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This Week's Citation Classic

Wigglesworth V B. The hormonal regulation of growth and reproduction in insects. *Advan. Insect Physiol.* **2**:247-336, 1964.
[Agricultural Research Council Unit of Insect Physiology, Dept. Zoology, Univ. Cambridge, England]

This review covers the neuroendocrine system, including the prothoracotropic hormone; the thoracic gland system including the chemistry and action of ecdysone; the role of hormones in diapause; the juvenile hormone and control of metamorphosis; the hormonal control of reproduction; and the metabolic action of hormones. [The *SCI*® indicates that this paper has been cited over 205 times since 1964.]

Vincent B. Wigglesworth
Department of Zoology
University of Cambridge
Cambridge CB2 3EJ
England

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"The study of insect endocrinology began with a paper by Kopec in Poland on the metamorphosis of the gypsy moth in 1917,[1] but little more was done until the 1930s. In that decade, the existence of a moulting hormone, the secretion of which was initiated by the brain, became established; the control of metamorphosis by a hormone, the juvenile hormone secreted by the corpus allatum, was recognized; the corpus allatum was also found to be necessary for the deposition of yolk in the developing eggs and for the full activity of the male accessory glands which secrete the spermatophores; and it became evident that the arrest of development in the young stages of insects, and the arrest of reproduction in the adult, both of which are termed 'diapause,' were due not to some ill defined defect in metabolism but to the controlled arrest in the secretion of clearly defined hormones necessary for moulting or for yolk formation.

"At that time only a handful of workers were concerned with insect endocrinology. But their numbers increased and by the beginning of the 1960s important advances had been made on many fronts. The moulting hormone ecdysone had been isolated and identified as an hydroxylated steroid, which activated the nucleolar system in the epidermal cells leading to ribonucleic acid production and the initiation of protein synthesis, thus setting in motion the renewal of growth and the formation of the new cuticle.

"These changes were correlated with the 'puffing' of a series of gene sites in the polytene chromosomes of the salivary glands and elsewhere in *Chironomus* and *Drosophila.* Discoveries in the insect field were thus becoming linked with the new advances in molecular biology, and hormone action was beginning to be described in terms of the gene controlled synthesis of specific enzymes.

"Neurosecretion was being extensively studied. The neurosecretory cells in the dorsum of the brain which were early shown to initiate moulting had been found to activate the prothoracic glands and so to induce them to secrete the moulting hormone. But neurosecretory cells in other sites with other functions were being described, and the corpus cardiacum, formerly a most puzzling structure, was recognized as the neurohaemal organ in which the neurosecretory product of the intercerebral group of neurosecretory cells was liberated into the circulating haemolymph.

"At the time this review was written (1963) we were on the brink of an explosive expansion of insect endocrinology. But it was still possible to present a more or less comprehensive account of the subject in an 80 page review. It still serves as a review of the first 30 years of insect endocrinology. The ensuing 30 years have seen a gigantic expansion—as recorded in some more recent reviews listed below."[2-4]

1. **Kopeč S.** Experiments on metamorphosis of insects. *Bull. Int. Acad. Cracovie* **B**:57-60, 1917.
2. **Gilbert L I.** Endocrine action during insect growth. *Recent Progr. Hormone Res.* **30**:347-90, 1974.
3. **Wigglesworth V B.** *Insect hormones.* Edinburgh: Oliver & Boyd, 1970. 159 p.
4. **Sridhara S, Nowock J & Gilbert L I.** Biochemical endocrinology of insect growth and development. *Int. Rev. Biochem.* **20**:133-88, 1978.