0 | 2 | 2 | 1 |
| Tobacco | 3 | 4 | 3 | 2 |
| Tropical & Subtropical Crops | 0 | 1 | 1 | 1 |
| Vegetable Crops | 26 | 8 | 12 | 9 |
| Other Crops | 0 | 0 | 0 | 1 |
| Diseases of Crops—Subtotal | 84 | 51 | 61 | 51 |
| Bacteriology & Bacterial Diseases | 0 | 12 | 5 | 1 |
| Control—Breeding for Resistance | 2 | 5 | 1 | 7 |
| Fungicides | 5 | 15 | 17 | 21 |
| Nematocides | 0 | 0 | 1 | 2 |
| Antibiotics | 0 | 0 | 0 | 2 |
| Deterioration of Plant Products | 2 | 0 | | 1 |
| Epidemiology | 0 | 0 | 1 | 1 |
| Extension | 1 | 0 | 0 | 0 |
| Genetics of Microorganisms | 0 | 4 | 3 | 4 |
| Mycology & Fungus Diseases | 13 | 7 | 4 | 3 |
| Nematology & Nematode Diseases | 3 | 2 | 2 | 2 |
| Parasitic Seed Plants | 0 | 1 | 0 | 0 |
| Pathological Anatomy & Histology | 0 | 3 | 1 | 0 |
| Physiology of Microorganisms | 0 | 0 | 5 | 9 |
| Physiology of Parasitism | 0 | 3 | 1 | 0 |
| Plant Disease Survey | 2 | 0 | 0 | 0 |
| Plant Pathology General | 1 | 0 | 0 | 1 |
| Soil Borne Pathogens & Diseases | 0 | 0 | 1 | 4 |
| Virology & Virus Diseases | 1 | 11 | 14 | 19 |
| Total Fields of Interest | 114 | 114 | 117 | 128 |
| Number of Abstracts | 104 | 91 | 111 | 112 |

TABLE II

COMPARATIVE FIELDS OF INTEREST
1953–1968

| Fields of Interest | No. per 1000 Members Reporting in: | | | |
|---|---|---|---|---|
| | 1953 | 1958 | 1963 | 1968 |
| Diseases of Cereal Crops | 111 | 119 | 116 | 113 |
| Deciduous Fruits & Nuts | 90 | 84 | 72 | 70 |
| Fiber Crops | 17 | 20 | 14 | 23 |
| Field Crops | 18 | 27 | 20 | — |
| Forage Crops | 30 | 47 | 27 | — |
| Forest & Shade Trees | 76 | 84 | 85 | 100 |
| Grasses & Turf | 8 | 7 | 15 | 34 |
| Legume Crops | 24 | 19 | 27 | 45 |
| Market & Storage | 11 | 13 | 18 | 24 |
| Ornamentals & Nursery Crops | 62 | 70 | 54 | 47 |
| Potatoes | 35 | 35 | 30 | 45 |
| Small Fruits | 18 | 27 | 17 | 30 |
| Sugar Crops | 17 | 15 | 14 | 22 |
| Tobacco | 19 | 17 | 15 | 23 |
| Tropical & Subtropical | 37 | 58 | 43 | 52 |
| Vegetables | 135 | 141 | 91 | 104 |
| Other Crops | 8 | 11 | 7 | 10 |
| Disease of—Subtotal | 716 | 794 | 665 | 742 |
| Aero & Space Biology | 2 | 0 | 3 | 7 |
| Agricultural Chemicals | 8 | 9 | 22 | 50 |
| Air Pollution | 5 | 8 | 11 | 22 |
| Bacteriology & Bacterial Diseases | 25 | 16 | 30 | 63 |
| Control—Biological | 1 | 2 | 5 | 39 |
| Breeding & Resistance | 79 | 60 | 75 | 117 |
| General | 18 | 10 | 20 | 127 |
| Fungicides | 182 | 175 | 156 | 131 |
| Antibiotics & Bactericides | 39 | 25 | 18 | 34 |
| Nematocides | 12 | 24 | 14 | 52 |
| Regulatory | 9 | 10 | 42 | 37 |
| Deterioration of Plant Products | 14 | 12 | 11 | 15 |
| Ecology of Organisms | 2 | 2 | 14 | 67 |
| Epidemiology | 12 | 17 | 18 | 74 |
| Extension | 5 | 5 | 28 | 52 |
| Genetics of Microorganisms | 19 | 21 | 16 | 39 |
| Industrial Microbiology | 12 | 5 | 8 | 15 |
| Mycology & Fungus Diseases | 92 | 81 | 47 | 32 |
| Mycotoxicology | 0 | 0 | 0 | 20 |
| Nematology & Nematode Diseases | 24 | 76 | 91 | 82 |
| Parasitic Seed Plants | 0 | 0 | 1 | 6 |
| Pathological Anatomy & Histology | 10 | 6 | 11 | — |
| Physiology of Microorganisms | 68 | 31 | 37 | 89 |
| Physiology of Parasitism | 27 | 39 | 112 | 155 |
| Plant Disease Survey | 11 | 12 | 6 | 35 |
| Plant Pathology General | 51 | 74 | 75 | 117 |
| Soil Borne Pathogens & Diseases | 28 | 55 | 80 | 162 |
| Soil Microbiology | 4 | 15 | 30 | 36 |
| Teaching | 15 | 21 | 81 | 124 |
| Virology & Virus Diseases | 137 | 158 | 197 | 181 |
| Total Fields of Interest | 1,627 | 1,763 | 1,924 | 2,722 |
| Total Members Reporting | 1,310 | 1,682 | 2,075 | 1,895 |

The trends are dramatically clear. I have spoken of mycology. It fell steadily in popularity during the first years (Table I) and has continued to fall in the last years (Table II). I have spoken, too, of the physiology and chemistry of the disease process. This subject was essentially absent from the abstracts from 1918 to 1948, but now is climbing rapidly. By 1968 it (physiology of parasitism) had reached third in the list of the "areas of expertise." A related field, physiology of microorganisms (actually for the most part fungi) has had a somewhat erratic growth in interest but is currently relatively high.

*Other changing trends.*—Another great shift is underway. Table I shows clearly that most of the interest in plant pathology in the early years was concentrated on the diseases of *crops* not on diseases *per se*. Diseases of crops occupied 80 per cent of the abstracts in 1918. The plant pathologists of the day were crop oriented. They were concerned more with plants than with pathology. Although the relative interest fell off during the 30 years after 1918, the crop diseases still held the center of the stage at nearly 55 per cent in 1948. The textbooks reflected this—"Diseases of Vegetables," "Diseases of Citrus," etc.

The interest in crop diseases has fallen rapidly in the last 15 years, however. It is now down to 27 per cent of the total.

My field, of course, is fungicides (21) which show a rise and then a fall. Interest in fungicides rose steadily during the 30 years after 1918 coming up from about 4 per cent to about 16 per cent of the total interest. This reflects the rise of the "fixed coppers" in the thirties and the organic fungicides in the forties. Now the trend is as sharply downward.

There are several reasons for this, not the least of which is the book "Silent Spring." There is also the general effectiveness of modern fungicides for many kinds of applications, and the increasing difficulties and expense of finding and developing newer and better ones. A really successful, hence practical fungicide for the rust diseases, powdery mildews, and soil fungi, and especially a systemic or chemotherapeutic fungicide would greatly stimulate renewed interest.

Virology and virus diseases are areas of considerable prestige and justifiably so, especially the former. After all, it brought a Nobel prize to one member of our Society. As pointed out earlier (18), twice as many members in the 1963 Directory preferred virology as their area of concern over virus diseases. The opposite ratio among plant pathologists would seem more realistic. You would think they would be more interested in diseases than in viruses but they claim not. Rather than encourage the members to compromise themselves, Dr. Mirocha, the editor, in 1968 (23) at my suggestion combined the two. This broad field has grown steadily from only one per cent of the abstracts in 1918 to the leading position in both 1963 and 1968. The results of 1968 suggest that the relative interest may have reached a plateau or perhaps even to have begun a downward trend.

Epidemiology and the ecology of organisms have been given a considerable increase in attention in 1968, as has also been the case with biological control, bactericides, plant disease survey, and soil borne pathogens and diseases.

A dramatic new area of plant pathology is mycotoxicology. It was wholly unrepresented as late as 1963, but 20 people claimed expertise in 1968.

Another discipline included in the broad field of plant pathology is nematology. This area, from the beginning of the tabulations in 1918, has received only modest attention but this has risen markedly since 1958.

The field of antibiotics (separately recorded before 1968) shows an interesting pattern of change in concern. The emergence of interest in antibiotics following the discovery of penicillin and streptomycin is very evident. In 1948 there were two abstracts. The year 1953 was the high point with 36 members reporting an interest. In 1958 this interest had dropped to 23, and in 1963 to 15. Antibiotics do not control plant disease very well and we have lost interest.

Several of the areas of interest require a special explanation since I think that the apparent marked increase in 1968 is due in part at least to the changed method for reporting. Some of the teachers and extension workers who reported in the earlier years possibly felt that only subject areas of interest were to be reported. However, in 1968 these two areas were listed and could be checked. Hence the marked increase. The elimination of a free choice in the areas to be listed in 1968 probably caused nonplant pathologists, e.g., chemists, entomologists, administrators, etc. to check the broad categories of general control (general chemical control), plant pathology general, or both, with the resultant marked increase.

*How broad is the interest in plant pathology?*—We have discussed the breadth of interest within the usually defined area of our subject. We can examine the width of our field by examining the ancillary specialties that impinge sufficiently on plant pathology to warrant membership in The American Phytopathological Society.

Data are available in this for the 1953 and 1958 Directories (16, 19) and they have been obtained for 1968. This survey is made on the assumption that from the title and field of interest (when recorded) the scientific discipline can be determined. For example, a person who lists himself as professor of plant pathology is a plant pathologist and not a nematologist or a virologist and a professor of biology is a biologist and not a plant pathologist. This is not necessarily always the case, but I believe that the assumption is reasonably accurate.

People calling themselves plant pathologists, including graduate students in departments of plant pathology, constituted 73 per cent of the membership in 1953 and also in 1958. In 1968 this dominant group had fallen slightly to 65 per cent. The ten other leading professions represented in the

Society over this period, accounting for approximately 15 per cent of the membership, were, in the numerical order of 1968: biologist, botanist, nematologist, entomologist, chemist or biochemist, microbiologist, agronomist, mycologist, geneticist or plant breeder, and horticulturist. The remaining percentage covers a wide variety of occupations which, as may be seen in the Directory for 1953 (16) and for 1958 in a President's Column (19), ranges from university president to housewife. Among the 10 other professions recorded above, botanist, entomologist, agronomist, and mycologist appear to be falling in relative numbers. However, biologist, nematologist, and chemist or biochemist appear to be rising. The founding of the Society of Nematologists in 1961 so far appears not to have materially affected membership in the plant pathology society since the number of nematologists per 1000 increased from 10 to 21 to 24 in the three years reported. However, the publication of their own journal which is expected shortly, may cause a decrease.

Somewhat surprisingly the professions of bacteriology, plant physiology, and virology are not in the first ten above, at least as far as they can be identified. There were only 5 plant physiologists per 1000 in 1968. This discipline is as closely related to plant pathology as any other. Probably the plant physiologists consider plant pathology too applied. In 1953 there were no identifiable virologists, in 1958 only 1 per 1000, and in 1968 only 6 per 1000.

The general conclusion from this appraisal is that in a modest way more scientists from other disciplines are being attracted to plant pathology. This of course is borne out by the increasing emphasis on the areas in the lower half of Table II.

As is well known, plant pathology developed mainly from mycology and the term "applied mycology" was very appropriate. This is no longer the case. Plant Pathology can now be called a conglomerate science; at least it is broad and appears to be broadening. In some countries the term plant pathology covers all diseases and disorders of plant including attacks by insect pests. The inclusion of plant pathological entomology is most logical especially from the applied and extension point of view. Whether this organic union will ever come about in the U.S.A. is doubtful, especially since there are about twice as many entomologists as there are plant pathologists. We would be outvoted. However, one can be optimistic. Thus when our small committee of three was working on a design for the official seal of the Society (11), I had in the back of my mind that with a little stretching a small insect could be inserted in the center of the shield as befits the most important cause of plant disease and disorders!

*Who employs plant pathologists?*—The Directory returns tell us who employs plant pathologists, at least in the U.S.A. Answers were gathered from the 1968 returns to add to those already available for 1953 and 1958 (16, 20). These answers are summarized per 1000 individuals (see next page).

| Type of employer | 1953 | 1958 | 1968 |
|---|---|---|---|
| State | 582 | 611 | 615 |
| Federal (incl. cooperation with State) | 187 | 169 | 170 |
| Industrial | 135 | 142 | 123 |
| Endowed colleges, institutions, foundations, etc. | 52 | 46 | 55 |
| Retired | 30 | 28 | 37 |
| Self-employed | 14 | 4 | 0 |

Fifty years ago employment of plant pathologists by industry was practically unheard of, but a decade later an upward trend had begun. Possibly the peak was reached about 1958 and has fallen since. More evidence would be required to substantiate this. The general impression that the government, specifically the U.S.D.A., has been expanding its opportunities for employment at a higher rate than others appears not to be borne out. Certainly the state and endowed institutions are keeping pace.

Apparently, self-employment of plant pathologists is becoming less attractive. Actually, only one self-employed person was reported in 1968, another old friend from Cornell days, Dr. Cynthia Westcott, the Plant Doctor. However, since the above returns are rounded to the nearest whole number, active Cynthia at 0.1 becomes a lost cypher!

*The costs of research in plant pathology.*—We are all aware of the trend in the costs which follows the motto of New York State—"Excelsior." Excellence is expensive. Much of the rise in costs is due to inflation which over the last 40 years is about fourfold. However, this is not the whole story. Forty years ago, when arriving at the Boyce Thompson Institute, I was assigned space in a well built laboratory; adequate glassware and chemicals were available. Also, I was assigned a secondhand microscope and balance, and that was my individual equipment. Today one cannot hire a young Ph.D. fresh out of graduate school without expecting to buy some $10,000 of new equipment immediately. The complication of present research with its increasing emphasis on biochemistry demands this.

Rather than quote some multimillion dollars of national effort in phytopathological research (which I do not have) some figures from my relatively small Institute might be more meaningful. Since the Institute is a completely self-contained unit, all costs are accounted for including such indirect things as administration, the library, other service departments, and maintenance of buildings, grounds, and a small farm. Items such as these do not appear in the budgets of most university departments of plant pathology; nevertheless, they are a part of the over-all costs.

In the broad field of plant pathology at the Institute, the equivalent of 20 full-time senior scientists (Ph.D.'s) plus a technical staff of 35 are engaged. A third or less of these consider themselves plant pathologists; the

others are plant physiologists, chemists or biochemists, virologists, and nematologists. Nevertheless, this is still plant pathology. The costs in this broad area in 1968 for direct expenses were $768,000. This figure includes salaries, supplies, specific charges from various service departments, and travel, but not capitalized equipment. The indirect charges were $378,000 or 73.7 per cent of research salaries. These indirect costs include a prorated share of administration costs, employee benefits, net costs of the service departments, and depreciation costs of buildings and equipment, an area not too well understood by research workers and some administrators as pointed out by Faiman (13). The total cost for plant pathology is $1,146,000 or $57,300 per senior research scientist. During the past decade these groups of workers have been furnished, for their own use, equipment costing $490,000.

*The status of plant pathology.*—Travel has become a status symbol in modern science. When I was a graduate student we were lucky to get to one scientific meeting in two years and that at our own expense. In fact a graduate student friend of mine from Cornell hitchhiked his way to one of these meetings in the dead of winter. This so impressed the elderly Dr. Erwin F. Smith that he asked to meet the young man.

Today most of us, including graduate students, expect to attend several meetings each year, on expense accounts which are often grant funds. This increase in travel, both national and international, while necessary and desirable for an exchange of information has become of concern to some administrators. As asked by Pound (25), when do they have time to stay home and get some work done?

Although I cannot produce any numbers to substantiate it, I suspect that the consensus would be that the science of plant pathology should be better recognized by top management and especially by the public at large. By the same token, I suspect that such a consensus could be derived for most other sciences and most other professions as well.

We need no numbers to show that plant pathology is submerged and diluted in the various crop departments of the U.S.D.A. It is my understanding that Erwin F. Smith in the early days had an opportunity to organize a named unit of plant pathology in the U.S.D.A. comparable to that in Entomology but that he was not interested. This seems too bad.

On the other hand, the trend in the Land Grant Colleges is upward according to Pound (25). The number of independent departments of plant pathology is upward. This is good for our profession. Pound notes one distressing trend—that our society shows the lowest growth rate of seven societies listed among the "ten other" disciplines closely related to plant pathology as noted above. Pound ascribes this to an inadequate publication program.

Nevertheless the percentage of foreign members in the society has been increasing from 1917 to 1968. The numbers at intervals of more or less a

decade are: 4, 12, 14, 14, 13, and 17 per cent of the total membership (1, 5, 7, 9, 17, 23). Since the foreign members in general would join primarily to receive and to publish in our professional journal, this would appear to be an endorsement of the increasing interest and quality of *Phytopathology*.

*Finis.*—And this is my personal perspective of plant pathology. I have enjoyed 50 years of associating with plant pathologists. I look forward to many more. I am confident that we can provide the adjustments needed in a rapidly changing world—that we can continue to do our bit to help feed a hungry world.

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