the theorem employed by Professor Huntington involves a physical principle not explicitly stated by him, namely that *matter consists of individual particles, each of which preserves its identity and its mass throughout all physical or chemical changes.*

Those who believe that mechanics should be regarded as a physical science rather than a branch of pure mathematics will probably agree that in elementary instruction it is less important to build up a logical framework than to help the beginner to appreciate the physical meaning of dynamical laws.

L. M. Hoskins

Stanford University,
September 16, 1916

FLASHING OF FIREFLIES

To the Editor of Science: The notes by Mr. Edward S. Morse in Science for February 4 and September 15, 1916, on fireflies flashing in unison, have been of very great interest to the writer, in connection with his studies of the light-emission of American Lampyridæ,[1] and during the course of these observations he has constantly been on the watch for synchronous flashing of the type reported by Mr. Blair and by Mr. Morse. There seems to be no doubt that it is a fairly frequent, if not a constant, method of light-emission among certain tropical (mainly oriental) Lampyrids, but instances of it in our North American species must be fortuitous, at least in this locality. The writer's observations so far made have been on *Pyractomena borealis, P. lucifera, P. angulata, Photinus pyralis, P. consanguineus, P. scintillans, P. marginellus, P. castus* and *Photuris pennsylvanica.* In most of these there is now no doubt that the photogenic function serves as an attraction between the sexes for mating, and synchronous flashing of a large number of individuals would seem to be of such a nature as to interfere with this function of the light. Among the species studied, there would appear to be a possibility of anything approaching synchronous flashing only in *Photuris pennsylvania,* whose lighting habits it has been found difficult to follow accurately. On one or two occasions during the past summer observations were made by Mr. H. S. Barber, of the National Museum, and the writer, of what appeared to be the alternate illumination of adjacent trees in which this species was present in abundance, but it was soon evident that while at a given instant one tree may have been more highly illuminated than the other, there was nothing approaching periodicity in the phenomenon, and no continuation of it was noticed. Of course, special conditions of temperature, moisture, air currents, etc., might influence these insects in such a way as to produce synchronous flashing, but although especially watched for, we have been unable to secure an observation of it. If any other observations of this character have been made on North American species of Lampyrids, the writer would be very glad to hear of them.

In regard to the synchronous head movements of ants, referred to by Mr. Morse as having been reported by Cox, it may be noted that one of our common web-worms exhibits a very similar conduct, a stimulus, such as a shadow passing over the colony, being sufficient to cause all of the caterpillars to jerk the head and forward segments from side to side, the great majority of them to the same side at the same time.

F. Alex. McDermott

Washington, D. C.,
September 20, 1916

[1] *Canadian Entomologist,* 1910, Vol. 42, p. 357; 1911, Vol. 43, p. 399; 1912, Vol. 44, pp. 73, 309; *Zeitschrift fuer wissenschaftliche Insektenbiologie,* 1914, Vol. 10, p. 303.

OCCURRENCE OF YELLOW LEAF RUST OF WHEAT (PUCCINIA GLUMARUM) IN THE SALT LAKE VALLEY, UTAH

On June 23, 1915, the writer and one of his assistants, Mr. W. W. Jones, collected an apparently new rust on wheat in several fields north and west of Ogden, Utah. It was noted that the infection was very serious and in some instances the fields had the appearance of suffering greatly from drouth. A careful examination, however, showed that this condi-

tion was due to the rust, the uredo stage of which was just beginning to make its appearance. The specimens were put away and were not again examined until a short time ago when it was decided to make a proper identification of them. When they were taken it was our intention to revisit the fields and collect the teleuto stage, but owing to press of other work this was not done. When a reexamination of the material was made we found it impossible to determine the species and a sending was therefore made to Mrs. Flora W. Patterson, mycologist, U. S. Department of Agriculture, Washington, D. C. The tentative opinion of the writer, that the rust in question was none other than *Puccinia glumarum* Eriks. and Henn., has been confirmed both by Mrs. Patterson and the pathologists in the Cerealist's Office at Washington.

Just two days previous to our finding this rust, Dr. F. Kolpin Ravn, of Copenhagen, Denmark, Mr. A. G. Johnson, of the University of Wisconsin, and Dr. H. B. Humphrey, of the U. S. Department of Agriculture, visited the Salt Lake Valley and were undoubtedly on the lookout for this rust which was seen for the first time in this country at Sacaton, Arizona.[1] The writer had the pleasure of entertaining these gentlemen during this visit, making with them a short automobile tour about the valley in the interest of cereal diseases.

The rust infection due to *Puccinia glumarum,* as noted in the Salt Lake Valley, is undoubtedly of greater economic importance than had hitherto been supposed. It is not known to what extent the wheat crop was injured, but it is the writer's opinion that the loss over a considerable area must have been quite heavy if the extent of the infection could be taken as a criterion. During the present season careful notes will be made on the occurrence, distribution and effect of this rust on wheat in the Salt Lake Valley and adjacent districts.

P. J. O'GARA

DEPT. OF AGRI. INVESTIGATIONS,
AMERICAN SMELTING AND REFINING CO.,
SALT LAKE CITY, UTAH,
June 10, 1916

[1] SCIENCE, N. S., Vol. XLII., No. 1071, p. 58.

IS INHERITANCE MODIFIED BY ACQUIRED CHARACTERS?

IN the *American Naturalist* for August, 1916, I find an interesting article by Dr. C. B. Davenport, on "The Form of Evolutionary Theory that Research Seems to Favor." The general result of his investigation is "that the course of evolution is chiefly determined by internal changes," that is, by genetic changes. He, however, reminds us that "there is some evidence . . . that the germ plasm is not beyond the reach of modifying agents. At least we must continue experimental efforts in that direction."

The question which I wish to raise is whether attention has been given to the book by Walter Kidd, entitled "The Direction of Hair in Animals and Man," published by Adam and Charles Black, London, 1903. On pages 76 and 81 will be found pictures showing the difference in the arrangement of hair on the head of the chimpanzee, and that found on the heads of many young human subjects, who seem to have inherited some of the new arrangements through the influence of the artificial parting of the hair, practised by their ancestors for several generations. If these pictures correctly represent inherited conditions, it seems impossible to attribute them to spontaneous variations, uninfluenced by habit, and preserved simply because they gave their subjects superior power in the struggle for life, or because of any other form of selection.

For several years failing eyesight has restricted, not only my own investigations, but my knowledge of what others have accomplished; and I shall be thankful for any information as to whether these points have been discussed in the *American Naturalist,* or in any of our scientific journals.

JOHN T. GULICK

HONOLULU, T. H.

TUMORS IN PLANTS

AT last I have succeeded in producing small tumors in plants without the use of the crown gall organism (*Bacterium tumefaciens*), *i. e.,* simply by means of substances which are by-