# This Week's Citation Classic

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**Telfer W H.** The mechanism and control of yolk formation.
*Ann. Rev. Entomol.* **10**:161-84, 1965.
[University of Pennsylvania, Philadelphia, PA]


**Evidence is reviewed that insect oocytes produce their protein yolk reserves by selective pinocytosis of a female-specified blood protein. The functions of the other cell types comprising the ovarian follicle are also surveyed, and are shown to be consistent with the pinocytotic model of vitellogenesis. [The *SCI*® indicates that this paper has been cited over 130 times since 1965.]**



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"This review was a reiteration of ideas that had developed over a 15 year period beginning when I was a student of Carroll Williams at Harvard. With much encouragement from Williams, my PhD thesis explored the utility of a newly developed antiserum-agar technique for analyzing protein changes in metamorphosing insects. On December 14, 1951, tests of a newly prepared rabbit antiserum revealed for the first time in the cecropia moth a female-specific blood protein that proved to serve as a precursor for yolk. This was the first known example of a widely occurring class of proteins that we later named vitellogenins.

"From 1954 to 1960 in the zoology department at the University of Pennsylvania I worked on the mystery of how a soluble blood protein could be selectively transported through an epithelium, across the cell membrane, and into a storage vesicle in the cytoplasm of the egg. Influenced by the late John M. Marshall, who was studying pinocytosis in amoebae in the department of anatomy, and by repeated and timely cues from cecropia itself, an amazingly simple pinocytotic model of yolk formation finally emerged.

"In the mid-1960s two developments brought unaccustomed attention to vitellogenin. Roth and Porter discovered the coated micropinocytotic vesicle,[1] a generally distributed organelle exhibiting all of the structural features that had been postulated for vitellogenin transport across the oocyte membrane. And endocrinology, beginning its search for proteins whose synthesis is controlled by hormones, turned its attention toward the vitellogenins that were now being found in many other kinds of animals.

"The 1965 review was written to reintroduce vitellogenin to the entomologists among this new audience. Its frequent citation in preference to the experimental papers on which it was based has often left me in a quandary. Did the review rescue my earlier papers from oblivion, or did it simply usurp the attention that they might otherwise have received? I am deeply grateful in either case to my scientific colleagues whose courtesy has earned this paper its place as a 'Citation Classic' in *Current Contents*®."


1. **Roth T F & Porter K R.** Yolk protein uptake in the oocyte of the mosquito, *Aedes aegypli* (L). *J. Cell Biol.* **20**:313-31, 1964.