aise insect trap, from obscurity. In the latter volumes he does the same for the landscape painter Gunnar Widforss, and Gustaf Eisen, a polymathic horticulturist, art historian and taxonomist of earthworms.

The marginality of these figures is part of the point. "I felt quite sure", Sjöberg writes of Widforss in an early chapter, "that, as ever, I'd of the Grand Canyon; he died, aged fifty-five, at the canyon's South Rim, and despite retaining some reputation in America, "in Sweden even the most discerning connoisseurs have question marks written all over their faces when you mention his name".

Gustaf Eisen was born in 1847 and lived to ninety-three. As a young man he published a was a long-time friend of August Strindberg; the two had studied together at Uppsala University. In later life, Eisen played a decisive role in the creation of the Sequoia National Park, became an expert on glass beads and their use in archaeological dating, and wrote a richly illustrated, two-volume work entitled *The Great Chalice of Antioch*, in which he tinction. "As a collector of flies," he explains, "I quickly learned to stand motionless and wait, net at the ready, for weeks if need be." The same applies to assembling the material for his books. "I quickly remembered the significance of simply sitting still and waiting, for stories or for whatever. Sooner or later everything seems to be part of the same puzzle."

Buzz words

On tarantula hawks and other insects

FARNON ELLWOOD

Justin O. Schmidt

THE STING OF THE WILD
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The Sting of the Wild is a delicate and highly refreshing glimpse into the private mind of a professional scientist. Justin Schmidt sprinkles the study of stinging insect biology with just the right amount of evolutionary theory – because, as Theodosius Dobzhansky said, nothing in biology makes sense except in the light of evolution. Bullet ants, which deliver the most painful sting of any insect on earth, make you think you've been shot. Schmidt was stung on the face – and it is fair to say that those of us who love insects do tend to push our luck more than those working on, say, lions and tigers and bears. Working with wild – albeit rather small – animals makes us prone to those unfortunate, often embarrassing occasions where, as Schmidt recalls, we need ice and beer, although not necessarily in that order.

The adaptive use of suicide through self-evisceration (when the stinger, attached to the insect's vital organs, is left embedded in the target's flesh) is something that had already puzzled Darwin. Even though he was not aware of genes, much less DNA, Darwin essentially came up with the right answer, concluding that social animals promote their species by helping their close relatives reproduce. As for solitary (non-social) insects, whose sting is not only for personal protection but also for hunting, the theory predicts that the sting must be particularly powerful. Wasps known as tarantula hawks lay their eggs on paralysed tarantulas; once the eggs hatch, the young wasps drink the bodily fluids of the living spider, sucking it dry. Do tarantula hawks have powerful stings, as predicted? Schmidt is able to report that the pain is so excruciating that those stung run the risk of further injury as they thrash around in agony.

Conversely, nothing in evolution makes sense except in the light of biology, and Schmidt is excellent at explaining the biological underpinnings of some fascinating behavioural phenomena. The sting of the tarantula hawkmoth, for example, is debilitating, but never fatal. Tarantula hawkmoths have evolved the perfect venom for paralysing an animal far larger than themselves, keeping the tarantula alive but incapacitated for the wasp's young to consume. The symbiosis between humans and honey bees is complex: they provide us with honey, but they are also liable to sting us. The relationship goes back millions of years to our hominid ancestors, in fact even to chimpanzees and other primates. Honey bees are social insects, but life in the hive is far from friendly: there is a constant battle between the sexes, physical aggression, daily threats from outside, the need to maintain the delicate balance between offensive and defensive behaviour, and the ever-present problems of overcrowding.

While pondering the parallels between social insects and ourselves, however, we would do well to contemplate just how fundamental stinging insects are to our continued existence. Take wasps, for example. The term "wasp" describes thousands of species within the order Hymenoptera, including the parasitic wasps such as ichneumonids and braconids, hunting wasps like mud daubers, digger wasps and pollinators like the fig wasp. Insects generally play major roles in making the world's ecosystems function, and wasps in particular provide extraordinarily important ecological services including pollination, decomposition, predation and parasitism. Fig wasps pollinate figs. Some wasps scavenge dead insects to feed their offspring, thereby acting as nature's recyclers. A very recent study has shown that *Polybia paulista*, a species of eusocial wasp that lives in Brazil, contains a special kind of venom that destroys cancer cells in a matter of seconds without harming healthy cells. The wasp's venom contains a molecule that interferes with the lipid membranes of cancerous cells, allowing their contents to spill out. Therapies that work in this way would represent an entirely new class of anti-cancer drugs.

With the combined threats of climate change and habitat destruction clouding the horizon for the world's species, biodiversity loss is a major issue. The planet's spectacular insect diversity will suffer the most during the current mass extinction crisis. But a species is nothing more than a collection of reproducing individuals, and it is easy to forget that, when discussing species in a rather sterile and detached way, we are essentially discussing the plight of millions of individual animals, each of whom deserves to live. Stinging insects nurture our respect – if not love – for the individual animal; nothing focuses the mind like a wasp at the picnic. Next time, why not share a little? As Schmidt says, "biology is the economics and energy of life", but a great tragedy of our time is the extent to which we are short-changing our wild neighbours. *The Sting of the Wild* sets out its intention to share a love of the natural world, and the beauty of all forms of life. I can think of no greater, more urgent, and worthier cause than that.