house, M.Sc., D.Sc., F.G.S., assistant lecturer in geology, Leeds University. Hygiene: Mr. W. J. Wilson, B.A., M.D., R.U.I., Riddell demonstrator of pathology and bacteriology, Queen's College, Belfast.

DR. ARTHUR ROBINSON, professor of anatomy in the University of Birmingham, has been called to the chair of anatomy in Edinburgh University, rendered vacant by the death of Professor D. J. Cunningham.

Nature is informed that the appointments to the chairs of chemistry in the Technical High School at Munich have just been officially announced. The names of the professors are: Organic chemistry, Professor Semmler; inorganic chemistry, Professor A. Stock; physical chemistry, Professor R. Abegg. Each professor has an institute of his own, and Professor Abegg retains, at the same time, his position as extraordinary professor in the University of Breslau. The Technical High School, which is being built at a cost of something like five million Marks, is making good progress, and is to be opened officially in October, 1910.

DR. F. RINNE, professor of mineralogy at Kiel, has been called to Leipzig.

DISCUSSION AND CORRESPONDENCE

TELEGONY AS INDUCED REVERSION

DARWIN and many other students of heredity have believed in telegony, and have collected many alleged examples. The typical instances were the striped colts produced by mares that had previously borne quagga hybrids.[1] The original theory of telegony assumed that the stripes of the later colts were inherited from the quagga sire of the first colt. Various attempts have been made to show how this could come about, but they were not able to secure scientific credence.

The tendency shown in Thomson's "Heredity" and other recent handbooks is to deny telegony altogether and to treat the alleged cases as ordinary instances of reversion. In Morgan's "Experimental Zoology" telegony is dismissed as "another breeder's myth," and is used as an illustration of the "credulity of men who have not been trained as to the value of evidence."

It is curious that this zeal for evidence allowed the fact to be overlooked that Darwin knew of three striped colts following quagga hybrids, instead of only one. This oversight may be partly responsible for the verdict reached in Professor Morgan's discussion of the supposed single case: "There was, then, merely a coincidence, and not a causal connection."

The additional evidence collected by Ewart has bearing upon the nature of the facts that have been grouped under telegony, but it does not explain the occurrence of such phenomena as sequels of hybridization. To reckon the striped colts as examples of reversion affords no proper warrant for denying any connection with the fact that the mares had previously borne quagga colts, or for assuming that such reversions are without scientific interest or practical importance. To know that characters of remote ancestors are likely to return to expression in progeny that follow hybrids may be quite as significant, from the standpoint of heredity, as the idea of long-range transmission from the male parent of the hybrid.

Before pronouncing telegony a myth, a further possibility should be taken into account, that the stripes of a later colt may be induced by the previous contact with the quagga, not through any form of transmission or "infection" with character-units or primordia from the quagga, but by giving a stronger tendency to expression to a primitive characteristic already included in latent form in the reproductive cells of the female. In his hybrids between zebras and horses Ewart found that the stripes were not like those of the striped parent, but of a much more complex pattern, indicating that a primitive character of some remote ancestor came into expression, instead of a character directly transmitted from the zebra. Ewart does not use his evidence to prove that striped colts following hybrids are mere coincidences, but to show that the theory of long-range transmission from the male parent is unnecessary.[2]

[1] "The Variation of Animals and Plants under Domestication," Chapter XI.

[2] Ewart, J. C., "The Penycuik Experiments," 1899.

Many external and internal conditions which do not appear to affect the *transmission* of characters are able to influence the *expression* of characters. Differences of heat and light, as well as of foods, chemicals and internal secretions (enzymes) are now known to induce changes in the expression of characters. Without the thyroid gland the remainder of the body does not complete its growth. Castrated animals may grow to abnormal size, but fail to develop secondary sexual characters. Parasitic fungi, insects and mites induce the development of galls and other changes in the habits of growth of their host plants. Horticulturists have learned that scions have definite influences upon the characters of the roots on which they are grafted. Plants grown under new and unaccustomed conditions often show wide ranges of individual variation, recalling many ancestral characters to expression. There is no ground for denying the possibility that similar reversions might follow impregnations by diverse types.

The fact that Ewart found only faint stripes on colts that followed his zebra hybrids does not destroy the older evidence that more vivid stripes, as well as peculiarities of mane and hoofs, followed the earlier instances of hybridization with the quagga, an animal of a different species, now reckoned as extinct. Atavistic changes have been found to be more frequent and more pronounced in some series of hybrids than in others, even in the same group of organisms. When our United States Upland cottons are crossed with the Kekchi cotton of Guatemala the hybrids have lint shorter than either parent, but when the Kekchi cotton is crossed with the Egyptian the lint is as long as in the Egyptian parent, or even longer. With hybrids, as with the parent stocks, external conditions often appear to have a definite influence upon the expression of characters. Hybrids of the same parentage may show Egyptian habits of growth under some conditions and Kekchi habits under others.[1]

[1] "Suppressed and Intensified Characters in Cotton Hybrids," Bulletin 147, Bureau of Plant Industry, U. S. Department of Agriculture.

The frequent occurrence of stripes in mules may also mean that hybridization has a tendency to induce this form of reversion. There is no reason to suppose that the stripes come from the asinine ancestry alone. Striped mules seem to be especially common in tropical countries, where unfavorable climatic conditions and the mixing of the breeds of horses may further increase the tendency to reversion. A vividly striped mule of a yellowish, zebra-like ground-color, seen at Cordoba, Mexico, a few years ago, gave me a better appreciation of the extent to which such reversions may sometimes be carried. The conspicuous markings of the legs happened to be seen first, the more uniform body of the animal being concealed by a wagon. I stepped into the street expecting to find a traveling managerie.

The possibility of bringing telegony into relation with other induced forms of reversion adds nothing, of course, to the evidence that reversions are induced by previous hybridization. Facts may establish theories, but theories do not establish facts, except as they lead to further observation. If enough reversions of the same kinds are found to occur without previous hybridization it will be reasonable to view all the alleged cases of telegony as coincidences. If reversions prove to be more frequent after hybridization telegony will be established, though its manifestations may not be otherwise different from reversions that occur without hybridization.

Negative evidence may show that induced reversions are rare, but does not affect the authenticity of particular cases, as Ewart himself perceived. Xenia also has appeared to be very rare in nature at large, but its frequent occurrence in maize is no longer doubted, and an explanation has been found in double fertilization, enabling the endosperm as well as the embryo to share the characters of the male parent. We need not feel obliged to discredit facts like those collected by Darwin and other students of heredity merely because an erroneous theory suggested the name telegony.

Pearson's plan of proving or disproving telegony by a statistical study of the degrees

of resemblance of children to fathers rests more on mathematical ideas than on biological indications, to judge from Thompson's account of it. To show that later children resemble their fathers more than earlier children would not demonstrate a cumulative paternal influence, but might only mean that children of older parents have less tendency to vary from parental characters than children of young parents. It would still be necessary to show that the paternal resemblances of the later children increase more than their maternal resemblances.

O. F. COOK

WASHINGTON,
April 30, 1909

SCIENTIFIC BOOKS

A Comparative Study of the Thorax in Orthoptera, Euplexoptera and Coleoptera. By R. E. SNODGRASS. *Proc. Ent. Soc. Washington,* IX., 1908, pp. 95–108, pls. II.–V.

The Thoracic Tergum of Insects. By R. E. SNODGRASS. *Ent. News,* March, 1909, pp. 97–104, pl. VI.

The Thorax of Insects and the Articulation of the Wings. B. R. E. SNODGRASS, of the Bureau of Entomology, U. S. Department of Agriculture. No. 1687—Proceedings U. S. National Museum, Vol. XXXVI., pp. 511–595, with plates 40–69. Published June 18, 1909.

The series of memoirs, under the above titles, constitutes a very valuable addition to the literature of insect structure. The last paper contains the detailed evidence for the theories presented by the other two and is really considerably broader than the title indicates, including an elaborate discussion of the segmentation of the head and abdomen and is not limited to a study of adult structure.

The diagrams (Figs. 1–6) present in an extremely satisfactory manner the author's views on the structure of the thorax, and the "glossary and synonymy" (on pp. 570–583) will prove more than ordinarily useful to subsequent students of this subject. Many will agree heartily with the protest against the tendency to explain all structural differentiation of a segment by the supposition of a multiple origin. It is pointed out that if segments have been lost they have been suppressed and not fused and are not represented by the present subdivisions of the segments.

There may be less assent to the idea of separating the labial segment from the head, there would be more reason for considering the prothorax as not forming part of the thorax. Much is added to our knowledge of the detail of the sternal and pleural structures, but nothing added to the interpretation of their significance beyond the accumulation of evidence against their supposed double origin and in favor of the single origin urged by myself several years ago[1] and the elevation of the occasionally partially chitinized articular membrane to the position of a component part of the segment under the names of the presternum and preepisternum.

In reference to the notum we find the most radical views. This region is conceived of as consisting of two parts, one the original chitinized portion of the segment, the other a new sclerite resulting from the chitinization of the articular membrane. This last portion is identified as the postscutellum of Audouin, the division between other three regions of the notum are supposed to be of relatively recent origin and not to be homologous through the group, since they do not correspond with a system of internal ridges which are considered as comparable in all insects.

It is probable that in some groups many authors have made mistakes in properly homologizing the various parts of the dorsum, but there has not yet been offered enough evidence to cause us to overturn at once the older nomenclature.

The scutum is the piece bearing the wing processes. Exactly what its anterior border is may be a question for discussion. Posteriorly it is probably bounded by the "V-shaped ridge," but here again we may have an unsettled question. The piece behind the scutum is the scutellum. There is no difficulty in most cases in recognizing it, but its exact boundary may again be an unanswered ques-

[1] "The Wing Veins of Insects," Univ. of Calif. Publications, Entomology, Vol. I.