combined chemical and bacteriological investigations into the conditions which govern the life and multiplication of microorganisms causing disease. These have been made possible by the cooperation of the Middlesex Hospital Medical School, the trustees of the late Lord Leverhulme and the Sir Halley Stewart Trust. Accommodations and facilities are being provided at the Middlesex Hospital in the Bland-Sutton Institute of Pathology and the adjoining Courtauld Institute of Biochemistry. The investigations will be directed by Dr. Paul Fildes, who has been appointed a member of the scientific staff of the council. The other workers are Mr. B. C. J. G. Knight, with a Halley Stewart Research Fellowship, and Dr. G. P. Gladstone and Dr. G. Maxwell Richardson, holding Leverhulme Research Fellowships. The arrangements took effect on June 1, and the support given by the cooperating bodies is sufficient for an initial period of five years.

DISCUSSION

THE CRISIS AT BUITENZORG

THERE are a host of reasons that something ought to be done to prevent one of the most important institutions of learning in the Orient, the Botanical Gardens and Biological Laboratories at Buitenzorg, Java, from falling into decay as a result of lack of governmental means of support.

This institution represents a collection of information regarding tropical botany and zoology reaching back well over one hundred years.

The herbaria and the collections of living plants contain great numbers of type specimens and much data of the utmost importance, because, due to the swift changes which have taken place in the forests of Java in the last century, they have become practically irreplaceable. In them are assembled the collections of Valliton, Boerlage, Treub, Hasskarl, Kohrdes, Backer, Teysman and many others, gathered from the whole Malay archipelago, and representing species, many of which have become exceedingly rare or even extinct.

The Museum of Economic Plant Products, created by Heine, during a lifetime of extraordinary industry, is probably not equalled by any other museum in the Tropics. The data which Heine was able to get together, respecting the uses of a multitude of tropical plants by the forty or more races of people who occupy the vast archipelago, possess a value almost impossible to estimate. The collections upon which these observations were based are unique and irreplaceable.

Not only is there the superb Botanic Garden, certainly the finest in the whole world, with its many and useful laboratories, but the gorgeous Mountain Garden as well. This is situated at the very edge of the Rain Forest on the slope of the Volcano Gedeh. It has been a source of inspiration to many famous investigators of the past. Shimper, Haberlandt, Weisner, Haeckel, Zimmerman, Douglas Campbell, Goebel, De Vries and many other Europeans and Americans have felt its inspiration and have reflected it in their subsequent writings. Out of the studies of these men have come papers and books and lectures and conferences which have enlightened thousands of students as to the real nature of tropical life and its bearing upon the problems of life or peoples inhabiting the temperate zone.

It was the privilege of one of us (D. F.) to visit Java in 1895, accompanying there Melchior Treub, to whose initiative much of what now stands in the way of equipment in Buitenzorg is due, and of the other writer of this appeal to spend months in the laboratory in the garden while it was still in Treub's hands in 1906–07. The senior author has visited it twice since. If there has ever been any one period of our lives more than another that has impressed our whole outlook on science it was the period of our first stay in the Botanic Gardens of Buitenzorg.

The strictly scientific standing of the garden and all connected with it is an example to the rest of the tropical world. It was much more than a tropical botanical garden. It was then and has remained to this day one of the most remarkable scientific institutions in the world.

It is impossible to look with equanimity upon the threatening disintegration of such an institution, more than ever when certain problems of the tropics are pressing for solution. The growth of our knowledge of the science of genetics, and the bearing of that science upon the whole intricate problem of evolution, make it of the greatest importance that there be maintained such accumulations of actual observations and specimens as are represented by the Buitenzorg collections. It is worth recalling that it was while collecting in the Malay archipelago that Alfred Russell Wallace thought out his theories of natural selection and communicated them to Darwin. It does not seem unfair to attribute to the stimulating environment of the Aru islands and their birds of paradise a share in this great biological conception.

It was in Java, we believe, that the rubber tree was first successfully propagated by budding instead of

by seed, and there hybrids of the cinchona with increased quinine content were first developed. The zoological collections in the Buitenzorg Museum are rich and varied, and uncared for in the climate of Java will before long be lost inevitably. They have come from every corner of the far-flung empire of Netherlands' India and represent much rare and priceless material upon which important publications have been based. For the botanist the garden is a wonderland. Here he finds gathered together the giant Rafflesia of Sumatra, the giant bamboos, the immense variety of superb and fascinating orchids, the wealth of insectivorous and myrmecophilous plants, the stinking but delicious Durian, the vast variety of strange and interesting palms which have fascinated the botanists of three generations.

No other institution in the Tropics has accumulated so great a fund of biological information as has Buitenzorg, or kept the priceless materials collected in better condition, most difficult undertaking in a tropical climate.

We are aware that the policy of the Dutch in keeping secret certain discoveries regarding gutta-percha has been criticized, and that there has been criticism too regarding the monopoly of cinchona which has been built up in Java. However, in defense of this policy, it may be said that the discoveries were made at great cost to the Netherlands' Indian government, and have constituted an important source of revenue from which to draw funds for the support of the scientific work carried on there.

These facts, furthermore, being of a political nature, should not prejudice us, as they do not concern the question at issue, which is how to prevent the loss to the scientific world from the collapse of a great center of European learning in the Orient. Every biologist, no matter where he lives, is interested in the conservation of this great scientific center in Java. National lines and national prejudices ought not to enter into the question.

Dr. Dammermann, the present director of the institution, has sent out a straightforward sincere appeal for assistance. The amount asked for is not excessive. No similar garden is maintained so economically as is that at Buitenzorg, owing to the trained staff of Javanese gardeners and laboratory assistants, who are paid the lowest wages ever given to men of such intelligence. When compared with the expenses of maintenance of similar collections elsewhere, the amount appears insignificantly small. Small as it is, however, the situation in Holland is such that help is needed and if not forthcoming, the crisis will soon come. The speed of deterioration of such organizations, when neglected in the Tropics, is amazing. A few months of neglect lead to irreparable losses. The Buitenzorg institution deserves to be tided over into a more prosperous era, or until new sources of income can be devised for its maintenance. It represents a storehouse of knowledge which should not be allowed to disintegrate. What can be done?

DAVID FAIRCHILD
THOMAS BARBOUR

CHEMICAL AND PHYSIOLOGICAL PROPERTIES OF KOJIC ACID

IN a recent study of the metabolism in dogs of the six-carbon derivatives of glucose, a marked toxic action was observed in the case of kojic acid. A definite response was noted after the intravenous injection of 150 mg per kg. The symptoms are copious salivation, retching, vomiting and defecation. The reducing power of the blood is greatly increased. The head begins to nod, the gait becomes unsteady, the animal becomes quieter and may even go to sleep. With larger quantities the animal becomes greatly excited. This is accompanied by continuous yelping and, at intervals, tonic and clonic convulsions. There is marked exophthalmos. Practically the same symptoms are shown by rabbits and rats. The lethal dose of the sodium salt was found to be about one gm per kg.

Kojic acid is formed under certain conditions by molds and aerobic bacteria.[1,2] Maximum yields of 65 per cent. have been obtained from molds by May, Moyer, Wells and Herrick.[3] Kojic acid, like glucose, has the amylene oxide ring structure;[4] but, unlike glucose, this ring is stable. Its acidic properties probably are due to the phenolic hydrogen. It is a pyrone and possesses the properties of other known pyrones. Its copper salt is quite insoluble. It forms a colored iron complex which the writer has observed even at a dilution of 1 to 400,000. The writer finds also that this iron complex can not be reversibly oxidized or reduced. Unlike ascorbic acid (vitamin C), it is not oxidized by iodine in acid solution; but it readily absorbs four equivalents of iodine at pH 6–7. It is further metabolized by molds and yeasts. The writer finds that small quantities injected at two-hour intervals are largely retained and probably burned by the animal.

Its mode of formation under aerobic or partially aerobic conditions, certain of its chemical properties and its marked pharmacological action suggest its possible formation in the tissues of animals in certain pathological conditions, such as epilepsy. Work is

[1] K. Saito, *Botan. Mag.* (Japan), 21: 249, 1907.
[2] T. Takahashi and T. Asai, *Proc. Imp. Acad.* (Tokio), 8: 364, 1932.
[3] O. E. May, A. J. Moyer, P. A. Wells and H. T. Herrick, *Jour. Am. Chem. Soc.*, 53: 774, 1931.
[4] T. Yabuta, *Jour. Chem. Soc.*, 125: 575, 1924.