The Nearest Gnat: The Simple Foundations of Molecular Biology

The title of Jonathan Weiner’s book *Time, Love, Memory: A Great Biologist and His Quest for the Origin of Behavior* might lead you to think that it is all about great issues of human life and romance and how these are controlled by our genes. So you might be surprised, and a bit disappointed, to find yourself reading a lot about fruit flies and their attraction to light. Great issues of human behavior do come up in this book, but this is a book about how molecular biologists come at these issues. Weiner’s book provides great insights into how scientists think and work. One important theme in Weiner’s book is how much scientists can learn about large, complex organisms like human beings by studying tiny, simple organisms like peas, bacteria-eating viruses, and fruit flies.

Genetics started with something even smaller and simpler than fruit flies: peas. While crossing peas in his monastery garden in the 1850s, Gregor Mendel “got a clearer view of the patterns of inheritance than anybody before him” (Weiner 20). The reason he was able to learn so much from peas is that in peas traits stayed intact from one generation to another rather than blending: “the patterns stayed crisp and clear” (Weiner 20). This suggested to Mendel that inheritance comes in something self-contained, “like the Greek idea of atoms” (Weiner 20). It took awhile for scientists to arrive at the idea of genes, and even longer for them to be able to examine them as physical entities. But Mendel’s simple little peas were a very important first step.
Another simple organism used in the study of genetics is Bacteriophage ("phage" for short), a bacteria-eating virus. Phage attracted the interest of the great Max Delbruck, an ex-physicist who won a Nobel Prize for his contributions to molecular biology. According to Weiner, Delbrück loved working with phage because “with phage and E. coli he could reduce the phenomena of inheritance to the kind of deep, clean, simple problem that he loved in physics” (39). Delbruck found that he could study behavior differences in different strains of phage even though he couldn’t see them because they left such clear evidence of their behavior. This helped move the science of genetics closer to the day when scientists could “[investigate] the behavior of copulating chromosomes at a level beyond reach of the microscope” (Weiner 40).

Fruit flies have been the hands-down champion subjects of molecular biologists studying genes, however. Weiner explains that this is because they are a perfect happy medium between being simple enough to study and complex enough to tell us about ourselves:

An E. coli bacterium is a single cell. In a sense, [Benzer] could think of it as a nervous system with a single neuron. At birth, a human baby has about one hundred billion neurons, one for every star in the Milky Way. A fruit fly has about one hundred thousand neurons, so it is the geometric mean between the simplest and the most complicated nervous system we know. (9)

Weiner’s paragraph goes on with further figures to prove how perfectly situated the fruit fly is between the simple and the complex. This helps us to understand how, from the first published paper on fruit flies in 1905 we have come to the point where there is a Fly Room in practically every university and research institute in the country.

The fruit fly fits right into a rule of scientific practice that Weiner calls Occam’s Castle: “Faced with several competing places to build a new science, prefer the simplest one” (68). That you can go from this simple foundation up into the most complex behavior is more for Weiner than just an interesting fact. He goes so far as to call it “a parable of the unity of life” (15). As one reads on in his book and meets mutant flies like period, fruitless, and stuck, each exhibiting behaviors that have clear counterparts in
humans, we can see why Weiner begins his first chapter with a wonderful line from Walt Whitman’s “Song of Myself”: “The nearest gnat is an explanation.”

Works Cited