for September, there were omitted four degrees given by the University of California: The recipients were: Harold Childs Bryant, in zoology; Wilson Gee, in zoology; Harry Noble Wright, in mathematics, and Friedrich Alexander Wyneken, in German.

Dr. A. G. Pohlman, of Indiana University, has accepted the professorship of anatomy in the school of medicine in St. Louis University.

Dr. C. L. Andrews, of the Johns Hopkins University, has been appointed professor of anatomy in the University of Mississippi Medical College.

Dr. Leonard W. Ely, of Denver, Colorado, was appointed associate professor of orthopedic surgery, and Dr. Ralph W. Majors, instructor in pathology, at a recent meeting of the board of trustees of Stanford University. On October first there will be opened a clinic in orthopedic surgery in quarters which are being fitted up for the purpose in the medical school buildings in San Francisco.

Ralph W. Curtis, B.S.A., who was for four years assistant superintendent of the Arnold Arboretum of Harvard University, has been appointed assistant professor of landscape art in the college of agriculture of Cornell University.

Josiah Main, of the State Normal School, Hays, Kansas, has been appointed professor of agriculture for schools in the State Agricultural and Mechanical College, at Stillwater, Oklahoma.

Paul S. Welch, Ph.D. (Illinois), has been appointed instructor in entomology in the Kansas State Agricultural College, and assistant entomologist of the experiment station to fill the place made vacant by the resignation of Dr. M. C. Tanquarry, who is accompanying the Crocker Land Arctic Expedition. Dr. John W. Scott, assistant professor of zoology and assistant station zoologist in charge of investigations in parasitology in the Kansas State Agricultural College, has resigned to become professor and head of the department of zoology and parasitology in the University of Wyoming. J. E. Ackert, Ph.D. (Illinois), has been appointed to the position in Kansas made vacant by Dr. Scott's resignation.

The following appointments to the faculty of the Alabama Polytechnic Institute and Experiment Station have just been made: Professor Ernest Walker, graduate of Cornell, formerly the head of the department of horticulture in the University of Arkansas, to be head of the department of horticulture; G. S. Templeton, B.S. (Missouri, '11), who has been for the past two years instructor in animal industry in the Texas College, to be head of the department of animal industry; L. S. Blake, a graduate of the University of Michigan, becomes acting head of the department of pharmacy as substitute for Professor E. R. Miller, who becomes acting assistant professor of plant chemistry in the University of Wisconsin. Lucius W. Summers, who has been assistant professor of animal industry for the past two years, has resigned to accept the position of professor of animal industry in the Virginia Polytechnic Institute.

Dr. J. Austin Bancroft has been appointed by the governors of McGill University Dawson professor of geology.

Dr. A. D. Imms has been appointed to the newly created post of reader in agricultural entomology at the University of Manchester. Dr. Imms was formerly professor of biology in the University of Allahabad, and afterwards forest entomologist to the government of India at the Imperial Research Institute, Dehra Dun.

DISCUSSION AND CORRESPONDENCE

THE DATA OF INTER-VARIETAL AND INTER-SPECIFIC COMPETITION IN THEIR RELATION TO THE PROBLEM OF NATURAL SELECTION

To the Editor of Science: Biometricians have clearly demonstrated[1] that of the variations which occur within the limits of the species some have far less chance of survival than others. In short, the intra-specific death

[1] See several papers in *Biometrika* and two general reviews in the *Popular Science Monthly* for 1911 and 1913.

rate is selective. The difficulties, however, of the problem of natural selection, the least investigated of all of the primary factors of organic evolution, demand the collection of evidences from every possible source.

The purpose of this letter is to call attention to inter-varietal and inter-specific competition as a source of information on natural selection, to illustrate the point by one or two recently published observations, and to urge the accumulation of more (and more precise) data of this kind by those field naturalists and experimentalists who have the opportunity for this sort of work.

The kind of studies to which I refer are illustrated by Brimley's interesting account[2] of the capture of Raleigh, N. C., by the wharf rat, *Mus norvegicus*. Up to 1909, the roof rat, *M. alexandrinus*, was the only species seen during a residence of twenty-five years. Since then it has been nearly or entirely replaced by the wharf rat.[3]

For a second illustration turn to botanical material.

Varieties of plants are generally believed to differ in their susceptibility to disease. An interesting demonstration of this is furnished by researches on the potato fungus, *Phytophthora infestans*. Jones, Giddings and Lutman have shown[4] that there is a correlation between the percentage growth of the fungus on various varieties in the test-tube and the percentage of rot observed in field trials on clay and sandy soil by Stuart. They find for laboratory growth and loss on clay a correlation of $r = .584 \pm .059$ and for laboratory and sandy soil a correlation of $r = .594 \pm .055$.[5] For convenient comparison I have also worked out the correlation between the percentage rot of the same varieties on clay and sandy soil, using Stuart's data as quoted by Jones and his associates. For the ungrouped material $r = .707 \pm .045$.

Clearly enough there is a pronounced individuality in the varieties with respect to their capacity for resisting disease. The interest of such a result from the standpoint of natural selection is clear, for in free competition more susceptible strains would be rapidly weeded out, and the morphological or physiological characteristics to which their inferiority is due would be lost.

Now of course in neither of these cases do we know why (*i. e.*, because of what peculiar characteristics) one variety or species was less capable than another of survival. Nor can we know until the questions are more intensively studied. But one can not doubt that these problems will yield to proper and persistent observation.

My point is merely that this sort of work may (if carried out extensively and intensively enough) have a most important bearing upon the two fundamental questions of natural selection. First, is the death rate random or selective? Second, if selective, what weight has each individual character in determining the chances of survival of the individual? In seeking the answer to the second question it may be desirable to deal with characteristics as strongly contrasted as possible—with varietal or specific differences instead of with intra-varietal variations—in order that the proximate causes of the differential mortality may be more easily recognized.

The value of such work for the problem of natural selection will be quite supplementary to that for which it was primarily carried out. May we not, therefore, have more observations of this kind, carried out in such detail that they may be of value to the evolutionist seeking to ascertain the selective value of individual characters?

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STATION FOR EXPERIMENTAL EVOLUTION,
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[2] Brimley, C. S., "Capture of Raleigh by the Wharf Rat," *Journ. Elisha Mitchell Sci. Soc.*, 28: 91–94, 1912.

[3] Dr. Hatai tells me that when he placed white rats on an island inhabited by the brown rat, *M. norvegicus*, the two forms at once established different centers and began fighting each other. See also *Year Book Carn. Inst. Wash.*, 10: 83–84, 1912.

[4] Jones, L. R., N. J. Giddings and B. F. Lutman, *Bull. Vt. Agr. Exp. Sta.*, 168: 74–81, 1912.

[5] These are calculated on grouped data. I have recalculated without classing and find results agreeing within less than half the probable error.