in plant development which require generations of effort can be carried on, an exhibition garden, a training school for gardeners, a public park and an experimental laboratory for both professors and students. One million dollars will be necessary before a start can be made, according to Comptroller A. E. Roth. The ultimate development of the garden would require an endowment of from $6,000,000 to $10,000,000. The project is being advanced at present by a group of scientists and others under the organization name of Pacific Botanical Gardens, whose executive committee includes Comptroller A. E. Roth and Professor G. J. Peirce, of Stanford; Professor E. B. Babcock and Comptroller Robert Sproul, of the University of California; Dr. H. M. Hall, of the Carnegie Corporation; George C. Roeding, of Fresno, and Milton B. Drury, secretary of the Save-the-Redwoods League.

ANNOUNCEMENT is made of a gift of $200,000 by Mr. J. P. Morgan to the Neurological Institute, New York, for the establishment of a fund for research and treatment of encephalitis. The fund will be administered through the new hospital of the institute to be erected as part of the Columbia-Presbyterian medical center in New York City. A complete floor will be equipped, including a ward of forty-eight beds, for the treatment of the disease.

UNIVERSITY AND EDUCATIONAL NOTES

THE General Education Board has appropriated $750,000 towards the sum of $1,500,000 required by Yale University for the construction of a new surgical laboratory and the extension of the pathological laboratory.

MR. AND MRS. JOHN ROBERTS have given to the University of Chicago $1,000,000 for the construction and endowment of a hospital for children.

HARVARD UNIVERSITY will get the bulk of the estate of Dr. Charles A. Brackett, long oral pathologist in its dental schools, amounting to nearly half a million dollars.

PRESIDENT EDWARD M. LEWIS, of the Massachusetts Agricultural College, has been elected president of the University of New Hampshire, to succeed Dr. Rudolph D. Hetzel, who recently resigned to become president of the Pennsylvania State College.

ROGER LOWELL PUTNAM was named by the late Guy Lowell his successor as trustee of the Lowell Observatory, in accordance with the provisions of the will of Percival Lowell, who founded the observatory at Flagstaff, in 1894, and there, until his death in 1916, pursued the study of astronomy—with particular regard to the planets. Mr. Putnam is a nephew of the noted astronomer.

THE department of pathology of the University of Pennsylvania has been reorganized under the chairmanship of Dr. E. L. Opie, who is, however, to continue his work at the Phipps Institute. Dr. E. B. Krumbhaar has resigned his posittion as director of laboratories at the Philadelphia General Hospital to follow Dr. Allen J. Smith as professor of pathology, and Dr. Herbert Fox has been appointed professor of comparative pathology. Dr. Baldwin Lucké has been promoted to an associate professorship.

DR. ELMER FUNKHOUSER, instructor in pathology at the medical school of Indiana University, has been promoted to be an associate.

AT the University of Bristol Dr. William Edward Garner, of University College, London, has been appointed professor of physical chemistry in succession to Professor J. W. McBain. In the department of physics Dr. J. E. Lennard Jones, reader in mathematical physics, has been promoted to the professorship of theoretical physics.

PROFESSOR HANS WINTERSTEN has succeeded Professor Karle Hürthle in the chair of physiology at Rostock.

DISCUSSION AND CORRESPONDENCE

PRESSURE DECOMPOSITION AS A SOURCE OF SOLAR ENERGY

IN a recent paper[1] Bridgman points out that if atoms are subjected to extremely high pressures, the superstructure of quantum orbits may give way, freeing the kinetic energy of the orbital electrons which would then become available as heat. Bridgman asks, "Has this been considered as a source of stellar energy?" I have made the following computations.

The kinetic energy of an electron in its orbit, including the relativity correction, which becomes appreciable for K-electrons in elements of high atomic numbers, is given by

$$E_{kin} = c^2 m_0 \left[\frac{1}{\sqrt{1-\frac{\alpha^2}{n^2}Z^2}} - 1\right] \tag{1}$$

where c is the velocity of light, m_0 the statical mass of an electron, Z the atomic number and n the azimuthal quantum number. α is the so-called constant of fine structure, equal to $\frac{2\pi e^2}{ch}$, e being the charge on the electron and h Planck's constant. Numerically,

$$\alpha = 7.29 \times 10^{-3} \text{ and } \alpha^2 = 5.31 \times 10^{-5}$$

[1] *Phys. Rev.* 29, 188, 1927.

For all elements where $\frac{\alpha^2}{n^2}Z^2$ is small, formula (1) reduces to

$$E_{kin} = \frac{c^2 m_0}{2} \frac{\alpha^2}{n^2} Z^2 \qquad (2)$$

The electron revolving in the first Bohr circle of the hydrogen atom will have a kinetic energy of

$$E_{kin} = 2.1 \times 10^{-11} \text{ ergs} \qquad (3)$$

Since there are 6×10^{23} hydrogen atoms per gram of the substance, the total energy which would be released by pressure decomposition is

$$E_{kin} = 1.26 \times 10^{13} \text{ ergs/gm} = 3.0 \times 10^5 \text{ cal/gm} \qquad (4)$$

Since the sun radiates approximately 1.5 calories per gram per year, the new source of energy, for a sun composed entirely of hydrogen, could be relied upon to keep the sun going for a period of only 2×10^5 years.

This figure will be increased when atoms of higher atomic weight are considered. To evaluate the other extreme, consider uranium, with its ninety-two orbital electrons. Summing the kinetic energies for the respective rings, taking Z, in each case, equal to the effective atomic number, we obtain an approximation to the total energy of all the electrons in the atom. The computed value is 1.4×10^{-6} ergs per atom, or

$$E_{kin} = 3.5 \times 10^{15} \text{ ergs/gm} = 8.5 \times 10^7 \text{ cal/gm} \qquad (5)$$

The foregoing computations show that the contribution of complete pressure decomposition to the life of the sun is less than 6×10^7 years. The accepted age of the earth is of the order of 10^9 years, hence this theory, as well as any other which fails to furnish energy for at least that length of time, must be discarded as inadequate though, of course, a small fraction of the solar radiation may be attributed to that source.

DONALD H. MENZEL

LICK OBSERVATORY,
JANUARY 26, 1927

"COMMENSALISM" OF A SEA ANEMONE AND A SEA URCHIN[1]

DURING the summer of 1926, while collecting along the south shore of Cienfuegos Bay, Cuba, I encountered an interesting example of commensalism which has hitherto escaped notice. This was the presence of the sea anemone, *Aiptasia tagetes* D. and M. on the aboral surface of the test of the sea urchin *Diadema*. The pedal disc of the sea anemone was about 8 mm from the anal opening of the sea urchin. When observed in the living state the tentacles nearest the anus were being moved over the anal opening and presumably any excreta could thereby easily be transferred to the mouth of the actinian.

While both forms are very common here—the sea anemone encrusting rocks at or just above low water mark, and the sea urchin plentiful in shallow water—only two pairs were found in this relationship and these within eight meters of each other. The sea anemones were of the same size, 28 mm in height and 15 mm in diameter. The sea urchins were not full grown—the test of one measured 52 mm in diameter, while the second measured 44 mm. The distance of the actinian from the anus was the same in each case.

The advantage which the actinian derives from this association is clear—a constant food supply during the life of the sea urchin. The sea urchin, on the other hand, may be regarded as a passive host deriving no advantage and suffering no disadvantage. The initial contact of the planula with the sea urchin and its attachment was undoubtedly fortuitous.

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[1] Contribution No. 4 from the Harvard Biological Station, Atkins Foundation, Soledad, Cienfuegos, Cuba.

PRESERVATION OF NATURAL AREAS

IN addition to the preservation of suitable areas of virgin forest from the standpoint of saving the trees themselves in their natural growing conditions, as pointed out by Dr. Van Name,[1] the preservation of examples of virgin forest soil, including litter and humus, would seem to be an equally important object. The soil is the foundation of forest growth just as it is of other vegetation; if trees of the type found in virgin forests can not be replaced in some cases for several centuries, what of virgin forest soils? As Dr. Van Name mentions, removal of dead trees for firewood and picnicking of tourists do not meet the requirements for preserving natural conditions. All litter and dead timber should be left untouched, and no disturbance (such as pushing over old stumps) should be permitted; nothing should be taken away, and nothing added.

In forestry, as in other fields, we have been wont to turn to Europe for examples, good or bad. The unfortunate result of the lack of preservation of virgin areas in central Europe was illustrated recently when Professor Hesselman, of the Swedish Forest Experiment Station, wished to study humus-types in virgin forests for comparison in connection with his extensive investigation of humus in coniferous forests.[2] Aside from some inaccessible parts of

[1] SCIENCE, n.s. 65: 173, No. 1677, 1927.

[2] Hesselman, Henrik. "Studier över barrskogens humustäcke, dess egenskaper och beroende av skogsvården." (Studies of the humus cover in coniferous forest, its characteristics, and dependence on forest conservation). Meddelanden från Statens Skogsförsöksanstalt 22: 169–552, 1925.