Theorem I has been applied[4] to the study of the famous deviation problem (a particle falling from rest to the earth allowing for rotation or ellipticity). Our new extended theorems will also have applications, direct and indirect, in physical situations dealing with interacting particles. The forces need not be conservative.

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A STUDY OF LAMPBRUSH CHROMOSOMES BY THE ELECTRON MICROSCOPE

LAMPBRUSH chromosomes have been photographed by the electron microscope. The nuclei were removed from the oocyte according to the method of Duryee[1] and were placed on the collodion film suspended on the wire mesh which is used in place of the slide in the electron microscope. The nuclei were torn apart so that the enclosed material spread over the film. The membrane was then removed since it was too thick for penetration by the electron beam when collapsed. The preparation was allowed to dry in air.

The photographs seem to verify early descriptions. Some chromosomes appeared to be highly branched and subbranched. They were fern-like in appearance. The threads were crystalline and single. Other chromosomes showed less numerous, thicker, more globular side branches. Many side branches had been lost between the first and second type. Finally some showed no branches. There were as many as four threads twisting about one another separating into twos at some points and rejoining at others.

No loops, as described by Duryee, were seen. However, chromosomes from full-sized eggs only have been examined. Further investigations, in which the nuclei of half-sized eggs will be used, are in progress. It may be that these will verify the loop theory as put forth by Duryee.

Blanks were run in which only cell debris, from which the nucleus had been removed previously, and the nuclear salt solutions were dried and photographed. No similarities between these preparations and those of the nucleus were observed.

The investigations are being extended in the belief that they will throw added light on the structure of such chromosomes and will clear up such problems as the time at which the chromomena thread becomes doubled.

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[4] W. H. Roever, *Bull. Amer. Math. Soc.*, 456, 1915.

[1] W. R. Duryee, "Cytology, Genetics and Evolution," University of Pennsylvania Press, Philadelphia, 1941.

CONSIDERATION OF THE ADEQUACY OF BIOMICROSCOPY AS A METHOD OF DETECTING MILD CASES OF VITAMIN A DEFICIENCY

RECENTLY Dr. H. D. Kruse has reported on "The ocular manifestations of avitaminosis A with especial consideration of the detection of early changes by biomicroscopy."[1] He has suggested that "xerosis conjunctivae probably precedes night blindness as an early sign of avitaminosis A," and recommends biomicroscopic examination as a "simple, convenient, objective method" for the detection of avitaminosis A in surveys.

In view of the importance of finding reliable tests for detecting mild degrees of the various avitaminoses, it is relevant to call attention to certain discrepancies between the above-mentioned observations and those reported in a study by Booher, Callison and Hewston in which impaired dark adaptation was produced in five adults by the consumption of a diet adequate in every known dietary essential except vitamin A.[2] The Hecht and Shlaer Adaptometer was used to determine the dark adaptation curves of these subjects. Dysadaption occurred in from 16 to 124 days after the vitamin A-deficient diet was begun and for four subjects was allowed to proceed until the visual threshold after 30 minutes of dark adaptation was elevated by 1 logarithmic unit; subject I of this group was continued on the experimenal diet until the 30-minute threshold was 4 logarithmic units above normal, while at this time of greatest visual impairment, the rod structures were not functioning at all below the scotopic threshold of the cones. Thus, there was no question of the existence of hemeralopia in any of the five subjects.

During the period of greatest impairment in retinal function, a slit-lamp examination was made on subject I by Dr. Alan C. Woods, of the Wilmer Ophthalmological Institute of The Johns Hopkins Hospital. There was no evidence of abnormality. The remaining four subjects were examined with the slit-lamp by Dr. William M. Rowland of the same institution both before and during impaired adaptation, as well as after that function had returned to normal following the administration of moderate amounts of vitamin A. Neither did any of these subjects show conjunctival or corneal changes at any of the examinations.

Attention should also be called to the work of Youmans *et al.*, who conclude that mild degrees of vitamin A deficiency can exist without any modifica-

[1] H. D. Kruse, *The Milbank Memorial Fund Quarterly*, 19: 207, 1941.

[2] L. E. Booher, E. C. Callison and E. M. Hewston, *Journal of Nutrition*, 17: 317, 1939.