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Author: McGavin, George C.

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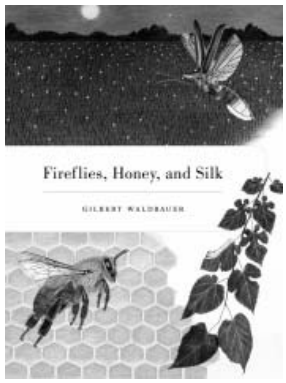
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BUG WORLD: MYTHS AND MARVELS

I am always rather puzzled as to why big animals seem to hog the limelight in the press and in the popular imagination. Last year I returned from a forest expedition in and around Mount Bosavi, an extinct volcano in the Southern Highland Province of Papua New Guinea. It is hard to estimate how many of the insects and spiders we collected will be new species, but our group discovered at least 16 new species of frogs; 2 new species of lizards; 3 new species of fish; and one undescribed, endemic woolly giant rat. Needless to say, it was the rat that caused quite a stir; on my return, the media were lining up to ask about it. (It is hard to maintain excitement during the last of 15 back-to-back radio interviews, when the only creature anyone wants to hear about is furry and the size of a large domestic cat.) No interest in the wondrous jumping spiders, the weird beetles, or the funky flies we had gathered. All right, if pushed, I have to agree that the woolly giant rat was a pretty impressive beast and quite tame, having never seen human beings before, but what really excited me were the smaller creatures we encountered.

In the past few centuries we have described around 1.5 million species of living organisms, and the vast majority of them have been arthropods such as insects. By comparison, vertebrate species—everything from aardvarks to zebras—make up just less than 3 percent of all known species. The "furries and featheries," as I like to call them, are simply outperformed. As herbivores, they are altogether outmunched by the myriad herbivorous insects; as predators, they fail to impress at any level. Ants are the major carnivores on the planet in almost any habitat. This is not to say you should not have a healthy respect for large things with sharp teeth, but the chances of dying from some insect-borne disease are several orders of magnitude higher than being devoured by a tiger. On the subject of pollination, sure, a few bats do the business for some plants, but the bottom line is: We need bees much more than they need us. In fact, if we are to continue to feed our burgeoning population, we need them more now than ever before.

Many modern humans lead lives somewhat divorced from the natural world, ignoring the contribution of



insects at their own peril. In *Fireflies, Honey, and Silk*, Gilbert Waldbauer, retired professor of entomology from the University of Illinois at Urbana-Champaign, shows us what insects have done and continue to do for us. I was impressed not only by the scope of this book but also by its wealth of historical detail and interpretation—perspectives that come only after a lifetime of immersion in a subject. Waldbauer takes the reader on a fascinating journey and reveals how the lives of insects are woven inextricably with our own. Unless you are reading this review online, the forebears of the paper and ink you are holding owe much to social wasps and gall wasps, respectively. Insect eating often raises eyebrows in the industrialized nations of the world, but we forget that our ancestors ate vast quantities of bugs, and for many people living today, entomophagy is a vital source of food. (I would suggest that we start rearing insects for protein in the future. It makes a lot more sense than rearing cattle—a rather energetically wasteful exercise.) Waldbauer retells the tale of the femme fatale of the insect world—the firefly; when she is hungry, she mimics the irresistible signal of another firefly species. The males fly in for love and end up as lunch. Like a child listening to a favorite story, I never tire of hearing it. He devotes further chapters to honey and silk (a.k.a. bee vomit and caterpillar spittle). I've just had an idea to rewrite *Fireflies, Honey, and Silk* for a teenage audience—I'd call it "Sex, Vomit, and Spittle."

It is hard to imagine life without the World Wide Web, but one of its downsides is the ease with which rumors and myths can be perpetuated—a little knowledge can be a dangerous thing. I have come across many false facts concerning insects and spiders, and in my time teaching at Oxford University, some even made their way into undergraduate essays. On a research trip safari to East Africa one year, I visited one of the many little "mhuri" stalls that make rubber stamps for all occasions, and ordered one with which I could mark offending passages. (I will not divulge what it said, but suffice it to say it left students in no doubt that they had strayed into the realm of fantasy.) Today I could simply refer them to May Berenbaum's excellent volume, *The Earwig's Tail: A Modern Bestiary of Multi-legged Legends.*

Berenbaum, also from the Department of Entomology at the University of Illinois at Urbana-Champaign, has selected a number of the more egregious stories that abound and takes them apart with surgical precision and a wry sense of humor. She goes from that hoary old chestnut—now deeply ingrained in popular mythology—that according to the laws of physics, bumblebees should not be able to fly, to Iraqi camel spiders that leap onto camels' undersides to suck their blood and deposit eggs. These spiders also apparently scream loudly and move at prodigious speeds. (I suspect this last bit may have more to do with the behavior of weary service members who, as well as having to endure the arid conditions of the Middle East and the constant threat of improvised explosive devices, also have to contend with supposedly malicious arachnids. People do like to scare themselves—I suppose this is why the horror genre is so popular.)

Then there is the story about earwigs and their love of crawling into human

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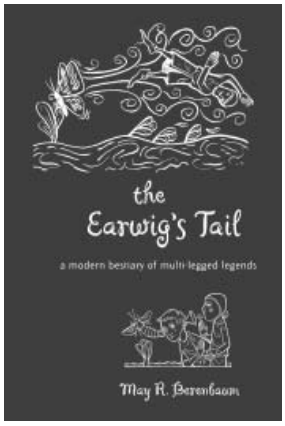
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ears with benign or malign intent. When I recently filmed a short item for British television on earwigs, I did some street interviews and was surprised at how many people expressed a strong revulsion for these innocuous insects for fear that they might crawl into their ears. Beliefs like this self-replicating yarn go back a long way. Indeed, according to Berenbaum, this one may have started with Pliny the Elder, the first-century polymath who advised if an earwig got into your ear, you should spit in it (easier to get someone else to spit into your ear, surely?) and "it will come forth anon."

Waldbauer also deals with the earwig issue, but points out that the association between ears and dermapterans may have more to do with the medieval Doctrine of Signatures, in which the shape or structure of an organism was thought to have been a clue, given by the creator, as to its use or benefit to us. The hind wing of the earwig is vaguely ear-shaped and therefore it was pretty obvious that a preparation using crushed earwigs would have some efficacy in treating aural complaints. If only things were that simple.

One misconception that drives me absolutely nuts is the one concerning the size of insects and the amazing things they could do if they were bigger. Stories of grasshoppers the size of small dogs, monstrous ants intent on world domination, and the like are common in B movies and science fiction. Even in popular natural history books and television programs you can find misguided attempts to compare the feats of small creatures like insects with the things that much larger animals do. A typical example of this is what I call "the flea fallacy." We all know that a cat flea is an excellent high-jumper, but how many times have you heard something along the following lines? "Did you know, if a flea was a foot long it could jump over the Eiffel Tower/St. Paul's Cathedral/the Brooklyn Bridge?" Well, no, it couldn't, and there are very good reasons why it couldn't. You simply cannot scale things up in that manner; that is, unless you want to rewrite the laws of physics.

On Earth, your size has quite an effect on what you can do. Small species have a relatively large surface area for a relatively small volume, whereas large species have the opposite—a small surface area relative to their large volume. It's the reason flies can land upside-down on ceilings and pond skaters can skim on the surface of water—and also why elephants don't jump. What fleas have in common with most small jumping species is their ability to store energy before they jump and to release this stored energy very rapidly, thereby producing high mechanical power over a very short time. This allows them to accelerate in under a thousandth of a second to a speed of more than one meter (m) per second. Even so, their jump has a range of 100 to 200 millimeters (mm), which is far shorter than the jump of a 200-mm-long lesser galago (a relative of bush babies), which can achieve a standing high jump of about 2 m. The energy is stored in a couple of rubbery pads at the base of its hind legs. The use of stored energy is just like the firing of an arrow from a bow (the energy-storage device), allowing these very small insects to jump about 45 times their body length. Larger animals, although they can jump much farther, can only jump a few times their body length. Even with its springy pads, a fist-sized or larger flea would be pretty unimpressive.



Brandishing her sword of truth, Berenbaum cuts a swath through a number of ludicrous legends and at the same time enlightens us on the real biology and behavior of these creatures, as well as the origins of the bizarre stories that surround them. And fact is generally stranger than fiction. There is one fly in the ointment, though—the people who perpetuate these silly stories will probably never read this book!

Fireflies, Honey, and Silk and *The Earwig's Tail* are equally accessible in their writing style and ideal to dip in and out of during lunch breaks or the daily commute. Having read several previous books by both authors, I now wonder if there is something in the air or water in Illinois that produces such good science communicators and first-rate ambassadors for bugs. Waldbauer and Berenbaum are truly passionate about their subject and communicate this with great authority and ease. I much enjoyed reading these two books because they reminded me why insects are endlessly fascinating, and why I got into them in the first place.

GEORGE C. McGAVIN
George C. McGavin (george.mcgavin@oum.ox.ac.uk) is an honorary research associate with the Oxford University Museum of Natural History in the United Kingdom.

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