THE University of Stockholm has received from Mrs. Amanda Ruben the sum of 50,000 kroner to found a readership in experimental zoology.

DR. B. C. CROWELL, professor of pathology and bacteriology, University of the Philippines, has been appointed director of the Graduate School of Tropical Medicine and Public Health of that university. This school gives courses which in one year lead to the degree of Doctor of Tropical Medicine and in two years to Doctor of Public Health.

DR. H. B. FANTHAM, of Christ's College, Cambridge, has been appointed to the professorship of zoology at the South African School of Mines and Technology, Johannesburg, and Dr. C. E. Moss, of Emmanuel College, has been appointed professor of botany in the same institution.

WE learn from *Nature* that Dr. Johanna Westerdijk has been appointed associate professor of phytopathology in the University of Utrecht. She is said to be the first woman to receive such an appointment in Holland.

## DISCUSSION AND CORRESPONDENCE

### THE LIMIT OF THE SPECTRUM IN THE ULTRA-VIOLET

IN the *Astrophysical Journal* for March, 1916, I gave an account of my work in the extreme ultra-violet. During the past year I have continued my investigations in the same field; the results have not been commensurate with the labor, but it is perhaps worth while to make a brief report of them.

I have not changed the general design of my spectroscope but I have replaced the 100 cm. grating by one of 50 cm. radius, thus halving the light path and considerably reducing the volume to be exhausted. My source of light is still a quartz discharge tube, but I have so altered the design that the end of the capillary can be brought much nearer the slit of the spectroscope than before; I have considerably increased the potential of the transformer; as before, I employ helium at one or two millimeters pressure to fill my spectroscope and discharge tube.

The net result of these changes is that I have certainly extended the spectrum from 600 to the neighborhood of 510 Ångströms; a trace of a line exists on my very best negative near 450 Ångströms, but it is far too faint to afford trustworthy evidence.

From time to time during the past five or six years I have tried Wood's miniature arc in vacuum, and a variety of vacuum spark arrangements, recently I have repeated the more promising of these experiments. None of these sources appear to yield lines in the most refrangible region. Helium continues the most promising source.

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February 14, 1917

### THE FOUNDATIONS OF DYNAMICS AND DADOURIAN'S ANALYTICAL MECHANICS

MY attention was called recently to a review of the second edition of my "Analytical Mechanics" by Professor E. W. Rettger, which appeared in SCIENCE (No. 1130) last summer when I was in the mountains and did not see it. The review on the whole was favorable and would not have tempted the author of the book to make an answer at this late date were it not for the fact that the two questions raised by the reviewer bear upon the foundations of the science of mechanics.

The first of these is directed against my direct application of the laws of vectors to the directed magnitudes of mechanics:

> Before we apply the law of vector addition to any kind of quantity, ought we not first assure ourselves that the parallelogram law holds for these quantities? Since force, for instance, is a *directed quantity* (italics are mine) does it follow that the parallelogram law holds for forces?

I would answer both of these questions in the affirmative. We have no right to apply vector operations to "any kind" of quantity. We ought to assure ourselves that the quantity in question is a "directed quantity" before treating it as such. But having once assured ourselves of this fact we need not hesitate to apply to it the parallelogram law or any other law of directed quantities.