nize the two distinct types of variation and hope for further light as to their significance and mutual relationship. I do not, however, believe that more than two new types of variability need not at present be postulated; and I would suggest that efforts be made to correlate any fresh phenomenon of variation with either the cyclogenic or the dissociative type of variability, before introducing new terminology or new philosophical concepts.

Bacteriophagy I conceive as a third and quite distinct phenomenon, arising from the influence upon bacteria of a self-perpetuating substance (probably an organism) of independent origin. I can not believe with Hadley that bacteriophage is a result of dissociation; nor can I agree with my colleague, D'Herelle, that dissociation is necessarily and always a result of bacteriophagy. Rough strains are commonly lysogenic and a symbiosis between bacterium and bacteriophage might explain the appearance of certain "rough" characteristics. It seems quite certain, moreover, that action of bacteriophage is one of the commonest and most powerful stimulants to both cyclogenic and dissociative variation. It may well be, however, that other incitants would prove to be of equal generality if they were tested as extensively.

As one who has been long interested in systematic bacteriology I would point out that all this new knowledge does not involve a return to Nägeli's pleomorphism nor does it invalidate the conception of bacterial specificity. The fact that under certain conditions the colony of typhoid bacilli produces papillae of lactose-fermenting organisms is just as definite a characteristic of the typhoid bacillus as the fact that most of its cells fail to ferment that sugar. What we are getting from these studies is not a negation of bacterial specificity, but a conception that the characteristics of each species are vastly more complex than we had supposed.

Nor is there any danger that these new discoveries will overthrow the fundamental bases of epidemiology. It is just as true as it ever was that typhoid fever is normally caused by the presence of the Eberth bacillus and diphtheria by the Klebs-Loeffler bacillus. The simple concepts of specificity have proved their value. They are relatively, if not absolutely, sound, as proven by the empirical results obtained through their application. On the other hand, the new knowledge opens enormous possibilities of explaining obscure phenomena and of obtaining new methods of defense against communicable disease. The serological relation of Proteus X 19 to typhus fever and of *Salmonella suipestifer* to hog cholera, the association of Pfeiffer bacilli and streptococci with influenza and poliomyelitis may all perhaps be elucidated by future discoveries in this field. It may be that exposure to a non-virulent but immunizing phase of the diphtheria bacillus and the streptococcus may account for the development of immunity which takes place during childhood and which always seemed a difficult phenomenon to explain on accepted principles. The use of nonvirulent dissociants like the bacillus of Calmette and Guerin may widen our resources in the production of artificial immunity.

The brilliant work of those who have presented papers to-day, and of their predecessors, has opened up new fields in bacteriology which are full of hope and promise. They have given us a new concept of the marvelous properties of the organisms with which we work. They have multiplied the fascination and the practical possibilities of our science.

# SCIENTIFIC EVENTS

## THE ANNUAL EXHIBIT OF THE BRITISH PHYSICAL AND OPTICAL SOCIETIES

THE twenty-second annual exhibition held jointly by the Physical Society and the Optical Society was held at the Imperial College of Science and Technology, South Kensington, in January. The exhibit was open to the general public. The London *Times* reports that the bulk of the floor space was occupied by the exhibits, many of them new, of the firms of scientific instrument makers. On the top floor and at a few other stands, however, there may be seen groups of apparatus displayed by some thirty contributors to the Research and Experimental Section.

The exhibitors here include many official bodies, such as the Meteorological Office, the Government Laboratory, and the National Physical Laboratory, the last of which showed a great variety of apparatus, including an interesting optical test of the effects of glare on the eye. The Post Office Engineering Research Station showed, among other apparatus, an "artificial ear," which has acoustic effects upon a telephone receiver equivalent to application to a human ear.

Mr. R. G. Bateson, of the Forest Products Research Laboratory, exhibited a direct-reading humidity meter operating on the wet and dry bulb thermometer principle, and enabling calculations of humidity to be made by inspection without reference to the usual tables or charts. A new humidity control apparatus for use in small testing rooms and laboratories was shown by the Wool Industries Research Association, together with a meter for testing the permeability of fabrics by the air, an extensometer for testing the elasticity of individual fibers, and a combined electrical

heater and temperature measuring sheet which will enable cloth-pressing to be carried on by less empirical methods than at present. The Rothamsted Experimental Station displayed a "pachimeter" made out of meccano parts for testing the plasticity of soils and clays. This, it is thought, may be useful also for millers and bakers in the preparation of flours.

Apparatus for studying speech visually were to be seen in many parts of the exhibition, the most interesting, perhaps, according to the *Times,* being that developed by Professor E. W. Scripture and the adaptations used at the Speech Laboratory of the West End Hospital for Nervous Diseases by Miss F. Janvrin. Speech curves, it appears, can be produced upon smoked paper, so as to provide clearly recognizable tests for the presence of such diseases as epilepsy, disseminated sclerosis, or general paralysis when the symptoms can not be directly recognized in listening to the patient's voice. Another interesting application of physical apparatus to physiological problems was shown by Professor A. V. Hill, in photographic exhibits of the minute heat-production curves which are produced by the stimulation of a nerve or the twitch of a muscle.

In the trade section the experimental sound-film projector for sub-standard (16 millimeter) film shown by the Ensign Company, the "tong-test" for alternating and direct current measurement produced by Crompton Parkinson, and the giant epidiascope with a throw of 70 feet made by W. Edwards and Company were typical of the more popular apparatus.

## THE FEDERAL APPROPRIATIONS FOR AGRICULTURAL RESEARCH

SCIENCE SERVICE reports that items in the agricultural appropriation bill, which were reduced below the Bureau of the Budget estimates for 1933 by the House Committee on Appropriations included many lines of scientific research, which had already felt the pruning knife of the agricultural chiefs and the bureau.

The Bureau of the Budget estimates had pared the $235,664,694 agricultural supply act of 1932 down to $186,243,405—a decrease of more than $60,000,000. Much of this was concerned with decreased appropriations for road building and relief loans—in fact almost all of it except about $10,000,000 to be cut from regular departmental activities. Actual savings of more than three millions, to revert to the treasury, were planned in various agricultural bureaus.

The house appropriations committee cuts from budget estimates, amounting to an additional ten million dollars, were made all along the line, and touched the following scientific investigations:

Administration of agricultural experiment stations, $13,646. (Bureau of the Budget had recommended increase.)

General weather service and research in Weather Bureau, $30,500. (Already cut $71,482.)

Aerology, $26,900. (Already cut $225,000.)

Animal husbandry, $20,505. (Already cut $29,495.)

Diseases of animals, $6,000. (Already cut $31,050.)

Dairy investigations, $9,900. (Already cut $69,442.)

Barberry eradication, $3,600. (Already cut $177,140.)

Cereal crops and diseases, $3,700. (Already cut $19,575.)

Citrus canker eradication, $2,100. (Already cut $7,900.)

Cotton production and diseases, $2,600. (Already cut $12,100.)

Rubber, fiber and other tropical plants, $1,500. (Already cut $25,031.)

Protection and administration, national forests, $76,500. (Already cut $119,746.)

Forest products investigations, $2,200. (Already cut $25,460.)

Agricultural chemical investigations, $5,600. (Already cut $5,851.)

Color investigations, $800. (Already cut $2,500.)

Insecticide and fungicide investigations, $1,100. (Already cut $10,000.)

Soil chemical and physical investigations, $200. (Already cut $30.)

Cereal and forage insects, $4,900. (Already cut $42,500.)

Insects affecting man and animals, $4,300. (Already cut $10,200.)

Agricultural engineering investigations, $6,600. (Already cut $58,550.)

Home economics investigations, $900. (Already cut $12,335.)

Pink boll worm control, $5,600. (Already cut $61,000.)

Gypsy and brown-tail moth control, $5,700. (Already cut $65,000.)

European corn borer control, $500,000. (Already cut $155,000.)

Japanese beetle control, $25,000. (Already cut $45,000.)

Among other cuts made by the Bureau of the Budget and not touched by the committee was one of $40,840 from the soil erosion investigation appropriation last year.

## THE INTERNATIONAL CONGRESS OF PURE AND APPLIED CHEMISTRY

THE Ninth International Congress of Pure and Applied Chemistry will be held in Madrid from April 3 to 10. The officers of the congress are: J. R. Mourelo, vice-president of the Academy of Sciences and professor emeritus of the School of Arts, *honorary president;* O. Fernandez, professor at the University of Madrid, member of the Academy of Sciences and dean of the Academy of Pharmacy, *president;* and E. Moles, professor at the university and at the