INNERVATION AS A CRITERION OF HOMOLOGY OF THE ELEMENTS OF THE LARVAL AND PUPAL CHAETOTAXY OF MOSQUITOES

(DIPTERA, CULICIDAE)

The constancy of the chaetotaxy pattern in the different instars of the immature stages throughout the family Culicidae (in the broad sense) suggests that this chaetotaxy is of monophyletic origin and consists of elements that are homologous phylogenetically as well as ontogenetically and in part serially. Attempts to homologize the chaetotaxy have been hampered by the complexity of the pattern and the lack of reliable direct criteria. In the course of recent studies on the mosquitoes of the South Pacific, I have seen several slides of prepupal fourth instar larvae in which nerve connections between the external hairs of the fourth instar and the internal developing hairs of the pupa show very clearly. These connections provide for the first time an absolute criterion of ontogenetic homology of the elements of the mosquito chaetotaxy and demonstrate the sensory nature of the hairs. It is well known that setae and various other cuticular modifications in insects are connected to distal filaments of sensory neurones to form sensilla of different types. Wigglesworth (Q. J. Micros. Sci. (n.s.) 94: 93-112, 1953) showed that the cuticular portions of some sensilla in *Rhodnius* are reformed in successive instars by the identical tormogen and trichogen cells which formed the preceding sensillum and that the new sensillum is innervated by a branch from the distal filament of the original sensory neurone. Owing to this relationship of the sensory filament the sensillum of the older instar remains functional while the new sensillum of the following instar is being formed under the loosened cuticula. In mosquitoes there is a dramatic change in morphology between the fourth instar larva and the pupa but the majority of the sensilla are carried over from the larva to the pupa as shown by the nerve connections. Owing to differential growth of the integument of the pupa the new sensilla come to occupy very different positions from those of the larva but retain the nerve connection by elongation of the original branch of the distal sensory filament. The different sensilla develop at different times and this allows for shifts in position which can be clearly seen in the crossing of filaments from different sensilla. Common innervation thus demonstrates the ontogenetic homology of individual hairs beyond any question from the first instar larva to the pupa. Serial homology and phylogenetic homology of the chaetotaxy, of course, cannot be proved in this manner but the similarity in the pattern on the abdominal segments is strongly suggestive of serial homology, and the constancy of the pattern on all body regions throughout the family likewise probably indicates phylogenetic homology. A reinterpretation of the homology of the larval and pupal chaetotaxy based on innervation is presented in a forthcoming publication on the mosquitoes of the South Pacific (Univ. of California Press).

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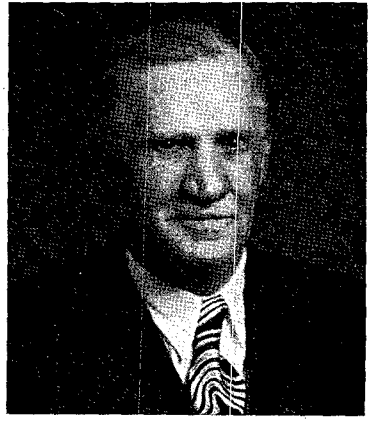

ARTHUR BURTON GAHAN
1880—1960

With the sudden death of Arthur B. Gahan on May 23, 1960, the Entomological Society of Washington lost one of its oldest and staunchest members. He was elected to membership in 1907, and until a few years before his death he attended the meetings very regularly and participated actively in the discussions. From 1915 to 1918 he served as Recording Secretary. He was Vice-President in 1920 and 1921 and President in 1922, and as Retiring President he addressed the Society on "The role of the taxonomist in present-day entomology." In 1958 he was elected an Honorary Member.

Mr. Gahan was born December 9, 1880, on his parents' farm three miles from Manhattan, Kansas. He was one of a large family, having six brothers and two sisters; and he lost his mother when he was seven. He attended the local public schools and after completing his high-school training he attended Kansas State College in Manhattan, walking the three miles back and forth daily. During the summers he worked in the Kansas wheat harvests. He received the B.S. degree from Kansas State College in 1903, and in 1904 he left for College Park, Maryland, to accept an assistantship in the Department of Entomology at the Maryland Agricultural College. Upon his arrival, and even before he had had an opportunity to look for living quarters, Professor T. B. Symons, Head of the Department of Entomology at that time, told him that he himself had to visit the Eastern Shore of