Lousy Designs

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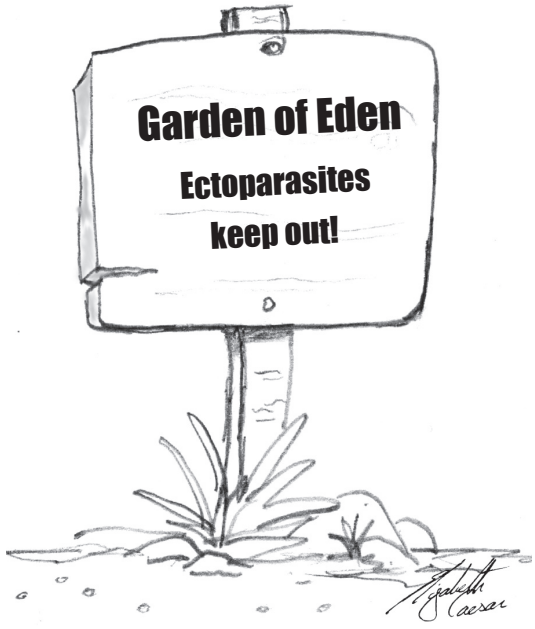

Of my many character flaws, I'm probably least proud of my reluctance to risk physical injury to defend a principle. Unfortunately, it has been my limited experience that the need to defend a principle arises only when the adversary is large, male, and tattooed. For example, to my shame, I once failed to speak up against anti-Semitism. A few years ago, at a garage sale in my own driveway, a potential customer (large, male, and tattooed) said, evidently in an effort to reassure me, "I won't try to Jew you down on the price," apparently utterly unaware that he was speaking to an actual Jew. This was, for the record, a garage sale where all of the items, including a stationary bicycle and a working television set, were priced at one dollar.

Also to my shame, I failed on one occasion to speak up in defense of evolution. On my way to visit my parents in Summit, N.J., several years ago, I picked up a cab at Union Station in Newark; the talkative driver (large, male, and tattooed), upon learning that I was a entomologist (which he knew to be some kind of scientist), launched into an incoherent rant about evolution and monkeys that lasted for most of the 30-minute ride. The main reason I didn't interrupt him to counter his argument, such as it was, was that I didn't relish the idea of being unceremoniously ejected in one of Newark's rougher neighborhoods, where the probability of encountering even more large male tattooed individuals would be quite high.

What makes this failure all the more disappointing is that American entomologists in particular have been speaking up in defense of evolution since Charles Darwin's *Origin of Species* hit the bookstores in 1859. Benjamin Walsh, first State Entomologist of my home state of Illinois, was in fact so passionate in his defense of the idea that he was called "Darwin's Little Bulldog," in direct reference to Thomas Huxley's status as principal defender and more conspicuous advocate (Sheppard 2004).

Darwin himself was enamored of insects. As a student in Cambridge, he happily engaged in a friendly competition with fellow student Charles "Beetles" Babbington to see who could find and identify more new species (http://www.literature.org/authors/darwin-charles/the-origin-of-species/chapter-06.html); he once wrote to a cousin, "it is quite absurd how interested I am getting about the science" of entomology. Darwin's enthusiasm for collecting beetles is legendary. According to his autobiography (Darwin 1876), this passion led him to at least one unforgettable experience almost half a century earlier:

> I will give a proof of my zeal: One day on tearing off some old bark, I saw two rare beetles and seized one in each hand; then I saw a third and new kind, which I could not bear to lose, so that I popped the one which I held in my right hand into my mouth. Alas it ejected some intensely acrid fluid, which burnt my tongue so that I was forced to spit the beetle out, which was lost, as well as the third one.

Likely, the beetle that Darwin spit out was a bombardier beetle, any one of many species of carabid ground beetles in a variety of tribes capable of expelling acrid secretions from abdominal defense glands, often with great force and at high temperatures (Eisner et al. 2006). Apparently, this passage is all Darwin ever wrote on bombardier beetles, despite having thought about them for close to 50 years.

Ironically, however, although Darwin had no problem with them (other than a lingering painful memory), many proponents of intelligent design have trouble accepting evolutionary explanations of the glandular defense of bombardier beetles. These beetles appear on a variety of intelligent design web pages and have been featured in creationist films and videos. The problem evidently, is the perception that the system is "irreducibly complex"—that without all of the components of the defensive secretion in place, the bombardier runs the risk of blowing off its posterior. Witness this text from The Reading Room at Associate.com, an on-line sort of clearinghouse for Christian discussion groups:

> But what would be the motivation for such disatrous [*sic*], trail [*sic*] and error, piecemeal evolution? Everything in evolution is supposed to make perfect sense and have a logical purpose, or else it would never develop. But such a process does not make any sense at all, and to proppose [*sic*] that the entire system evolved all at once is astronomically improbable, if not impossible. Yet, nature abounds with countless such examples of perfect cooridnation [*sic*]. We can only conclude that the surprising little bombardier beetle is a strong witness for special creation, for there is no other rational explanation for such a wonder. (http://www.associate.com/ministry_files/The_Reading_Room/Evolution_n_Creation_2/The_Bombardier_Beetle.shtml)

There is an abundance of creationist literature centered on this group of beetles (including a children's book called *Bomby the Bombardier Beetle* [Rue 1984]) and probably as much literature from evolutionary biologists countering the claim for special creation for this one group of beetles. Much

of the content of the web-based arguments relates to apparent confusion early on over the exact meaning of the term "Explosionschemie" and its implications in the original description of the defense mechanism (Schildknecht and Holoubek 1961, Schildknecht et al. 1968). At issue is how bombardier beetles avoid doing themselves injury while manufacturing and storing highly reactive substances (quinones and enzymes). Despite an abundance of subsequent experimental work on the chemistry, morphology, and systematics of carabid defense secretions (e.g., Aneshansley and Eisner 1969; Eisner et al. 1977, 1989, 2000; Moore 1979; Eisner and Aneshansley 1982; Aneshansley et al. 1983; Dean et al. 1990) published since Duane Gish of the Institute of Creation Research first suggested a divine origin for these secretions (Gish 1977), much of the creationist discussion still focuses on the original 45-year-old paper and its 38-year-old sequel (Schildknecht and Holoubek 1961; Schildknecht et al. 1968).

I think there's extraordinary reluctance on the part of the creationists to let go of this example because the opportunities for metaphorical language are irresistible. Robert Kofahl (1981) e.g., attempts to answer his critics in an essay titled "The Bombardier Beetle Shoots Back.") and Mark Armitage, a lifetime member of the Creation Research Society, and Luke Mullisen (2003) call the bombardier beetle "a hot topic in the creation/evolution debate" (http://www.answersingenesis.org/tj/v17/i1/beetle.asp), although to be honest, I don't know for certain whether the phrase is intended as a pun.

What's especially ironic about the bombardier beetle's role in the forefront of creationism arguments is that, if proponents of intelligent design would actually read *Origin of Species*, they'd realize that other insects gave Darwin far greater concern in terms of explaining away remarkable attributes by invoking natural selection. In the section titled "Difficulties," in which Darwin identifies biological phenomena that defy simple explanation, the word "insect" appears 17 times. Among his "gravest" concerns was the matter of "neuter insects, which are often very differently constructed from either the males or fertile females." As well, "the presence of luminous organs in a few insects, belonging to different families and orders, offers a parallel case of difficulty." He also reflected on seeming imperfections of insect design—

> If our reason leads us to admire with enthusiasm a multitude of inimitable contrivances in nature, this same reason tells us, though we may easily err on both sides, that some other contrivances are less perfect. Can we consider the sting of the wasp or of the bee as perfect, which, when used against many attacking animals, cannot be withdrawn, owing to the backward serratures, and so inevitably causes the death of the insect by tearing out its viscera?

Darwin can't really be taken to task for being stumped by a few entomological peculiarities, given that he wrote this text years before anything was known about concepts of inclusive fitness and altruism, haplodiploid sex determination, or even genes, for that matter. I expect Darwin would have happily embraced these advances in resolving the difficulties he had with the Class Insecta, had they been available at the time. Genetic evidence, however, doesn't carry a lot of weight with contemporary creation scientists faced with six-legged challenges.

As a case in point, there are the conceptual problems presented by human ectoparasites. Darwin didn't write much about human lice; there's no mention, for example, in his autobiography as to whether he was personally acquainted with them. He maintained a lively correspondence with Henry Denny, a systematist, and even sent him a few specimens on occasion. In *The Descent of Man* (1871), he mentioned, in a passage about people with mental infirmities (known in less sensitive times as "idiots"), that, in addition to being "filthy in their habits," "remarkably hairy," and "possessed of no sense of decency," they could be observed using their mouths in addition to their hands "whilst hunting for lice." He also speculated briefly on p. 219 on the evolution of human lice relative to specialization of lice on dogs and other domesticated animals:

> In determining whether the supposed varieties of the same kind of domestic animal should be ranked as such, or as specifically distinct, that is, whether any of them are descended from distinct wild species, every naturalist would lay much stress on the fact of their external parasites being specifically distinct. All the more stress would be laid on this fact, as it would be an exceptional one; for I am informed by Mr. Denny that the most different kinds of dogs, fowls, and pigeons, in England, are infested by the same species of Pediculi or lice. Now Mr. A. Murray has carefully examined the Pediculi collected in different countries from the different races of man (8. 'Transactions of the Royal Society of Edinburgh,' vol. xxii, 1861, p. 567.); and he finds that they differ, not only in colour, but in the structure of their claws and limbs. In every case in which many specimens were obtained the differences were constant. The surgeon of a whaling ship in the Pacific assured me that when the Pediculi, with which some Sandwich Islanders on board swarmed, strayed on to the bodies of the English sailors, they died in the course of three or four days. These Pediculi were darker coloured, and appeared different from those proper to the natives of Chiloe in South America, of which he gave me specimens. These, again, appeared larger and much softer than European lice. Mr. Murray procured four kinds from Africa, namely, from the Negroes of the Eastern and Western coasts, from the Hottentots and Kaffirs; two kinds from the natives of Australia; two from North and two from South America. In these latter cases it may be presumed that the Pediculi came from natives inhabiting different districts. With insects slight structural differences, if constant, are generally esteemed of specific value: and the fact of the races of man being infested by parasites, which appear to be specifically distinct, might fairly be urged as an argument that the races themselves ought to be classed as distinct species.

The taxonomy of human lice has been subject to considerable debate since Mr. Denny and Mr. Darwin speculated on the relationship between humans and their ectoparasites. Among the key issues is whether humans are infested by two species of lice or three; there's one species of *Pthirus, Pthirus pubis*, the crab louse, and then one or two species of *Pediculus*, depending on whether head lice and body lice are two separate species, or whether they represent subspecies of *Pediculus humanus*).

Molecular systematics has provided new insights into this debate (Barker et al. 2002, Yong et al. 2003), but Kittler et al. (2003) took the debate a step further, examining the phylogenetic relationship between head lice and their putative descendants, the body lice, with the aim of determining at what point in time humans began wearing clothes. Because contemporary body lice, which molecular evidence suggests are derived from more ancient head lice (Yong et al. 2003), prefer to reside on clothing rather than, as their name suggests, bodies, these authors figured that their evolutionary origins might coincide with the invention of clothing, a cultural innovation that has puzzled anthropologists for some time (given the relatively poor preservation quality of clothing). According to their evidence, applying the molecular clock concept to estimate the divergence time between these subspecies, these authors pegged the invention of clothing at about 72,000 years ago.

This analysis, not surprisingly, received a lot of press attention (e.g., Weiss 2003. Not in bibliography) and as a consequence also attracted attention from anti-evolution groups. Creationists in general have argued that the parasitic habit, at least in certain groups, arose only after "the Fall" (http://www.icr.org/index.php?module=articlesandaction=viewandID=226), suggesting that

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Adam and Eve must have been parasite-free in the Garden of Eden.

Michael Matthews, in an article titled "Hairless Hokum" posted at AnswersinGenesis, has problems with just about every aspect of Kittler et al. (2003), questioning a long list of assumptions, including, among others, the assumption that chimps and humans are related, that differences in DNA are due to mutation, and that mutational change can be clocked, ultimately dismissing the whole project as "assumption-laden mind games," sharing, with other questionable pseudoscientific enterprises like radiometric dating, "no basis in reality" (http://www.answersingenesis.org/docs2003/0825hairless.asp).

As an alternative scientific explanation, Matthews offers what he called Biblical "eyewitness testimony":

1. Who invented clothing? Adam and Eve sewed together aprons from fig leaves, and then God made coats of animal skin to cover them (3:7; 3:21).

2. When were clothes invented? About six thousand years ago, on the same day that Adam and Eve sinned and lost their innocence (3:6–7).

3. When did lice colonize clothes? After God's Curse (3:17–19).

4. Why were clothes invented? Adam and Eve's sin was not sexual in nature. They were husband and wife, and had been told to procreate before the Fall. But as now-sinful creatures, nakedness had a totally new significance. Sin distorts nakedness and sexuality. In other words, there is ultimately a moral basis for wearing clothes, even in warm climates.

The origin of clothes is only a mystery if one willfully rejects the written record of God's infallible Word. Whenever scientists reach conclusions that contradict the history of the Bible, it's time to start asking questions…about the obviously wrong assumptions behind man's fallible beliefs.

I have to admit, although I was familiar with this text (I think it was my nephew's Torah portion for his Bar Mitzvah), I never realized its entomological implications. Frankly, though, I think as an explanation, it raises more questions than it answers. Matthews referred to the Biblical account as God's "eyewitness testimony" to the colonization of lice by clothing. The phrase used suggests some sort of courtroom proceeding, and the common practice in giving testimony today is to swear on the Bible. If such was the historical practice 6,000 years ago, could God swear on His own Book? Would He swear to tell the whole truth, so help Himself? Maybe I should check with my rabbi on the details—he's large and male, but at least he's not visibly tattooed.

Acknowledgments

Thanks to Gene Kritsky for pointing out Darwin's lice to me and for suggesting insect intelligent design as a subject deserving of attention. No offense was intended to large male tattooed readers of American Entomologist.

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