

and many others are projected. Among them is a formaldehyde factory at Vetluga, and a technical laboratory for the production of lanolin, naphthalene, etc., at Rostov. A large company has been formed at Moscow for the production of coke-benzol products and at Tomsk a chemical factory is projected for the making of medical chemicals. Several new works for making sulphuric acid have been erected in the Volga region, in the Donets basin, in the Caucasus and in the Urals. Mirrors, lenses and other optical instruments, thermometer tubing and chemical glass, formerly imported, are now being made. There is a large demand for microscopes and other scientific apparatus, as well as for articles for medical and surgical use.

At a meeting of the board of managers of the Cold Spring Harbor Biological Laboratory of the Brooklyn Institute of Arts and Sciences, the completion of an endowment of \$25,000 for the laboratory was announced. The principal donors are: Mr. W. J. Matheson, estate of Colonel Robert B. Woodward, Mr. Walter Jennings, Mr. A. A. Healy, Mr. August Heckscher, Mr. Cleveland H. Dodge, Mr. Louis C. Tiffany, Mr. Howard C. Smith, Mrs. E. H. Harriman, Colonel T. S. Williams, Mr. Henry F. Noyes, Mr. Albert Strauss and Mr. Donald Scott. It is expected that the laboratory will now become one of the four fundamental departments of the institute, and will be under the special care of a governing committee of the trustees of the institute.

ALTHOUGH New York was not included among the states where a serious fungous disease of poplars was reported by the federal authorities, the State College of Agriculture at Ithaca announces that the disease has been found on Long Island. This disease is similar in appearance to that which destroys the chestnut trees and may be found on any species of poplars or cottonwoods. Trees attacked by this fungus show cankers or depressed areas in the bark, which spread rapidly and often girdling the twig, limb or trunk of the tree and killing the part above the canker; the trees become ragged in appearance and finally die. This is especially true of the

Lombardy poplars so often planted in rows along highways. The fungus which causes this disease, according to the authorities, was imported from Europe, and is especially severe on stored and transplanted nursery stock. The centers of infection appear to be, in every case, either certain nurseries known to contain diseased trees, or points where poplars from such nurseries have been planted. Residents of New York who think their trees are affected by the disease may receive exact information by sending samples to the department of plant pathology, New York State College of Agriculture, Ithaca, New York.

THE Rizzoli Orthopedic Institute of Bologna has inaugurated an exposition of orthopedic appliances, to be held at Bologna in February under the auspices of the national federation of committees engaged in welfare work for blinded, mutilated and crippled soldiers. The institute has announced a prize of 5,000 lire for the best appliance, and is urging others to collect funds for additional prizes.

PROFESSOR L. C. KARPINSKI writes that the first volume of the "Nouvelles Tables trigonométriques fondamentales" by Professor H. Andoyer, of Paris, mentioned in a recent review in *SCIENCE* as delayed by the war, appeared in 1915. This volume of 341 pages + lxviii pages includes the sines and cosines for each one hundredth of the quadrant to 20 decimal places, for each 9 minutes to 17 places, and for each 10 seconds to 15 decimals.

UNIVERSITY AND EDUCATIONAL NEWS

A GIFT of \$20,000 from Mrs. George Putnam to Harvard University was announced at the last meeting of the president and fellows. The money will be used to establish a fund in memory of Mrs. Putnam's brother, James Jackson Lowell, and the income will be used for the purchase of books for the college library.

THIRTY-FOUR thousand guineas have been subscribed to the South Wales University College for the extension of scientific and technical education.

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.