THE School of Engineering at the University of Pittsburgh, announces that Mr. Morris Knowles, C.E., will take charge of the course in sanitary engineering and public health. This course will be developed in cooperation with the medical school of the university and the departments of health of the city and state. The students will have a year's practical work along this line during their four years' course.

THE board of trustees of the University of Illinois in its annual meeting on March 14, made the following appointments and promotions: George Alfred Goodenough, associate professor of mechanical engineering, of the university was promoted to be professor of thermodynamics. Professor Charles Russ Richards, dean of the College of Engineering, University of Nebraska, professor of mechanical engineering in charge of the department. Professor Richards succeeds, as head of the department, Professor L. P. Breckenridge, who two years ago relinquished his office to take up work at Yale University. Mr. Burt R. Rickards, of Columbus, Ohio, who has been for some three years chief of the laboratories of the Ohio State Board of Health, was appointed associate professor of municipal and sanitary dairying in the Agricultural College.

DISCUSSION AND CORRESPONDENCE

LARVAL SPECIES

IN his recent review of Theobald's last volume on the mosquitoes Dr. E. P. Felt emphatically condemns the founding of species, or of a classification, on larval characters.[1] Dr. Felt has a right to his opinion, but his remarks are so incomplete that they do not fairly present the question at issue. In the case of the Culicidæ, as in the many others that might be cited, there were causes which led logically to such a course. First of these was the fact that certain species of mosquitoes could not be distinguished in the imago state, while they showed very marked differences in the larval condition. This led naturally to the founding of species on the early stages and Dr. Felt himself was the first to take this step. He has been amply justified by the fact that, in spite of diligent study with abundant material, no tangible characters for separating the imagos have been found. It should be added that a study of the male genitalia has revealed corresponding differences, equally marked with those of the larvæ. There can therefore be no question that the species indicated on larval characters really exist in nature. Since then a considerable number of species have come to light which are only separable on characters of larvæ and male genitalia.

Under such circumstances two courses are open to the systematist who will not recognize larval characters, neither of which, in our opinion, is scientific. The most convenient is to ignore the true condition and adhere to the concept of species on the basis of well-marked differences in the imagos; the other is to admit the species indicated by the larvæ and draw up descriptions from the indistinguishable imagos. To designate, as specific, individual differences due to variation, as Theobald has done in the case of *Aëdes fitchii, A. abfitchii* and *A. subcantans,*[2] only obscures the subject. We do not advocate the founding of species on larval characters as a general practise and we think that Dr. Felt expresses needless alarm on this account. Under the special conditions indicated above and in similar cases we not only consider the founding of species on larval characters justified, but unavoidable. Furthermore, if the mosquitoes are considered from an economic standpoint (and we are constantly told that this is the primary reason for their study) a knowledge of the larvæ is fully as important as that of the imagos.

But, Dr. Felt's criticism in his approval of Theobald's position is mainly aimed at our paper on the classification of the mosquitoes by larval characters.[3] He chooses to ignore the fact that we have since published a classification of the imagos, which, in the main, is

[1] SCIENCE, N. S., Vol. XXXIII., pp. 150–151.

[2] "Monogr. Culicidæ," Vol. 4, 1907, pp. 319, 321.

[3] "The Larvæ of Culicidæ Classified as Independent Organisms," *Journ. N. Y. Entom. Soc.*, Vol. 14, 1906, pp. 169–230, pl. 4–16.

in accord with that we had indicated with larvæ.[4] It is now clear that the old classification, employing the relative length of the palpi in the two sexes as a primary character, is not a natural one. It is true that the length of the palpi indicates, in a general way, the evolutionary state of the species. The forms with the long palpi are the more primitive ones, reduction having occurred first in the female, where, on account of the feeding habits, they were most in the way, and then in the male. The forms with the palpi shortened in both sexes are therefore evolutionally the highest.

Unfortunately for any system based on this character, the reduction of the palpi has taken place independently at different points and on this account the forms with the palpi short in both sexes can not be associated, as was formerly done. Dr. Adolpho Lutz was the first, in 1904, to subordinate the palpi and to outline a natural classification. Theobald has adopted this classification as the frame-work for his complicated scale-character system. We have found good reason to go still further than Dr. Lutz and discard the palpi for even generic limits. Aside from this it will be found, when the errors and weak points are eliminated from both, that the classification of Dr. Lutz, and the one we formulated on larvæ alone, agree very closely. Furthermore, the genitalia, when understood, indicate the same grouping. It seems that the question of stability strongly influenced Dr. Felt in his criticism. We venture to point out that only by attacking problems from new points of view can we progress. There are no fences in true science.

The further salutary effect of the study of the larval characters has been to establish a more exact and homogeneous concept of generic values. The best example is the genus *Culex*. Formerly the most heterogeneous elements were united under this name, and with those who work with the superficial characters of the imagos alone this is still the practise. Thus, even in the last volume of his work, Theobald associated wholly unrelated forms in this genus, while, on the other hand, forms which should be included are removed and scattered through the system on account of trifling differences in the scale vestiture. We believe that an impartial and careful study of the Culicidæ from all points of view will show that we were justified in overturning the crude ideas on which their classification was based and that this was brought about through our study of the larvæ as organisms unrelated to their adults. We believe that the names founded on larvæ are valid and should be given due priority. The characters used are in many cases more positive and reliable than those found in the adults and are further of more evolutionary importance than those heretofore used in classifying the adults.

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Frederick Knab

[4] "On the Classification of the Mosquitoes," *Canad. Entom.*, Vol. 39, 1907, pp. 47–50.

THE GERM-CELL DETERMINANTS OF CHRYSOMELID EGGS

There lately appeared in these columns under a title similar to the above, an article[1] by Dr. R. W. Hegner dealing with a paper of mine[2] in which I had questioned his use of the term "germ-cell determinants" as applied to the granules of the pole disc of chrysomelid eggs. As I do not quite agree with Hegner's interpretation of my position, I take this opportunity to make a more explict statement of my point of view.

To my mind, a cell or tissue *determinant* suggests or implies a physiological activity that, to use a crude illustration, resembles the physical action of a dye upon impressionable metal. Thus a germ-cell determinant would be something that stamps the undifferentiated cells arising from the cleavage nuclei with a specific germinal or reproductive property.

I have given evidence that what he calls "germ-cell determinants" are in all likelihood merely a part of the food stream from the nurse cells, and this Hegner admits is no

[1] R. W. Hegner, "The Germ-cell Determinants in the Eggs of Chrysomelid Beetles," Science, Vol. XXXIII., No. 837.

[2] *Biol. Bull.*, Vol. XVIII., No. 4.