voltage laboratory, in which pressures as high as 500 kv. can be obtained.

UNIVERSITY AND EDUCATIONAL NEWS

Steps have been taken to insure the erection of a new building for the Indiana University School of Medicine on a site near the Robert W. Long Hospital, Indianapolis.

Professor Robert M. Yerkes, of Harvard University, has been appointed head of the department of psychology at the University of Minnesota.

At the Johns Hopkins University, Professor Edward W. Berry, associate professor of paleontology, has been advanced to be professor of paleontology, and Associate J. T. Singewald, Jr., to be associate professor of economic geology.

At the Massachusetts Institute of Technology, Dr. Charles L. Norton has been appointed professor of industrial physics. Promotions from instructor to assistant professor have been made as follows: Mathematics, Joseph Lipka and Frank B. Hitchcock; physics, Herbert P. Holnagel; drawing, Arthur L. Goodrich.

Dr. H. H. Newman, dean of the college of science of the University of Chicago (medical and premedical students), has been promoted from an associate professorship in zoology to a professorship in that department.

In the botanical department of the Michigan Agricultural College Dr. G. H. Coons has been promoted to associate professor, and Dr. E. F. Woodcock to assistant professor. Beginning with July 1, Mr. Ezra Levin, at present instructor in botany at the Kalamazoo High School, takes up his work as extension agent in plant diseases, for half his time, and assistant pathologist in the Experiment Station for the other half.

Dr. Pierre Marie has been appointed to the chair of clinical neurology in the University of Paris in succession to the late Professor Dejerine.

Fräulein A. M. Curtius has been appointed lecturer in French at Leipzig. She is said to be the first woman on the staff of a German university.

DISCUSSION AND CORRESPONDENCE

SURFACE TENSION, CAPILLARITY AND PETROLEUM POOLS

While surface tension and capillarity[1] are being discussed, the writer would like to raise the question of whether or not the material composing the tube makes any difference in the height to which the liquid rises.

It is surprising that it is not possible to settle this apparently elementary question at once by reference to any one of a score of good treatises on physics; physics is an old science, the subject of intermolecular attraction is fundamental, capillarity is discussed at length and the deductions carry conviction born of impressive formulæ. As a matter of fact, statements bearing on the point in question seem inharmonious and many of them lack clearness. One of the most convincing that the writer has seen is that of Bigelow and Hunter,[2] who say: "We have demonstrated that capillary ascension of water (and benzene) is different in tubes of different substances," and they base the assertion on experimental evidence.

This declaration accords with the writer's[3] concepts concerning capillarity. Since he is not a physicist, these concepts should come from the conclusion of physicists concerning the point or at least from well-known and unquestioned principles of physics, but as a matter of fact they are based partly upon such conclusions and principles, partly upon several years of cogitation, and partly upon the

[1] Patrick, W. A., Ostwald's "Handbook of Colloidal Chemistry," Science, N. S., Vol. XLV., No. 1,143, pp. 750–751, November 24, 1916. Kimball, Arthur L., "Negative Surface Tension," Science, N. S., Vol. XLV., No. 1,152, p. 75, Jan. 26, 1917. Becker, Geo. F., "Propulsion by Surface Tension," Science, N. S., Vol. XLV., No. 1,153, p. 115, Feb. 2, 1917.

[2] Bigelow, S. L., and Hunter, F. W., "The Function of the Walls in Capillary Phenomena," *Jour. Phys. Chem.*, Vol. 15, p. 380, 1911.

[3] Shaw, E. W., "The Rôle and Fate of Connate Water in Oil and Gas Sands" (discussion), *Am. Inst. Min. Eng. Trans.*, Vol. 51, p. 601, 1916.

results of some experiments which may seem more significant to the writer than they would to a physicist. Up to the time Bigelow and Hunter's paper was published, at least, the literature did not seem to cover the point at all satisfactorily, yet many statements and implications seem to be clear. Ramsay and Shield's classic determinations of surface tension based upon capillary rise may be cited as an example. If capillary rise is affected by the nature of the tube, their results would apparently be invalidated.

Do not three substances ordinarily play parts in capillarity, and does not the result depend on the identity of each of the substances? If water, air and glass are the substances, the water heaps up against the glass, and if the tube is of hair-like diameter there is a rise of water. Is not this due to the fact that where water, air and glass come together molecules of water are drawn toward the glass much more than toward molecules of air or other molecules of water?

The mechanics of this process seem simple, whereas it is difficult to conceive how the raising of the liquid can be a product of its surface tension alone,[4] even though the walls of the tube above the liquid have a contractile coating of adsorbed liquid or a membranous extension of the liquid in the tube.

The writer is particularly interested in the part that capillarity or differences in intermolecular attractions may play in oil and gas accumulation. In the vicinity of oil and gas pools which occupy the pores of rocks in the earth, water with various quantities of salt in solution, oil of one or more kinds, natural gas and perhaps air are in contact with each other and with various minerals. Oil and gas are found in relatively large-pored rocks, in pools which show some similarity in shape and the pressure upon them is usually several hundred pounds to the square inch. The pressure on some pools is greater than that which would be exerted by a column of water extending to the surface. May not these features be explained in considerable part by differences in intermolecular attractions?

E. W. SHAW[5]

[4] Washburne, C. W., "The Capillary Concentration of Gas and Oil," *Am. Inst. Min. Eng. Trans.*, Vol. 50, p. 830, 1915.

SYNCHRONOUS RHYTHMIC MOVEMENTS OF FALL WEB-WORM LARVÆ

RECENT discussion in SCIENCE of synchronous actions of certain animals, notably, flashing of fireflies, brings to mind a habit of the larvæ of the fall web-worm (*Hyphantria cunea*), which seems to be of the same nature. Whether it has been noted in the literature or not I am unable to say; probably it has, as it is of common occurrence. In any event a short account of the habit may not be out of place in this connection.

Fall web-worm larvæ, scattered over the outside of the web, may be seen, at intervals of from three to five minutes, to start a sharp rhythmic swaying from side to side, accomplished by raising the anterior half of the body to a semi-erect position, then moving it quickly, first to one side then to the other, through an angle of about ninety degrees. The movement is started by a few of the larvæ, but in a few seconds all the individuals in the colony will be moving in the same manner and in perfect unison. I do not have my notes at hand but, as I remember it, the movements were at the rate of about forty per minute and continued each time for from forty-five seconds to more than a minute. Even more suddenly than they start, the movements cease.

What the cause is for this strange habit is a puzzle. It seems to have nothing to do with spinning the web. Artificial stimuli failed to start them before the end of the resting interval although various means were tried. These included sounds, both musical and otherwise, made with various instruments, smoke and strong chemical odors, jarring and several other devices which suggested themselves at the time. Equally futile were attempts to stop the movements.

There seemed to be no leader, the swaying starting one time in one part of the colony or even in several parts at once, and again in

[5] Published by permission of the director, U. S. Geological Survey.