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

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

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

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

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

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

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

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

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.

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"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.

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

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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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.

Lithuania and the Carpathians, the only natural area he could locate was the Böhmerwald on Mt. Kubani near the Bavarian boundary. This had been preserved as a natural reservation by Count Adolph von Schwarzenberg and his family, and comprised an area of forty-six hectares (113.6 acres) embracing one major forest type.

The litter, humus and soil conditions in virgin forests may not be ideal—are often very poor from the view of commercial production, and could be bettered by cultural treatment—but certainly our intensive use of forest land has not reached such a point that we can not afford to reserve some areas of reasonable size in each vegetational, climatic or soil type, in a state of natural productiveness or unproductiveness. Our greatest luxuries are the millions of waste and devastated acres. As far as the national forests are concerned, it would not seem to require any great modification of policy, and surely but little financial deprivation to set aside areas in each type as permanent "control" areas in the government forest research program. It would not be necessary to lay out any exact plots, or carry out any elaborate studies at once. The areas should not be too accessible; but they should be catalogued and available for properly qualified persons to study under certain restrictions. No one can tell when such areas will be called upon to furnish solutions for the most practical kinds of problems. The types have been studied and classified with few exceptions, their locations are known, and men are available, well-fitted to carry out the project. It is obviously a function to be performed by some public agency, and the sooner it is done the better.

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WHEN IS MID-WINTER?

ALTHOUGH December 22 or thereabouts is the shortest day of the year, it never seemed to me that it was justly entitled to the name of "mid-winter." Recently I made a careful study of Weather Bureau records of St. Paul and Minneapolis to find out when, in the sense in which the term ought perhaps to be used, the real middle of cold weather occurs in this climate. It was found that the lowest average daily temperatures occur in January; in fact, the records showed that from the 10th to the 23rd of January, inclusive, the average temperature was 11° F. and that before and after these dates the daily temperatures were higher. As this did not give a satisfactory answer, the problem was approached in another way. It was noted that September 20 and May 18 both had average temperatures of 59 degrees. Between these two dates, it was assumed that, if the average daily temperatures were each subtracted from 60 and the differences totaled, the date before and after which the half totals equaled each other could properly be called the middle of winter. By this method of calculation, January 18 was found to be the date sought. Sixty degrees was chosen on the assumption that at about that temperature in the average year fires would be built and in the spring when the temperature had reached 60 degrees, fires would be allowed to die. Is it not fair to suppose that on January 18, in the climate of the Twin Cities, the coal pile should be half gone, if we may assume that on the average wind velocities and other conditions are no more effective before that date than after that date in eating up fuel? This date is not in accord with the old proverb, "Half your meat and half your hay should be in store on Candlemas Day" (February 2).

About midnight, July 19, exactly one half year has elapsed, and it is perhaps proper to apply the term "middle of summer" to this date, although from the 17th to the 25th the average temperature remains at its highest point of 73 degrees in the Twin Cities, which would bring mid-summer two days later by this process of reasoning.

It would be interesting to know when mid-winter, as above defined, occurs in such climates as Buffalo, New York, Florida, Los Angeles, Seattle and Southern England.

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THE NEWTON BICENTENARY

THE notable scientific distinction of 1927 being the fact that it is the bicentenary year of Newton's death, it would seem desirable to mark it, where possible, by tributes to his memory more real than merely literary and festival celebrations. The preparation of a revised complete edition of his writings is, it seems, not to be looked for, however appropriate and overdue such an undertaking may be; but a return to their direct study, and to the recital and employment of methods and results contained in them, that at least is practicable, and would be a generous homage on their part, if writers and teachers would adopt it.

One of his methods, with which a start might well be made, is Newton's theory of resistance—that theory which Cotes characterized as "his noble theory of resistances." Noble it undoubtedly is, yet none the less it has for long years been consistently passed over, if not forgotten, for too few of us read the "Principia" now, though we one and all allow it to be a scientific classic that can never die.

In place of Newton's "noble theory" we have sub-