College, and for the past year professor of electrical engineering at the Clarkson School of Technology, has been appointed assistant professor of railway electrical engineering. F. C. Lincoln, S.B. (Mass. Inst. '00), E.M., Ph.D. (Columbia '11), for three years professor of geology and metallurgy at the New Mexico School of Mines, for three years professor of geology at the Montana State School of Mines, and for the past year in practise in New York City as consulting mining engineer, has been appointed associate in mining engineering. Paul Hanson, B.S. (Mass. Inst. '03), for several years practising sanitary engineer, has been appointed associate in sanitary engineering. G. A. Shook, A.B. (Wisconsin '07), for the past four years instructor in physics at Purdue University, has been appointed instructor in physics. J. W. Hornbeak, B.S. (Ill. Wesleyan '06), A.M. (Illinois '09), assistant in physics at Cornell University, has been appointed instructor in physics. G. A. Goodenough has been promoted from associate professor of mechanical engineering to professor of thermodynamics, and M. L. Enger from associate in theoretical and applied mechanics to assistant professor of theoretical and applied mechanics.

NEW faculty appointments to the School of Applied Science of the Carnegie Technical Schools, Pittsburgh, for 1911–12, are: Charles B. Stanton, assistant professor of railroad engineering; Clyde T. Griswold, assistant professor of mining engineering; Clinton J. Davisson, instructor in physics; Arden B. Holcomb, instructor in electrical engineering; Joseph H. Cannon, instructor in electrical engineering; H. J. MacIntire, instructor in mechanical engineering; Edgar F. Leippe, assistant instructor in machine design; O. T. Geckler, instructor in mathematics; J. A. Fitzgerald, instructor in commercial practise and statistics; Edwin C. Kemble, assistant instructor in physics; Roy B. Ambrose, assistant instructor in mechanical engineering laboratory.

MR. G. R. ANDERSON has been promoted to an associate professorship of physics, Mr. H. W. Price to an associate professorship of electrical engineering and Mr. P. Gillespie to an associate professorship of applied mechanics at the University of Toronto. Mr. T. B. Saunders has been appointed lecturer in vertebrate embryology.

DISCUSSION AND CORRESPONDENCE

COUPLING *vs.* RANDOM SEGREGATION

TO THE EDITOR OF SCIENCE: The suggestion offered by Morgan, in SCIENCE of September 22, to account for the coupling and repulsion of factors for various characters in inheritance in such forms as *Abraxas, Drosophila,* fowls, sweet peas, etc., incites this note.

Briefly Morgan's hypothesis is (1) that the materials representing factors that couple are "near together in a linear series" in the chromosomes; (2) that, when pairs of parental chromosomes conjugate, "like regions stand opposed"; (3) that "homologous chromosomes twist around each other," but that the separation of chromosomes is in a single "plane"; (4) that, thereby the "original materials will, for short distances be more likely to fall on the same side of the split," while more remote regions will be as likely to fall on one side as on the other; (5) that, in consequence, whether characters are coupled in inheritance or are independently inherited depends upon the "linear distance apart of the chromosomal materials that represent factors."

Leaving for cytologists to determine what has become of the "individuality" of the chromosomes, we may well inquire whether this hypothesis can account for the facts of Mendelian inheritance as exhibited in coupling, allelomorphism and independent segregation of the factors that represent characters. If parental chromosomes twist together and then separate in a single plane so that materials near together in a linear series are usually left together on one side of the split while more remote materials fall by chance on either side, it would seem that somewhere between these two regions the material representing some one character at least must be divided by the split so that part of it would lie on one side and part on the other. That

is, there would result a quantitative division of the material representing the character in question. This brings us back, at least so far as certain characters are concerned, squarely to the position taken by Morgan last year in his paper: "Chromosomes and Heredity" (*Amer. Nat.*, 44: 449–496).

While the hypothesis there presented, including the proposition that the plane of division of homologous chromosomes may be at any angle to the plane of union and the assumption that a certain quantity of the material representing a character must be present in order that the character develop, will doubtless account for the results (ratios) obtained in F_2 of a cross, *it certainly will not account for the purity of extracted recessives and dominants as exhibited by their behavior in* F_3 *and later generations. To overlook this is to neglect the fundamental part of Mendelism.*

A hypothesis that does not explain how extracted recessives can breed true generation after generation without the production of so much as a single individual having the dominant character will hardly be accepted by present-day students of genetics.

R. A. EMERSON

HIBERNATION

TO THE EDITOR OF SCIENCE: The *Popular Science Monthly* of October, 1910, published an article of mine entitled "The Natural History and Physiology of Hibernation," pp. 356–364. Since this article appeared some additional facts, in natural history, have been brought to my notice as well as some errors bearing on this subject. It is the purpose of this letter to note the former and to correct the latter.

On page 359 will be found the sentence: "Many butterflies and moths hibernate in the perfect state as well as in the form of imagos, but not in the larval state (?)." The correction here is that "*pupa*" should be read instead of "*imagos*." In the latter part of the same sentence, "but not in the larval state (?)" the statement is wrong, for several butterflies and a great many moths hibernate in the larval state, notably the Noctuidæ and Arctiidæ, consequently the query mark should be abolished.

Again the statement is made, "Insects which hibernate do not pair until spring and bees do not hibernate at all." This sentence is not quite full enough and demands more detailed information or additional light on the subject. All our wild bees, wasps and some others pair in the autumn and the fertile females hibernate. Hive bees, on the other hand, pair in the spring and do not hibernate.

The statement will be found on page 360: "but curiously enough no case [hibernation] is known among birds." I must still hold to this notwithstanding the following account, which may interest your readers, furnished to me in a private communication, by Mr. C. W. Nash, biologist to the Ontario government. I quote in full: "I have found evidence (of a sort) which leads me to believe that the Purple Martin and Chimney Swift may at times become partially dormant and I have recently received from an eye-witness an account of the cutting down of a hollow tree near Peterboro, in the month of January, many years ago; this tree is said to have contained hundreds of swallows in a dormant state, some of which were revived. I have the names of other witnesses of this curious incident and am looking them up."

In support of this suggestive phenomenon one can say that we do not know what part of the world the Chimney Swift does migrate to for the winter but it would be well to remember also that we are equally ignorant of the path the Arctic Tern takes to and from its winter and summer homes, 11,000 miles apart! We are still lamentably ignorant of a great many things about birds.

Mr. Nash supports the statement on page 360 that a low temperature was not the only cause of hibernation. He experimented with Black Bass and found that when the fish were "kept in a warm room they ceased to feed at the end of October and resumed again in March, though they never became dormant—in fact were just about as active during the winter as at any other time, though in nature I do not think they are so." I trust that these