vancement of Science on the evening of January 20. The title of his lecture was "How Old is Man?"

PROFESSOR EMIL T. WITSCHI, of the department of zoology of the State University of Iowa, will be the guest of the Iowa State College Chapter of Sigma Xi on January 26. He will address the society on "Hormones in Development and Evolution."

THE two hundred and nineteenth regular meeting of the American Physical Society will be held at Columbia University on Friday and Saturday, February 25 and 26, as a joint meeting with the Optical Society of America. The preliminary arrangements of the program include a joint session with the Optical Society of America in a symposium on "The Optical Properties of Metals" at which the speakers will be Professor L. A. DuBridge, University of Rochester; Professor J. B. Nathanson, Carnegie Institute of Technology, and Professor H. A. Bethe, Cornell University. In addition there will be a lecture on "The Debt of the World to Optical Science" by Dr. Harlow Shapley, director of the Harvard College Observatory. This lecture will initiate the Adolph Lomb memorial lectureship established by the Optical Society of America. A meeting on April 28 to 30 will be at Washington, D. C., and the June meeting will be on the Pacific coast.

A $500,000 trust endowment for agricultural research has been established for the Michigan State College by the Horace H. Rackham and Mary A. Rackham fund. The first utilization of the fund will be the financing of study in the development of industrial uses for farm waste products. A board of trustees to administer the fund consists of Dr. Robert S. Shaw, president of the college; V. R. Garner, director of the Experimental Station; Hudson McCarrol, head of the chemical and metallurgical laboratories of the Ford Motor Company at Dearborn; Michael M. Gorman, editor of the *Flint Journal,* and Dexter Horton, of Ann Arbor.

DISCUSSION

POVERTY OF HUMAN REQUISITES IN RELATION TO INHIBITION OF PLANT DISEASES

THE writer spent the early spring to late fall of 1936 in Turkey (Asia Minor), exploring for certain plants under the auspices of the Division of Plant Exploration and Introduction, U. S. Department of Agriculture. In connection with seed collecting, surveys of vegetable plant diseases were made in different parts of the country. While making these notes it was interesting to find a marked absence of certain plant diseases in gardens of some villages. Occasionally it was possible to repeat visits to the same localities a number of times, and in places additional information was secured from Europeans and Americans living there. The conclusions reported in this paper are the result of only one season's observations, but it is believed they deserve to be published.

Diseases of cultivated vegetables occurred commonly in some localities, while in others they were apparently rare. In a few districts because of the nature of the terrain, gardening was possible only in restricted areas where irrigation and cultivation could be carried on, so that the gardened spots were very old. Wild plants growing outside of disease-free gardens were found with leaf spots and other fungus and bacterial infections, which indicated that some condition other than climate was probably effective in the phenomenal freedom from plant diseases in the gardens.

It appeared that, in general, the vegetables most nearly disease-free were growing in regions where there was a serious lack of certain natural resources. This was, of course, reflected as human poverty resulting in a vicious circle which in turn put its stamp on gardening operations. Places where healthy vegetables were so commonly produced were, for example, in sections where, judging from findings of archeological students, ancient civilizations had once flourished but had long since become much reduced. In such regions sufficient crops to support life for a limited number of human beings had been grown since prehistoric times. In many instances the mode of life of the growers was very simple and the material possessions minimized, a condition which the present Turkish government is evidently taking steps to alleviate. Apparently this economy of scarcity had become a stabilized condition that had existed for so long that it was taken as "the Will of Allah" by the peasantry, and they governed their living practices accordingly.

It appeared that people living under the difficulties obtaining in certain regions planned to produce their own seeds, to eat everything they grew and to feed their camels and asses every possible green leaf that was grown but not fit for human consumption. Fuel was at a premium in a number of the regions, and manure of animals was collected and dried for this purpose. In village gardens, workers were observed digging roots of harvested vegetables, which then were dried for fuel or fodder. The common method of fertilization of the gardens was the use of night soil mixed with ashes from the cooking and heating fires of dried animal dung.

Since rainfall was slight in many of the sections and water available for irrigation with primitive methods was meager and somewhat seasonal, the smallest amount was required to go the longest way. These

limitations were, in themselves, probably effective in arresting some development of parasitic plant diseases that require large amounts of rainfall. However, diseases needing the least amounts of moisture were also found to be quite uniformly absent in certain of the garden spots.

It is safe to estimate that in some situations human beings had grown crops under these difficulties for centuries. It is likely that in those days as soon as diseased plant materials were encountered in the gardens, they were removed and consumed by human beings or stock, or else dried and burned. Yellowed or spotted leaves were likewise removed and used as forage by early gardeners, as they are at present. Consequently, it seems the most severely diseased plant materials may well have been fed to animals, the manure collected and dried and used as fuel; thereby disposing of infective material. On questioning it was found the peasantry do not eat noticeably decayed vegetables. Indeed, at the present time, they eat comparatively few raw vegetables, and presumably they have not changed greatly in their dietary practices from long ago. It is reasonable to conclude that during many generations of cultivating these fields, little infective material has passed through the human digestive tract to be applied to gardens as night soil.

Manifestly what would appear to be an unintentional system of field sanitation has evolved in certain regions in Turkey. Restrictive causes have led to practices which might well be considered antagonistic to the perpetuation of many plant diseases. Of course it is appreciated that the inadvertent selection of disease-resistant strains of crops in some communities, together with the relatively dry climates encountered, may have been in themselves operative to a considerable extent in producing disease-free vegetables.

It was notable that in many places visited where human economy was unfavorable, vegetables were found growing markedly free from diseases of a bacterial nature, leaf spots of a parasitic fungus nature were lacking, stem or root-rotting diseases did not occur, and there was apparent absence of seedling trouble. While in other regions of the country where climatic conditions were similar but poverty of materials and resources was somewhat less apparent, plant diseases of all classes just noted were found in fair abundance, and in some cases they occurred with considerable severity.

It is to be regretted that numerical data could not be gathered that would give statistical evidence of the effect of unconscious field sanitation practices necessitated by meagerness of available natural resources. The securing of such figures would obviously require prolonged residence in the country so that observational evidence could be supplemented with experimental activities. Needless to state, human poverty is not suggested as a remedy for plant diseases nor as a beneficial state from any standpoint, even though gardeners of very poor economic status, living in regions of extremely scanty natural resources, may in some cases produce comparatively disease-free crops. Human poverty, unless it results in agricultural practices and economies of the character here described, can not be expected to bear any relation to plant diseases. The important point is that in certain areas visited in which there existed the most serious deficiency of human requisites, the dearth of those requisites had necessitated an agriculture that is essential to even a bare human existence and which appeared to inhibit the perpetuation of crop plant diseases.

A more detailed account of these plant disease surveys is being prepared, and will be presented at a later date.

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IRREVERSIBILITY OF CONDUCTION IN THE REFLEX ARC[1]

CONDUCTION in the reflex arc is said to be irreversible; but, inasmuch as no nerve cell has yet been found to have but a single synapse upon it, nor has a nervous impulse ever been shown to be effective across a single synapse in either direction, there is neither logical nor empirical justification for inferring any irreciprocity of the individual synapse.

There is good evidence that a synapse is, as Keith Lucas suggested, a "region of decrement" which, in the cases so far reported, reduces the impulse to subthreshold value and thus, for transmission, requires summation. Lorente de Nó's recent measurements of the period of latent addition at the synapse have shown it to be of the same order of magnitude as the refractory phase. Hence, temporal summation at a single synapse is extremely improbable—whereas spatial summation from neighboring synapses is possible anatomically and known to occur physiologically.

Because subthreshold stimulation does not set up a propagated disturbance, spatial summation can only occur from synapses close together on the cell receiving the impulses; and, because the separation of synapses, measured along that axon whose endings they are, is great in comparison with the separation of synapses, measured along the surface of that cell body and its dendrites, to which they are applied, spatial summation will occur mainly in one direction only—and this will obtain though many synapses upon a single cell be terminations of a single axon.

[1] From the Laboratory of Neurophysiology of the Yale University School of Medicine, New Haven, Conn.