ence" than has yet been explained or suggested by "western scientific research."

It never can be too strongly emphasized that, granting suitable climatic and physical soil condition, the fundamental of crop production is crop feeding, and that crop hunger (and thirst) has been the prime condition determining reduced yield oftener than any other. These have been the tenets of practical men through all the past and are likely to remain so to the end. Disease, parasitism, phagocytism, degeneration of seed, toxic substances or what not may at times reduce yields and the advance of knowledge which shall make it possible to diagnose these cases and apply the proper remedy, for each will augment the efficiency of plant food but make the demands for it greater nearly in proportion to increase of yield, and will accelerate soil exhaustion where nature or man makes inadequate return.

It is difficult to see on what basis of knowledge one may contend that the increase in the productivity of soils of western Europe, referred to as occurring in recent years, has been due to improvements along any of these minor lines rather than to better physical soil condition and to the increasing application of the three most essential plant-food elements which have certainly been coincident with these increases of yield; and even more difficult does the case become when referred to the long and high maintenance of soil productivity in China where plant feeding has been the heaviest burden of the people.

F. H. KING

MADISON, WIS.

A KINETIC THEORY OF GRAVITATION

TO THE EDITOR OF SCIENCE:

Imagine a pound-weight of iron raised from the surface of the earth to a point near the moon, the point so chosen that the opposing attraction of the earth and the moon shall exactly balance each other. In the surface of the earth the pound-weight had some so-called "potential energy of position" because it was capable of falling into a pit: but in its new position near the moon this potential energy has disappeared entirely; the pound-weight, left free to move, remains stationary. We can not believe that the whole or any part of it [the energy] has been annihilated: it must, in some form, be resident somewhere. I believe it was absorbed by, and is now resident in, the ether through which the weight was raised. Conversely if this be true, a falling body must acquire its energy from the ether through which it falls."[1]

Since the ether is as yet a hypothetical substance, postulated to explain certain physical phenomena, it may be allowable in discussing some phenomena to postulate its non-existence. We do not know that if the ether were non-existent and only an imaginary substance, that gravitation would also be non-existent. Assuming the non-existence of ether, but gravity acting as usual, would not the pound-weight act just as is described by Dr. Brush?

Consider a simple case. A ball weighing one pound is lifted five feet from the floor, and placed on a shelf. It has a potential energy of five foot-pounds, with reference to the floor, but it can not exert this energy, or convert it into kinetic energy, for it is prevented by the shelf. So if the ball is raised to the point near the moon, it has 20,000,000 foot-pounds of potential energy, referred to the earth, and this energy could be made kinetic, if the body were "free to move," which it is not; it is restrained by the attraction of the moon, just as it was restrained by the shelf. Suppose the ball is of iron, and that on being raised five feet it comes within the field of attraction of an electromagnet which attracts it and prevents it falling to the floor. It has five foot-pounds of potential energy, just as it had on the shelf, but it is for the time being unavailable. Let the current which actuates the electromagnet be interrupted for a fraction of a second, the ball begins to fall and the potential energy becomes kinetic. In neither of these cases has the potential energy "disappeared entirely," it has only been rendered unavailable by the attraction of the moon or the electromagnet, or by the shelf. It has not been annihilated nor is it "resident in the ether."

[1] Extracts from an article, "Kinetic Theory of Gravitation," by Charles B. Brush, SCIENCE, March 10, 1911.

The ball, the earth and the moon are portions of matter, one of the fundamental entities, or primary concepts (defining concept as that of which the mind thinks, and not an action of the mind). Gravitational attraction, a force, whether a push or a pull, is also a fundamental entity. Energy, velocity, work, etc., are complex concepts, or mathematical expressions, involving two or more simple concepts, such as, matter, space, time and force, besides the concepts of condition, such as direction, relative position and availability. The potential energy of the ball on the shelf is not merely five foot-pounds, it is five foot-pounds relative to the position of the floor, and it is not available until it is rolled off the shelf.

Consider a one-pound ball held in the hand five feet above the floor of a railroad car which is traveling eastward at the rate of 32 feet per second. It has 5 foot-pounds of potential energy and zero kinetic energy relative to the floor of the car, and $\frac{1}{2}MV^2 \equiv 16$ foot-pounds of kinetic energy relative to the earth. If it is thrown westward at the same velocity that the car is moving eastward, it has zero velocity and zero kinetic energy relative to the earth, but 16 foot-pounds of kinetic energy relative to the car, and it is capable of breaking the window in the door of the car if thrown against it.

If Dr. Brush's kinetic theory of gravitation depends on the hypothesis that the potential energy of a body raised from the earth's surface and held by the attraction of the moon (or of a magnet) disappears entirely and becomes resident in the ether, it is not likely to meet with acceptance.

There seems to be another weak point in his theory, viz., he assumes that the long radiant waves of ether, the hypothetical cause of gravitation, "pass freely through all bodies," and yet that they cast a "shadow." These two ideas seem to be inconsistent. A perfectly transparent glass plate casts no shadow of light when rays of light pass freely through it.

WILLIAM KENT

MONTCLAIR, N. J.,
April 3, 1911

WHAT IS THE GENOTYPE OF X-US JONES, 1900, BASED UPON A SPECIES ERRONEOUSLY DETERMINED AS ALBUS SMITH, 1890?

Statement of Case.—Jones proposes the new genus *X-us,* 1900, type species *albus* Smith, 1890.

It later develops that *albus* Smith, 1890, as determined by Jones, 1900, is an erroneous determination.

What is the genotype of *X-us,* 1900; *albus* Smith, 1890, or the form erroneously identified by Jones as *albus* in 1900?

Discussion.—The nomenclatorial problem expressed in the caption of this note is solved in two diametrically opposite ways by different authors.

Some writers maintain that the original *albus* Smith, 1890, is the genotype, while others maintain that the genotype is represented by the species actually studied by Jones and misdetermined as *albus* Smith.

Cases of this general nature have given rise to considerable confusion in nomenclature, and several such cases have been referred to the International Commission on Nomenclature for opinion.

At the last meeting of the commission, the principles involved came up for discussion, but it was impossible to reach a unanimous agreement. On account of the differences of opinion, the secretary was instructed to make a careful study of a number of cases, and to report upon the same to the commission.

It is not difficult to foresee that no matter how the cases are finally decided, great dissatisfaction will arise among zoologists because the opinion rendered is not the direct opposite of what it eventually will be.

Recognizing that this is one of the most difficult cases that has ever been submitted to the commission, and recognizing the fact that regardless of our action we shall probably be criticized more on basis of our decision on this case than because of any other opinion that we have rendered, I am desirous of studying at least one hundred cases if possible, that