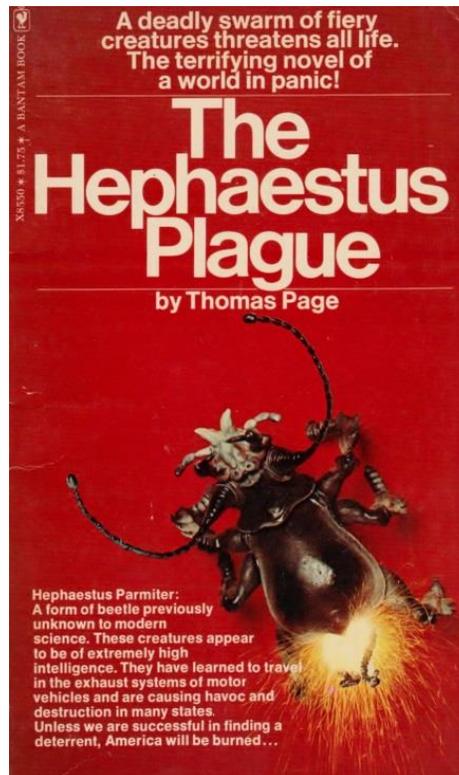


Murray Eiland
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THE HEPHAESTUS PLAGUE

Thomas Page

About the Book

The author is a well-known novelist. The book titled *The Hephaestus Plague* (1973) was turned into a major motion picture called *Bug* in 1975. The trailer is on YouTube (<https://www.youtube.com/watch?v=i0OnDYxdilk>). The film is dated according to modern standards, but the book is fresh. The main character is Professor James Lang Parmiter, a reclusive entomologist at a minor fictional college in North Carolina called Bainboro College. He has an obsession with insects. He is also socially awkward. He makes life difficult for his lab assistant/graduate student Gerald Metbaum. Both are called to a site (Candor, North Carolina) after an earthquake, which has released strange insects from a newly opened chasm.

The insects can start fires. They cannot move very well, they have no wings, and they eat ashes. The entomologists examine the insects and find that they have no wing seams at the sides. They have long front and short back antennae, and they are completely blind. At first they suggest that the closest parallel is the bombardier beetle, but of course that insect cannot start a fire (p. 27). Parmiter calls them “fire beetles.” They gather specimens and return to the lab.

They find that the hard rear antennae can be rubbed together to produce a chirping sound as well as start a fire. When the beetles are dissected they are found to have no digestive system. They are full of bacteria, and further analysis shows that these bacteria allow the insects to eat pure carbon from ash. Believing this new species to be a threat, the chasm that opened after the earthquake is cemented over.

The prize specimen in the lab is a very large female Madagascan hissing cockroach (*Gromphadorhina portentosa*). One day they use filter paper from her cage in the cage of some of the fire beetles. They react with a chirping mating song. In a eureka moment, Metbaum concludes that they are in fact of the order *Dictyoptera*, cockroaches.

Some of the farmers near the earthquake site notice that the insects get into the exhaust pipes of tractors and cars. The insects find food there, and can go from place to place via cars and trucks. Cities are hit very hard with fires, and inspection stations are set up to prevent fire insects from entering. A variety of predators are tested to combat them. All tests fail. Their shells prove too tough, and the ability to spark fire as a weapon discourages all possible predators. Poison does not work. Antibiotics do not kill the bacteria that the insects use to digest food. The good news is that although some females carried egg cases out of the chasm, they did not reproduce on the surface. Any infestation is limited to the insects that emerged from the chasm and their eggs.

In another eureka moment, after Parmiter sees bubbles forming in a champagne glass, he realizes that the fire insects are not adapted to life on the surface with little pressure. Their carapace is airtight, and they have no way of relieving the pressure (having come from deep in the earth). In short they have “the bends.” When the atmospheric pressure is increased in experimental tanks, they can move. They are also able to mate with and produce viable offspring with the Madagascan hissing cockroach. While other researchers later breed roaches under pressure,

Parmiter is the only one to cross-breed them with another species. This is quite dangerous, as it changes the otherwise sterile fire insects into something that can spread.

Parmiter and other researchers start to notice something sentient in the fire insects. Parmiter takes the pressurized cage and the other specimens home, and is increasingly isolating himself with the insects. While at home he finds the one weakness the insects have after turning on a radio (p. 116): “Sound waves. Like millions of needles of molecular width striking millions of balloons and exploding them, ultrasonic waves assaulted those iron shells in tidal furies, straining the already stressed bodies to the bursting point.” Eventually other scientists find the exact frequency that will kill the insects, but they have to be very close to the sound emitter.

Parmiter meanwhile starts talking to his hybrid specimens, who reply by chirping. They move around the house at will and become something like pets. The hybrid insects are able to live comfortably at surface pressures. They can also eat a range of foods, not just ash. They have a functional digestive system unlike the underground type. They have the ability to start fires, but they are as delicate as a normal roach. They are easily crushed and poisoned. Parmiter starts to have dreams, almost as if they can communicate with him telepathically. When he places the hybrid insects in mazes they complete them in times comparable to mammals and much faster than other insects. Eventually they confront him by spelling out his name “James Parmiter.” They communicate with Parmiter using chirps when they are spoken to. They can follow simple commands. The Professor finally attempts to get a university official to see what he is working on. The colony understands that in the future they are either to be contained in a laboratory or killed. The colony kill the official as he heads home. Shortly after, the entire colony disappears from Parmiter’s home. When they return the colony is enormous, and they communicate their desire to return underground. He also learns that it is the microbes who were communicating with him. The insects are only vessels for sentient bacteria. They have a long memory, and convey that they had communicated with other humans a long time ago. When Parmiter says that he cannot help the colony further, they incinerate his house as well as the block. After Parmiter recovers, he and Metbaum (who returns after an illness) head back to the chasm. The hybrids are headed there in great numbers. Parmiter dynamites the concrete cap above the chasm, and some hybrid insects return underground. Those that remain on the surface lose their

special abilities in a few generations. Parmiter's body is never recovered, and the end of the book suggests that he has become one with the colony.

Discussion Guide

1. Professor Parmiter originally assumes that the new species are beetles. They have a smooth, seamless armored case with a plated belly. As the novel states (on p. 29): "In the Coleoptera, or beetle, the tough front wing sheath protects the fragile rear wings. Period. That definition was what characterized the more than two hundred and ten thousand species of beetle, making it the most common form of life on earth-plant or animal." What are the other characteristics of beetles and how do these characters contribute to the success of the Coleoptera?
2. The novel introduces tension by noting that the new species could become a pest if it reproduced. The researchers note that after millions of dollars in abatement efforts, the fire ant spread anyway. Why is it so difficult to control insect pests that do not have natural enemies in a new environment?
3. The new species is first described by Parmiter as of the order Coleoptera, with the suggested formal designation *Hephaestus parmitera*. Does this follow the normal practice for naming new species?
4. Gradually Parmiter realizes that the fire insects have formed a relationship with bacteria in their their gut (starting on p. 46). According to the novel, between 25 and 50 million years ago the insects became trapped underground. They developed mutual relationship with bacteria in order to eat what was available (moss, lichens or fungus). What other insects use gut microbes to process their food?
5. Metbaum notes that the fire beetles are in fact cockroaches (p. 50). Why would it be likely for someone to confuse beetles and cockroaches, and why should the scientists have known better?
6. Max Linden from the Smithsonian notes (on p. 77) that: "I believe that the only possible weapon is natural enemies. We just have to find the right one. A bird. A spider. A lizard. Maybe even dogs or cats. Some kind of predator. Also another type of predator may be good at killing the eggs, some kind of parasitic wasp." This was a good idea, but it seems that underground there were no natural enemies of fire beetles. What real life insect pests

that have thrived in an area with no natural enemies have been controlled using predators or parasites from their original habitat?

7. According to the book the fire insects are not born with bacteria. They are inoculated with them by the mother's saliva. Insects such as (real life) termites and cockroaches use a similar system to inoculate their young with microorganisms. Why are insects not born with the required microorganisms?
8. Really funny parts of the book are usually about academic life. The relationship between a former professor and an accomplished student is summarized (on p. 95): "King realized that he might win the Nobel Prize, inherit a million dollars, or put heaven in a test tube someday, but to Parmiter he would never be anything more than a former student." How accurate is the novel when it portrays university life?
9. On pages 138-139 the social structure of the hybrid colony is outlined. There are large females with light colored heads, black medium sized soldiers, and small black workers. There are cockroach species that live in colonies, but do they have individuals with different roles that look different from each other?
10. The book suggests that the hybrid insects are gathering into a group in order to migrate (pp. 143-144). Like locusts they have changed from one form to another. By the end of the book the hybrid insects have lost the ability to make fire or aggregate (p. 213). Locusts in the solitary phase pose no economic threat, while after a drought followed by rain and plant growth, they start to breed, aggregate, and then travel. The "locust" phase is different morphologically and behaviorally, which is similar to the hybrids in the novel. What is the trigger that turned the hybrid insects to their nomadic phase?
11. Parmiter has dreams that act as a guide that tells him what the colony is thinking. An image that constantly appears is "Rome and Sparta." Parmiter writes in his notes: "The survival of any species is solely dependent on how it cares for its offspring." He notes that flies leave many maggots to care for themselves, while kangaroos care for one or two offspring in their pouch. He goes on to suggest that in humans there is a sense of "instinctive tenderness" to young animals of all species, and that this might drive adults to sublimate their own immediate wellbeing for the sake of another (p. 187). This statement touches upon reproductive strategies as well as brood care. What are the

theories regarding why brood care evolved in insects? Are the reasons the same in mammals (including humans)?