

This Week's Citation Classic

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Johansson A S. Relation of nutrition to endocrine-reproductive functions in the milkweed bug *Oncopeltus fasciatus* (Dallas) (Heteroptera: Lygaeidae).

Nytt Mag. Zool. 7:1-132, 1958.

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The paper contains a description of the neurosecretory cells and the corpus cardiacum-allatum complex. By means of a series of experiments it was shown how nutrition influences reproduction by way of the central nervous system and the endocrine organs. [The SCI® indicates that this paper has been cited over 175 times since 1961.]

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"My first contact with the milkweed bug was in 1948-1949 when I was staying with F.H. Butt at Cornell University and was asked to take a closer look at the central nervous system of this insect. On leaving the US I brought the insect with me to Norway and continued to play around with it. I noticed that if I starved female bugs or kept them on glucose, they would stop laying eggs. At the same time the corpus allatum, the endocrine organ necessary for normal egg production, was influenced and remained small in starved or inadequately fed bugs. It was well known at that time that the functioning of reproductive organs in insects is controlled by endocrine organs, and is also influenced by nutritional factors. It had also been shown in a few insects that starvation influenced the corpus allatum. It occurred to me that this might represent a chain of events and that the corpus allatum could be compared to an electric switch which could be used by environmental factors to stop egg production, thus saving energy for the

survival of the individual. I transplanted active corpora allata into females fed glucose, went on Easter vacation skiing in the mountains, and on my return to the laboratory a week later, I found that females with implanted corpora allata had laid eggs despite inadequate food. When I told this to Ellen Thomsen in Copenhagen, she urged me to write a note to *Nature*.¹

"To work out the details of the chain of events was a long operation. I was lucky to get the opportunity to work for a year (1954-1955) with Berta and Ernst Scharrer at the department of anatomy, University of Colorado, Denver, where I enjoyed myself while performing experiments both on the milkweed bug and on 'Berta Scharrer's cockroach,' *Leucophaea maderae*. After a short stay at the Marine Biological Laboratory, Woods Hole, Massachusetts, and the Albert Einstein College of Medicine, Yeshiva University, New York, I returned to Norway and wrote up my results, and with great doubts published them as a single paper in a little-known Norwegian journal. For the whole syndrome caused by inadequate nutrition I coined the term 'pseudo-allatectomy,' as a parallel to the term 'pseudo-hypophysectomy' used for similar situations in vertebrates.

"I have often believed that the paper has been cited mostly because it contains so many references (more than 500) and because since then *Oncopeltus* has become a common laboratory animal.² But it also contains an early description of the ecological significance of the nutritional-endocrine-reproductive relationship and of survival strategy.³

"Anyway, the paper got me a full professorship, and thereby a lot of administrative work. It gave me a network of friends all over the world and led me to interests in other scientific fields."

1. Johansson A S. Corpus allatum and egg production in starved milkweed bugs. *Nature* (London) 174:89, 1954.

2. Fehr D. *Oncopeltus fasciatus*: a research animal. *Annu. Rev. Entomol.* 19:81-96, 1974.

3. De Wilde J. Seasonal states and endocrine levels in insects. (Assenmacher I & Farner D S, eds.) *Environmental endocrinology*. Berlin: Springer-Verlag, 1978. p. 10-19.