Thomas Eisner:1929-2011

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<u>An Affectionate Farewell</u>
<u>from the Archbold Biological Station</u>

Tom Eisner, 1993. Photo: Maria Eisner

Each summer here at the Archbold Biological Station we would mark our calendars: on this date Tom and Maria Eisner would appear. Upon their arrival, conversation at meals and coffee breaks would become more expansive and exciting, swooping with verve from wolf spiders to sundew caterpillars to lacewings, from science to art to music and back to science. Returning to our own field studies after such an interlude, it seemed to us that the very arthropods were strutting their stuff and inspired, like actors when a renowned director enters the room. That, of course, was an illusion. The insects and spiders were behaving exactly as they had for hundreds of thousands of years. What had changed was that we were momentarily seeing the world through Tom's eyes. For a few minutes we had a notion of what it would be like to be a brilliant observer with an intuitive feel for the challenges faced by arthropods, a genius for definitive experiment and an uninhibited vision of the wider implications of every discovery. Then we went back to counting ant colonies in a particular habitat, or whatever else we were doing that day.

Tom wrote hundreds of papers that had their origins in field observations. Natural ecosystems offer a huge variety of subjects, of which Tom happily accepted a generous selection. This is why his papers and those of his students and collaborators range so exuberantly over the natural world. Moreover, field studies, even when tightly focused, often provide more than one discovery. To take a local example, at one point Tom was exploring the reactions of web-building spiders to chemically defended insects. One of these spiders is most common in swamp forest, so Tom and Maria went to Highlands Hammock State Park, where they got permission to gently lob chemically defended squash bugs into a succession of spider webs. Somewhat surprisingly, each spider rushed down and quickly tied up the squash bug (which had surrounded itself with an obnoxious chemical mist), administered a venomous bite to one of the bug's legs, and retired to another part of the web to wait for the defensive spray to dissipate. Tom and Maria were patiently timing the length of time that it took each spider to return and begin feeding on its victim, so they were present when a batch of tiny flies appeared and started to slurp up the soup of partially digested bug tissue that oozed out around the fangs of each dining spider. Later experiments showed that the flies are attracted to the chemical defenses of dying squash bugs. I am still amazed by this. Nobody would have predicted such a thing, that the drooling juices of squash bugs in spider webs constitute such a significant resource that several species of flies have evolved mechanisms to detect the dying emanations of these bugs.

This kind of story helps explain why Tom and his lab were so amazingly productive, and helps explain the off-the-charts coolness index of their research. It does not quite explain why Tom has often been called "the father of chemical ecology," a name that he would customarily

toss back to the arthropods as his favorite actual practitioners of chemical ecology. In spite of his cheerful evasions, Tom does deserve the title. Examples of chemical communication and chemical defenses have been known for a long time, but Tom was the first to realize the pervasiveness of these phenomena. At a time when biomedical research was just beginning to show that the inner, physiological world was seething with chemical activators and inhibitors, Tom had a revelation that the outer, ecological world was in a similar state. Just as important, he recognized that the chemicals of defense and communication are invisible traits that are subject to natural selection, just like morphological features. Like morphological features, adaptive chemicals can diverge or converge among groups of organisms, they can develop elaborate extravagances, or they can remain stubbornly conservative. There are also chemical rules at play here, dealing with such things as volatility, general reactivity, specificity, storage characteristics and the cost of manufacture. Chemical ecology is closely linked to the formal sciences of behavior and genetics, but it is even more strongly bound to natural history, the study of an organism's way of life. It was Tom's background in natural history, combined with his understanding of chemistry and evolution that brought him to chemical ecology.

Tom did not go about the enterprise of chemical ecology alone, he benefitted from his association with many gifted students and colleagues, some of whom have continued to visit the Archbold Biological Station. Jerrold Meinwald, in particular, was Tom's partner in chemical ecology for decades, tirelessly analyzing samples sent up to Cornell and discovering new compounds, many of which were milked from arthropods collected here at the Archbold Biological Station. Maria became expert in electron microscopy, editing, and preparation of illustrations for manuscripts, but that was up at Cornell; here at Archbold she was notable for her talent in capturing and cajoling arthropods, getting them to perform spontaneously under the looming lens of Tom's camera.

We are each of us born with our own special gifts, but we each eventually have a special price to pay. Uniquely attuned to the inexhaustible potential of the natural world, Tom was also uniquely sensitive to its destruction. In the realm of metaphysical chemistry he made himself adept at transmuting pessimism into activism. Early in his career Tom decided that he would work for biological conservation at every opportunity. He cited each discovery as further evidence that the natural world should be protected for practical, scientific reasons. He was completely aware of social, ethical and aesthetic justifications for the conservation of biodiversity, but his special contribution was in detailing the importance and untapped promise of the astonishing diversity of chemical products that are a correlate of biodiversity. I believe that continuing to stress the connections between science and biodiversity conservation is the best tribute, perhaps the only tribute that Tom would have requested.

Here at the Archbold Biological Station we saw Tom and Maria as they interacted with the natural habitats that are preserved and managed on the Station. We saw little of Tom's academic life back at Cornell, or of his evidently active social life that often seemed to be centered about music. We saw him at a field station, where his goal was to immerse himself in field biology. In fact, that is what he is telling me right now. "Close out that document! Grab your insect net and vials! Let's get out there!"

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