

UNDER MY MICROSCOPE

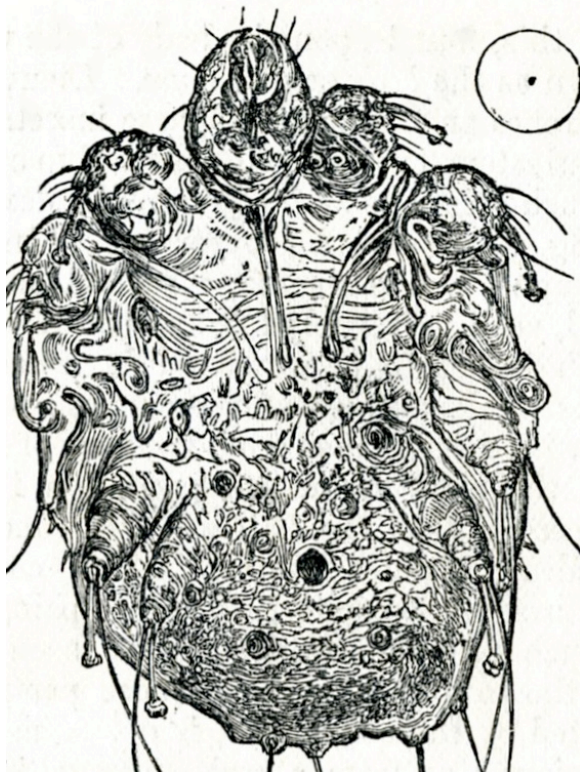
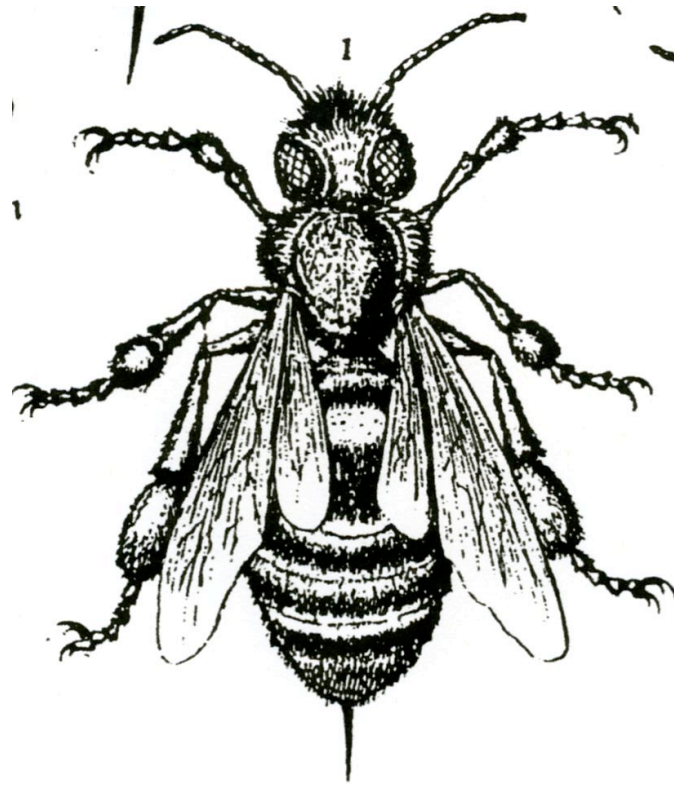
THE BEE AND THE MITE

or the bitter story of the
Varroa infestation

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I enjoy honey. I detest mites.
I use microscopes.

Put those elements together with the fact that I find conversation with (most) of my neighbors informative and stimulating, and then we have the origin of the story I'm about to tell.



A neighbor who has a barn that has, so far, escaped the horror of urban sprawling, keeps bee hives as a hobby. He was telling me about the joys and tribulations of an amateur beekeeper. In years past I had sampled the honey he harvested; delightful, with a delicate hint of roses (we all grow roses in our yards here). No honey this year; he was telling me of his dwindling colony, of his efforts to save the remaining population. He was particularly concerned with the infestation by Varroa mites. In truth, I have never heard of them, but the word “mite” brings to my mind images of *Sarcoptes scabiei* (Hogg, 1883; figure 1, to the left). This is one of the scourges of the populations of developing countries now, and one that affected about every country in the world until the early part of the 20th century.

Figure 1. A camera lucida drawing showing a ventral view of *S. scabiei*. The dot inside the circle at the upper right shows the actual size of the parasite; from Hogg, 1883.

Is Varroa, as ugly as *S. scabiei*? You will judge. But certainly, for a colony of bees the invasion of Varroa may be as frightening and destructive, as the invasion of the Earth by the Martians in the War of the of the Worlds (Wells, 1898).

My neighbor wondered whether I would be interested in examining some of the parasites. Of course!

A few days later he produced a small jar containing twelve brown specks, some of which still showed some sluggish motion.

Observation under a stereo microscope confirmed that these were indeed Varroa mites (www.uky.edu/Ag/Entomology, 2007). Unfortunately, all dead specimens were damaged. It was necessary to work with six that were alive and appeared anatomically intact.

Histology. The mites were fixed in Bodian's variation of the FAA fixative (Formalin-alcohol-acetic acid; Lillie, 1965). After a week in fixative the specimens were changed to 95% alcohol. At that point some specimens were changed to carbol-toluene, followed by pure toluene, then they were mounted in Canada Balsam. Other mites were taken from the alcohol and mounted in lacto-phenol (Brontë-Gatenby and Beams, 1950). Lactophenol, a mixture of phenol 20 ml, lactic acid 20 ml, glycerine 40 ml, and water 20 ml, is an excellent, but much underutilized fixative - clearing agent - mounting medium for small insects, larvae, molds, etc.

Observations. All specimens were well preserved and made excellent permanent preparations when mounted in concave slides. However, the mites treated with lacto-phenol were slightly more translucent. Six specimens were measured with the following average results (in micrometers): Width 1690 Length 1144.

Photography. A lacto-phenol treated mite mounted in a supine position (belly up) was photographed using an Olympus 4x S Plan objective, a magnification changer set at 1.25x, and a 3.3x photo-ocular. A stage micrometer was photographed next under the same conditions. A Nikon camera loaded with Fuji ISO 100 film was used to record the images. Total magnification on the 4 by 6 inch print was 73.3x. A digitized version of that print, was used to produce figure 2.

Figure 2. Ventral view of a fully developed Varroa mite, likely a female, given its size. The four pairs of legs are clearly visible. Centrally, between the most anterior pair of legs appear the piercing mouthparts that Varroa uses to pierce the bees exoskeleton and suck its hemolymph. The dense materials seen at various places in the posterior hemisphere, I assume, are intestinal contents.



Control of Varroa infestation is difficult. New pesticides are under development; miticides and essential oils like thymol are sometimes effective. Unfortunately, my neighbor lost his colony in spite of all his efforts.

Wells' War of the Worlds ends with the Martians falling victim to earthly bacteria. It is to be hoped for the sake of the bees and of all honey lovers, that some bacteria or fungus will be found that will, likewise, destroy the Varroa mite.

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Lillie, R. D. (1965) *Histopathologic Technic and Practical Histochemistry*. Third edition. McGraw-Hill Book Company. New York, p. 39.

Wells, H. G. Wells (1898) *The War of the Worlds*. William Heinemann, London, 303 pp. [There are innumerable editions and the book is also available as on-line text]

<www.uky.edu/Ag/Entomology> (2007) Varroa Mites Infesting Honey Bee Colonies.