seems to me a very strange ground for admiration. And of course it is not true; and the truth is much better than the fable.

All discoveries in science grow from the work, patient and brilliant, of many workers. They would not be possible without this collaboration; they would not be possible without the constant technological developments that are necessary to new experiment and new scientific experience. One may even doubt whether in the end they can be possible except in a world which encourages scientific work, and treasures the knowledge and power which are its fruits.

For science is not parasitic on society: it makes a good return. And it is for its return, and not its abstruseness, that our children, when they learn of Einstein's work in college or in school, will prize it. It will be part of their thought, as for us to-day the work of Newton and of Pasteur; they will be able to trace its history in the development of countless new and powerful technological methods. In fact it was some of the early work of Einstein on the theory of relativity that first pointed the way to vast and hitherto untapped sources of energy. We know now that most of the sun's heat comes from these sources. And it is one of the most spectacular projects of contemporary atomic physics to make this energy available terrestrially, and thus to solve as far as human wants are concerned the problem of mechanical and electrical power. One could multiply instances of the usefulness, in the most direct and immediate sense, of Einstein's discoveries. But in every case we would find their development so closely interwoven with the work of countless other scientists and technicians that there would seem something artificial to such an analysis, and we would come away with only a deepened conviction of the cooperative and interrelated character of scientific achievement. And if we were to trace the effects of any great scientific discovery on human thought and culture, we should find a similar story.

It seems appropriate, on Einstein's sixtieth birthday, to speak of these simple things with a certain seriousness, for we know that he himself has been led to question the possibility of continued scientific progress in a world dominated by fascism and by fascist thought. We may be sure that it is not the special persecution to which he has been subject which has raised these grave doubts. It is a deeper thing. For it would seem that in a fascist world neither the technological nor the cultural fruits of science could find anything but abuse. For technology, by rendering less desperate the struggle for an adequate and rich existence, should tend to reduce and not increase the exploitation of man by man and of nation by nation. And in general the effect of science is to reduce too the absoluteness of the differences between people, and to increase their common understanding: that is just the content of its objectivity.

There are surely graver reasons for concern in the contemporary world than this threat to the future of science. But I doubt whether to-day there can be any better way to honor Einstein than to commit ourselves to the kind of world in which such work as his can be possible.

SCIENTIFIC NOTES AND NEWS

DR. SAMUEL C. LIND, dean of the Institute of Technology of the University of Minnesota, previously director of the School of Chemistry, has been chosen president-elect of the American Chemical Society.

A MEETING of the Harvey Cushing Society in honor of the seventieth birthday, on April 8, of Dr. Harvey Cushing, Sterling professor of neurology emeritus at Yale University, was held in New Haven on April 7. The speakers included Dr. Walter Freeman, professor of neuropathology at the George Washington University; Dr. James W. Watts, of the department of neurosurgery at the Hospital of the University of Pennsylvania, and Dr. Tracy J. Putnam, professor of neurology at the Harvard Medical School.

MERRITT L. FERNALD, Fisher professor of natural history and director of the Gray Herbarium of Harvard University, has been elected an honorary member of the Nova Scotian Institute of Science in recognition of his work on the flora of the Maritime Provinces.

AT the annual meeting of the Philadelphia College of Pharmacy and Science held on March 27, Dr. Wilmer Krusen, formerly director of public health of Philadelphia, was reelected president for the thirteenth time.

PROFESSOR FRANK E. RICHART, professor of engineering materials at the University of Illinois, was elected president of the American Concrete Institute at the recent annual meeting in New York City.

Nature states that at the annual general meeting of the Ray Society, London, held on March 23, the following officers were reelected: *President,* Sir Sidney F. Harmer; *Treasurer,* Professor F. E. Weiss; *Secretary,* Dr. W. T. Calman. Dr. John Ramsbottom was elected a vice-president.

DR. FRANKLYN BLISS SNYDER, professor of English, vice-president and dean of faculties of Northwestern University, has been elected eleventh president of the institution. Dr. Snyder, who has been associated with the university for thirty years, will succeed Dr. Walter Dill Scott, who has been president since 1920. Dr. Scott joined the university in 1900 as instructor in psychology and pedagogy and later became professor of psychology and director of the Psychological Laboratory.

DR. ROBERT A. MOORE, assistant professor of pathology at the Cornell University Medical College, has been appointed Edward Mallinckrodt professor of pathology and head of the department at Washington

University, St. Louis. Dr. D. K. Rose, associate professor of genito-urinary surgery, has been made full professor and head of that division in the department of surgery, and Dr. Felix Deutsch, a member of the faculty of the University of Vienna from 1919 to 1935, has been made associate professor of psychosomatic medicine.

DR. HAROLD C. UREY, professor of chemistry at Columbia University, has been appointed executive officer of the department of chemistry for a term of three years beginning on July 1. He will succeed Dr. Henry C. Sherman, Mitchill professor of chemistry, who has been head of the department for the last twenty years. Dr. Sherman will devote his time to research and teaching. Dr. J. Enrique Zanetti, professor of chemistry, has been named to the newly established position of director of laboratories.

RETIREMENTS from the faculty of the Johns Hopkins University have been announced as follows: Dr. Dean DeWitt Lewis, professor of surgery and surgeon in chief, the Johns Hopkins Hospital; Dr. Edward Bennett Mathews, since 1917 professor of mineralogy and petrography, and Dr. Thomas S. Cullen, since 1917 professor of gynecology. Each of them will receive the title of professor emeritus.

PROFESSOR WERNER HEISENBERG, of the University of Leipzig, will be visiting professor at Purdue University from July 1 to July 22 during the summer school session. He will lecture on problems of nuclear physics and cosmic rays.

DR. ROBERT HEGNER, professor of protozoology at the Johns Hopkins University, has accepted an invitation from the Department of Public Health of Mexico to help to organize a new Research Institute of Hygiene and Tropical Diseases, for which a building has been erected in Mexico City. He will sail on April 20 and return late in September. Dr. Redginal Hewitt will accompany him, and later in the season Marion Brooke will spend several months working at the institute under Dr. Hegner's direction.

DR. JOHN T. KING, associate in medicine of the School of Medicine of the Johns Hopkins University, was recently appointed physician-in-chief of the Baltimore city hospitals, filling the vacancy caused by the death of Dr. Thomas R. Boggs.

DR. P. N. ANNAND has been appointed assistant chief of the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture, effective on April 1. Since September, 1937, he has been a special assistant to the chief of the bureau on matters relating to research. He will continue to give special attention to the integration and planning of the research work.

DR. GEORGE S. STEVENSON, for twelve years director of the Division of Community Clinics of the National Committee for Mental Hygiene, has been appointed medical director, succeeding Dr. Clarence M. Hincks, who has asked to be relieved of the work, except as part-time field consultant, in order that he may give more time to the work of the National Committee for Mental Hygiene of Canada, of which he is the general director and founder. H. Edmund Bullis, who has served as executive officer of the National Committee and as assistant to Dr. Hincks, continues on the staff as part-time business manager.

ROBERT E. ADAMS, a recent graduate of the University of Wisconsin, and W. G. N. Heer, graduate in metallurgy of the University of Alabama, who was previously associated with the Tennessee Coal, Iron and Railroad Company, have been appointed members of the technical staff of the Battelle Memorial Institute, Columbus, Ohio. Both have been assigned to the process metallurgy division.

PROFESSOR JOHN S. DODDS, chairman of the American Engineering Council Committee on Surveys and Maps, has been appointed a member of the Advisory Council of the Federal Board of Surveys and Maps.

Nature states that J. E. Montgomrey has been appointed secretary of the British Institution of Mechanical Engineers in succession to Brigadier-General Magnus Mowat, who has retired on account of ill health. Mr. Montgomrey has been assistant secretary of the institution since 1920.

THE British Minister of Health has appointed a number of consultant advisers on the organization of hospitals in England and Wales in war-time. These advisers, who were nominated by the presidents of the Royal Colleges of Physicians and Surgeons, are Dr. Gordon Holmes, neurology; Dr. Bernard Hart, psychiatry; Dr. Gwynne Williams, orthopedic surgery; Sir Cuthbert Wallace, general surgery; Sir Harold Gillies, facial and jaw injuries; Dr. A. Tudor Edwards, chest wounds; Professor Hugh Cairns, head injuries; Professor F. R. Fraser, general medicine; Dr. W. M. Mollison, ear, nose and throat; Dr. C. B. Goulden, ophthalmology, and Dr. A. E. Barclay, radiology.

THE Medical Research Council of Ireland has awarded a grant for one year's training in methods of research on hormones to Dr. T. E. T. Bradshaw and a whole-time grant for one year to carry out serological research in the department of bacteriology, Trinity College, Dublin, to Professor Hans Sachs. Grants-in-aid of research expenses have also been made to Professor T. W. F. Dillon, Professor J. F. Donegan and Dr. Patrick FitzGerald. The grants made to Dr. J. C. Flood, Dr. R. A. Q. O'Meara and Dr. J. C. Shee have been renewed.

PROFESSOR BERGEN DAVIS and Professor Daniel D.

Jackson, of the department of physics of Columbia University, have leave of absence for the present semester.

DR. JONAS BORAK, of Vienna, the radiologist, who has been invited to give a number of lectures at New York University, arrived in New York on April 6.

THE Acoustical Society of America will celebrate the tenth anniversary of the founding of the society on May 15 and 16. A symposium is planned on "The Measurement and Application of Absorption Coefficients." There will also be a program of technical papers, which will include a paper entitled "A Demonstration of Combination Tones," by Sir William Bragg, of the Royal Institution, London.

DR. WILLIAM DEB. MACNIDER, Kenan research professor of pharmacology in the Medical School of the University of North Carolina, delivered a Mayo Foundation lecture at Rochester, Minn., on March 17.

THE eighth annual series of addresses under the auspices of the Benjamin Knox Rachford Lectureship will be given at the Children's Hospital Research Foundation, Cincinnati, Ohio, by Dr. Ernest W. Goodpasture, professor of pathology at Vanderbilt University. The subjects of the lectures will be: "Experimental Virus Infections of the Chick Embryo" and "Experimental Bacterial Infections of the Chick Embryo."

DR. FREDERICK F. RUSSELL, professor of preventive medicine and epidemiology, emeritus, of the Harvard Medical School, will deliver the annual Cutter lecture in preventive medicine on April 17. His subject will be "The History of Yellow Fever as an Illustration of Methods of Study and Control of Virus Diseases."

DR. C. H. DANFORTH, professor of anatomy at Stanford University, will deliver the seventh Harvey Society lecture of the current series at the New York Academy of Medicine on April 20. He will speak on "Genic and Hormonal Factors in Some Biological Processes."

DR. RENÉ LERICHE, professor of chemical surgery at the University of Strasbourg, delivered the Lister Memorial Lecture before the Royal College of Surgeons of England on April 5. The lecture was entitled "The Listerian Idea in the Year 1939."

A NEW series of short courses in science is announced by the American Institute, New York City. Dr. M. L. Crossley, director of research of the Calco Chemical Company, will lecture on "Sulphanilimide and its Compounds." His lectures were announced for April 11, 18 and 25. The dates of lectures by Dr. Oscar Riddle, of the Station for Experimental Evolution at Cold Spring Harbor, Long Island, on "The Endocrine Glands" are April 13, 20 and 27. The lectures will be given at 7:30 P.M. at the meeting rooms of the institute, 60 East 42d Street, New York City.

THE Royal College of Surgeons, London, has appointed Sir James Walton Bradshaw lecturer and Sir Walter Langdon-Brown Vicary lecturer for the coming year.

THE forty-fourth annual meeting of the Michigan Academy of Science, Arts and Letters was held on March 9, 10 and 11. Included in the program were addresses by Professor Arthur E. R. Boak, president of the academy, and by Dr. George H. Whipple, dean of the School of Medicine and Dentistry of the University of Rochester. Professor Boak spoke on "The Rôle of Taxation in the Decline of the Roman Empire," and Dean Whipple on "Anemia and the Building of Hemoglobin in the Body." Two hundred and ninety-four special papers were included in the program.

THE Dutch Congress of Natural Science and Medicine was held at Nymwegen, under the presidency of Professor G. Holst, from April 11 to 13.

AN extensive program is being developed for the 1939 World Engineering Congress of the Society of Automotive Engineers. Some sixty technical papers by well-known authorities are given on the preliminary program; over one third of the speakers are Europeans. The congress opens on May 22 in New York for a five-day session, will be in Indianapolis from May 29 to 30, in Detroit from May 31 to June 2 and closes with a three-day session in San Francisco, ending on June 8. Advanced engineering design problems of aircraft, automobile, trucks, buses, railcars, the rôle of tractors in our national economy, operating problems of fleet owners and reports on fuels and lubricants developments will be covered by the congress.

THE University of Pavia arranged a celebration in honor of the eighteenth-century physiologist, biologist and vulcanologist, Spallanzani (1729–1799), which was held in Pavia from April 11 to 14. According to *Nature,* a monument to Spallanzani was unveiled and a program of scientific addresses, mainly on modern genetical problems and the physiology of reproduction, was presented by delegates invited from various countries, including from Great Britain Professor R. Ruggles Gates, Professor F. A. E. Crew and Dr. C. F. Pantin. Meetings of the societies for experimental biology, botany, geology and veterinary medicine are also being held at the university, and a visit will be paid to the Spallanzani Museum at Reggio Emilio.

Museum News states that a survey of the exhibits

at the world's fairs at New York and San Francisco will be made by internes in training at the Buffalo Museum of Science under Carlos E. Cummings, director, in cooperation with Robert P. Shaw, director of the New York Museum of Science and Industry. The internes will make an analysis of each exhibit, covering such items as the use of light and color, sound effects, labels, leaflets and folders, attendants and visitor participation and flow. An endeavor will be made also to list exhibits that might be suitable for museum use after the fairs. The Rockefeller Foundation has made a grant for preparing a report. The American Museum of Health, New York, has received a grant from the Carnegie Corporation of New York for a study of the reaction of visitors to the museum's medical and public health exhibit at the New York fair. The study will be directed by Dr. Mayhew Derryberry, of the U. S. Public Health Service.

DISCUSSION

DISEASE, DAMAGE AND POLLINATION TYPES IN "GRAINS"

AMERICAN students of plant diseases for over half a century have been more concerned with the organisms causing disease, especially fungi, than with the host plants. No doubt the present interest in plant breeding will tend to readjust the balance. But even to-day interest in virus diseases centers rather on the nature of the viruses than on their effects. In particular, any attempt to generalize as to the disease relations of groups of plants has been almost wholly lacking from our literature. Hartley's[1] discussion of the disease hazards incident to planting clonal varieties of trees is a conspicuous exception. He notes that "The expectation that genetic uniformity will favor the building up of specialized strains of parasites is supported by practical experience with such clonal cultures as Lombardy poplar avenues, rubber plantations, fruit trees, roses, potatoes, bananas, sugar cane and the creeping-bent golf-green grasses." The present paper is an attempt to examine some of the available evidence in order to determine whether such a relation is observable among major crop plants.

That numerous biological strains of many parasitic fungi exist in nature and that they vary continually through crossing and otherwise has been abundantly demonstrated in recent literature. Some of our crop plants, on the other hand, because of the method used in propagation or their own floral characteristics, have very much less natural opportunity for variation and adaptation than others. It seems probable that in their long-continued mutual association, parasites might well obtain a relatively greater advantage over those host plants which themselves had the least capacity for variation and adjustment. This might express itself in greater disease losses over a period of years or, in the case of parasites particularly favored by special environmental conditions, it might express itself in epidemics in the relatively weaker groups of host plants.

As to the capacity of the host to vary and adjust itself, vegetatively propagated plants would be less efficient than those produced from seed. Among plants grown from seed there would be a gradation in this respect from plants largely self-pollinated, to plants with perfect flowers which are usually cross-pollinated, then monoecious and finally dioecious or heterostylous plants. Of course, no such complete series exists among comparable crop plants, but those commercially classed as "grains" offer some interesting contrasts.

In an attempt to evaluate disease losses in the United States as a whole, one naturally turns first to the estimates of diseases losses compiled by the Plant Disease Survey. These have, however, been systematically collected for only twenty years and suffer, to some extent, from the lack of regular reports from many states. In fact, there are no subjects on which present-day plant pathologists are more reluctant to express an opinion than the extent of crop losses from disease and the economic importance of plant diseases. These are obviously not the same thing. Economic importance, while difficult to measure, must be in some way a function of the value of the crop concerned, the loss caused by disease and the fluctuations in loss. This last is a very important consideration. Other things being equal, even the average losses over a period of years, that disease is the most important which fluctuates most. Secretary Wallace has said, "Fluctuations in yields cause as much embarrassment as unbalanced acreage."[2]

In searching for some means of measuring the relative importance of diseases of economic plants, it dawned upon me that volume of publication must, in some degree at least and for the more important crops, express the opinion of plant pathologists and others interested as to the importance of diseases.

I have accordingly tabulated the total pages regarding the diseases of various important crops in the publications of the U. S. Department of Agriculture up to January, 1925, of the Experiment Stations up to December 1, 1927, and in *Phytopathology* up to January, 1927. This covers, for the experiment stations, a period of 40 years and, in the case of the

[1] Carl Hartley, *Phytopathology*, 29: 9, 1939.

[2] *New Republic*, December 2, 1936.