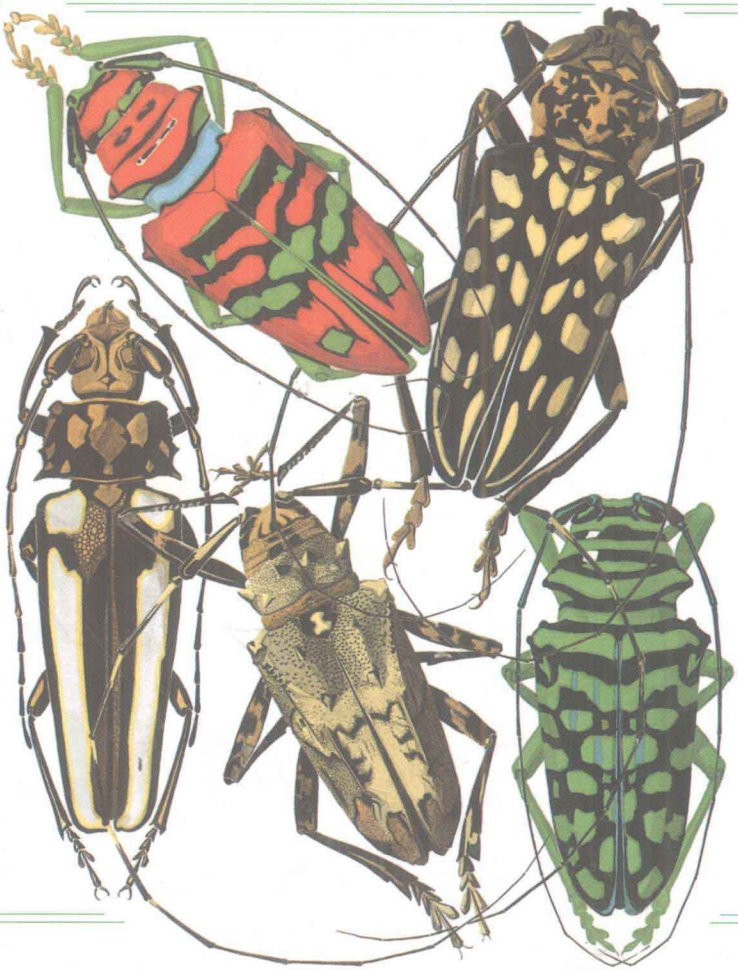
EDITED BY

ERICH HOYT & TED SCHULTZ

INSECT LIVES



stories of mystery and romance
from a hidden world

INSECT LIVES

Stories of Mystery and Romance from a Hidden World

Edited by

Erich Hoyt and Ted Schultz

Harvard University Press

Cambridge, Massachusetts

For my father, Robert Emmet Hoyt,
and my mother, Betty Shutrump Hoyt,
with love and admiration.

For my father, Robert A. Schultz,
and my mother, Reiko June Schultz,
with thanks for putting up with all the insects,
amphibians, reptiles, and rodents.

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Editors' Note

The selections herein are, for the most part, presented exactly as written and published. In a few cases, we have made some concessions on behalf of readability, removing a few references in the scientific papers or adding a word or two of explanation in brackets. However, to retain a sense of authenticity, we have kept all the original spellings, grammar, and punctuation, even if peculiar to one era or another, entirely intact.

Contents

Introduction

Alien creatures have overrun planet Earth. They wear their skeletons on the outside, bite sideways, smell with antennae, taste with their feet, and breathe through holes in the sides of their bodies. Their eyes are placid, unmoving orbs; when we humans look into them, we experience neither recognition nor empathy. They are the insects.

From a human point of view, insects are aliens, denizens of another world, shadow opposites with whom we share planet Earth. But, by nearly any objective measure, it is really we who are the aliens and they who are the Earth natives. Insects have been here for 400 million years; we have been here for 1 million. They occupy nearly every nook and cranny of the terrestrial environment and number anywhere from 5 million to 30 million species: nobody really knows. We and all our large and lumbering terrestrial vertebrate kin together constitute no more than 24,000 species.

Insects are arguably as complicated as humans and yet as different from humans as any complex animal that we know. If we trace the chain of species leading to humans backward in time, and if we do the same for insects, the two separate lineages do not converge until the early Cambrian, more than 500 million years ago. The common ancestor is unknown, but it is thought to have been something like a simple flatworm. From this humble beginning two mighty stocks went their separate ways, evolving down different tracks, solving life's problems in radically different ways. They still do.

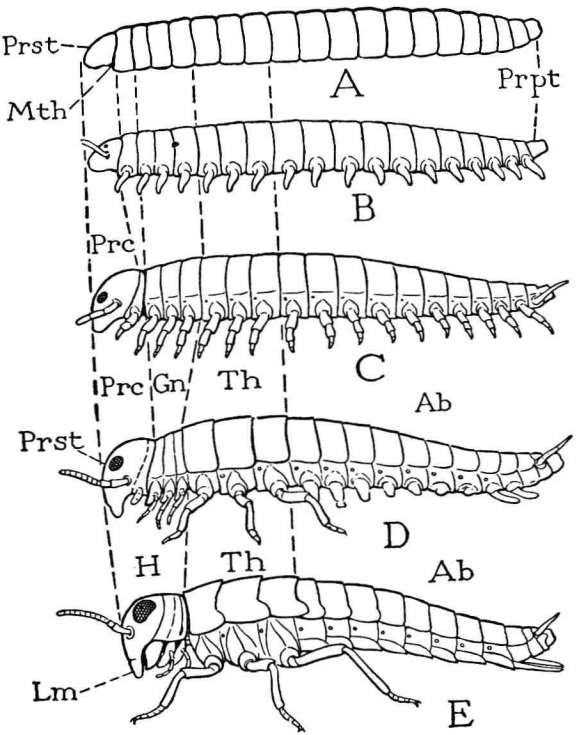
The list of differences between insects and humans—indeed, between insects and all vertebrates—is worth considering, for these differences represent alternate body plans that achieve the same goals. Insect jaws open and shut horizontally; their heart is a tube running the length of their bodies. With their skeletons on the outside, insects have the appearance, at least in the eyes of those who appreciate them, of intricate, miniature sculptures, sometimes more baroque than our wildest human imaginings. In contrast, our soft and squishy flesh hangs from internal skeletons. Insects smell (that is, they sample airborne molecules) with antennae, structures for which we do not even possess an analogue. With two antennae, spaced apart, insects have the olfactory equivalent of our three-dimensional sight and hearing (both of which they also have); some species can home in on faint odors

from miles away, sensing and responding to single molecules of substance. In contrast, we snort volumes of atmosphere up hairy nostrils and miss most of it with our crude olfactory sense. Most of the time we don't even stop to smell the flowers. Insect vision is modeled along completely different lines from that of humans. Their eyes are spheres composed of thousands of separate facets, each with its own set of lenses and light and color detectors. Truly a redundant system! And insects hear through ears in their legs, or their chests, or their sides, depending on the species.

In short, they're different. But that difference makes the similarities between humans and insects all the more uncanny. It is especially among the social insects—for example, termites, ants, bees, and wasps—that we find the most astonishing parallels with humans. They live in large, organized societies, practice agriculture, keep pets and cattle, sacrifice themselves for the good of the colony, stage tournaments and all-out wars, enslave one another, take drugs, and communicate with symbolic language. These surprising parallels with humans have made the social insects among the most admired and studied of all insects from ancient times to the present.

In this book, we offer a sweeping tour of the human fascination with insects—the diabolical as well as the divine—from the Bible and Aristotle to Darwin and the great nineteenth-century naturalists sending accounts from the rain forest. Some of the finest nature and science writers have been entomologists—scientists who study insects—but much of their writing has been underappreciated. We have selected contemporary works from scientists who write well such as E. O. Wilson, May Berenbaum, and Tom Eisner. Human fascination with insects has hardly been limited to scientists, and *Insect Lives* also includes excerpts from a horror film screenplay, the product notes for Mexican jumping beans (actually moth larvae), the odd Hunkin and *Far Side* cartoon, and dozens of rare and beautiful insect illustrations.

Once we started to look for good writing on insects, we found it everywhere and in the most unusual places. The final selections used in the book were chosen and edited from a rather long shortlist. We must interject a brief advisory here: We have not attempted to be representative of all insect orders. With so many orders and such uneven reportage among the diversity of species, that would clearly be an impossible task. In fact, we must confess to a bias toward ants and social insects. Still, we have endeavored to keep our particular passions appropriately reined in. There is enough great ant and bee writing to make a large anthology in itself; we were forced to exclude treasured passages. At the other extreme, we have occasionally strayed from insects to other arthropods—that is, to eight- or ten-legged creatures—but again, not in a truly representative way. Therefore, what you



From worm to insect. A famous 1935 drawing depicting the evolution of insects from a hypothetical earthworm-like ancestor, by the great entomologist Robert Evans Snodgrass. Notice how groups of body segments that are separated in the primitive animal fuse to form the head (H), thorax (Th), and abdomen (Ab). Labels refer to anatomical parts: Prst = prostomium, the primitive head; Mth = mouth; Prpt = peripoct; Prc = protocephalon; Gn = gnathal segments; Lm = labrum (*Principles of Insect Morphology* by Robert Evans Snodgrass, The McGraw-Hill Book Co., New York, 1935).

have here is a somewhat eclectic assortment, arranged along various themes to help bring insects entertainingly to light, and each introduced with a minimum of fanfare and annotation to frame the author, subject, and chosen selection.

Our ultimate goals? To give enlightening pause to the steppers, swatters, and screamers who live in fear or dread of six legs—that would be reason enough. But we also hope that this book will illuminate insect lives in such a way that it transports and frees the curious general reader from the constraints of being human—for at least a mayfly's brief lifetime or two—in suspended appreciation of that other, hidden world beneath our feet and beyond our rolled-up newspapers.

1

Wonders of Creation: Insects Praised

Since the beginning of human history, we have carried on an up-and-down, hot-and-cold relationship with this planet's much more ancient inhabitants, the insects. On the positive side, we have long appreciated the obvious beauty of some insects, for example, butterflies and ladybugs. We have erected gardens devoted to the evening enjoyment of firefly watching, we have caged crickets just to listen to their songs, and we have ornamented our bodies with the metallic elytra, or wing covers, of buprestid beetles. We have worshipped the archetypal image of the scarab beetle and used it and other insects—damselflies, wasps, and katydids among them—as motifs in jewelry, sculpture, and even architecture. We have, since ancient times, entered into alliances with ants to keep pests out of our citrus groves, we have tamed bees for their honey and wax, we have gathered the secretions of scale insects to make shellac, and we have pampered caterpillars for their luxurious silk. In most human cultures, we have even enjoyed insects from a culinary perspective.

In this chapter, we celebrate the biology, aesthetics, and practical, utilitarian value of insects with writings from authors who appreciate insects as objects of extraordinary complexity, elegance, and beauty, and who have tried in one way or another to tell us more about them.

So Great the Excitement

Alfred Russel Wallace

Along with Charles Darwin, Alfred Russel Wallace (1823–1913) was one of the architects of the theory of evolution by natural selection. Wallace spent many years collecting plants and animals in South America and in the islands of the Malay Archipelago, supporting himself by selling specimens to avid natural history buffs back in Britain. (How times have changed!) Wallace's two book-length accounts of his travels are engrossing natural and human histories of a more pristine world. More than anything else, Wallace's enthusiasm for the natural world, and especially for birds, beetles, and butterflies, radiates from every page.

On our way back in the heat of the day I had the good-fortune to capture three specimens of a fine *Ornithoptera,* the largest, the most perfect, and the most beautiful of butterflies. I trembled with excitement as I took the first out of my net and found it to be in perfect condition. The ground color of this superb insect was a rich shining bronzy black, the lower wings delicately grained with white, and bordered by a row of large spots of the most brilliant satiny yellow. The body was marked with shaded spots of white, yellow, and fiery orange, while the head and thorax were intense black. On the under side the lower wings were satiny white, with the marginal spots half black and half yellow. I gazed upon my prize with extreme interest, as I at first thought it was quite a new species. It proved, however, to be a variety of *Ornithoptera remus,* one of the rarest and most remarkable species of this highly esteemed group. I also obtained several other new and pretty butterflies. When we arrived at our lodging-house, being particularly anxious about my insect treasures, I suspended the box from a bamboo on which I could detect no sign of ants, and then began skinning some of my birds. During my work I often glanced at my precious box to see that no intruders had arrived, till after a longer spell of work than usual I looked again, and saw to my horror that a column of small red ants were descending the string and entering the box. They were already busy at work at the bodies of my

treasures, and another half-hour would have seen my whole day's collection destroyed. As it was, I had to take every insect out, clean them thoroughly as well as the box, and then seek for a place of safety for them. As the only effectual one, I begged a plate and a basin from my host, filled the former with water, and standing the latter in it, placed my box on the top, and then felt secure for the night; a few inches of clean water or oil being the only barrier these terrible pests are not able to pass. . . .

I have rarely enjoyed myself more than during my residence here. As I sat taking my coffee at six in the morning, rare birds would often be seen on some tree close by, when I would hastily sally out in my slippers, and perhaps secure a prize I had been seeking after for weeks. The great hornbills of Celebes *(Buceros cassidix)* would often come with loud-flapping wings and perch upon a lofty tree just in front of me; and the black baboon-monkeys *(Cynopithecus nigrescens)* often stared down in astonishment at such an intrusion into their domains; while at night herds of wild pigs roamed about the house, devouring refuse, and obliging us to put away every thing eatable or breakable from our little cooking-house. A few minutes' search on the fallen trees around my house at sunrise and sunset would often produce me more beetles than I would meet with in a day's collecting, and odd moments could be made valuable, which when living in villages or at a distance from the forest are inevitably wasted. Where the sugar-palms were dripping with sap, flies congregated in immense numbers, and it was by spending half an hour at these when I had the time to spare that I obtained the finest and most remarkable collection of this group of insects that I have ever made.

Then what delightful hours I passed wandering up and down the dry river-courses, full of water-holes and rocks and fallen trees, and overshadowed by magnificent vegetation! I soon got to know every hole and rock and stump, and came up to each with cautious step and bated breath to see what treasures it would produce. At one place I would find a little crowd of the rare butterfly *(Tachyris zarinda)*, which would rise up at my approach, and display their vivid orange and cinnabar-red wings, while among them would flutter a few of the fine blue-banded Papilios. Where leafy branches hung over the gully, I might expect to find a grand *Ornithoptera* at rest, and an easy prey. At certain rotten trunks I was sure to get the curious little tiger-beetle *(Therates flavilabris)*. In the denser thickets I would capture the small metallic blue butterflies *(Amblypodia)* sitting on the leaves, as well as some rare and beautiful leaf-beetles of the families Hispidae and Chrysomelidae.

I found that the rotten jack-fruits were very attractive to many beetles, and used to split them partly open and lay them about in the forest near my

house to rot. A morning's search at these often produced me a score of species—Staphylinidae, Nitidulidae, Onthophagi, and minute Carabidae being the most abundant. Now and then the "sagueir" makers brought me a fine rosechafer *(Sternoplus schaumii)* which they found licking up the sweet sap. Almost the only new birds I met with for some time were a handsome ground-thrush *(Pitta celebensis)*, and a beautiful violet-crowned dove *(Ptilonopus celebensis)*, both very similar to birds I had recently obtained at Aru, but of distinct species.

About the latter part of September a heavy shower of rain fell, admonishing us that we might soon expect wet weather, much to the advantage of the baked-up country. I therefore determined to pay a visit to the falls of the Máros River, situated at the point where it issues from the mountains—a spot often visited by travellers, and considered very beautiful. Mr. M. lent me a horse, and I obtained a guide from a neighboring village; and taking one of my men with me, we started at six in the morning, and after a ride of two hours over the flat rice fields skirting the mountains which rose in grand precipices on our left, we reached the river about half-way between Máros and the falls, and thence had a good bridle-road to our destination, which we reached in another hour. The hills had closed in round us as we advanced; and when we reached a ruinous shed which had been erected for the accommodation of visitors, we found ourselves in a flat-bottomed valley about a quarter of a mile wide, bounded by precipitous and often overhanging limestone rocks. So far the ground had been cultivated, but it now became covered with bushes and large scattered trees.

As soon as my scanty baggage had arrived and was duly deposited in the shed, I started off alone for the fall, which was about a quarter of a mile further on. The river is here about twenty yards wide, and issues from a chasm between two vertical walls of limestone over a rounded mass of basaltic rock about forty feet high, forming two curves separated by a slight ledge. The water spreads beautifully over this surface in a thin sheet of foam, which curls and eddies in a succession of concentric cones till it falls into a fine deep pool below. Close to the very edge of the fall a narrow and very rugged path leads to the river above, and thence continues close under the precipice along the water's edge, or sometimes in the water, for a few hundred yards, after which the rocks recede a little, and leave a wooded bank on one side, along which the path is continued, till in about half a mile a second and smaller fall is reached. Here the river seems to issue from a cavern, the rocks having fallen from above so as to block up the channel and bar further progress. The fall itself can only be reached by a path which ascends behind a huge slice of rock which has partly fallen away from the mountain, leaving a space two or three feet wide, but disclosing a dark

chasm descending into the bowels of the mountain, and which, having visited several such, I had no great curiosity to explore.

Crossing the stream a little below the upper fall, the path ascends a steep slope for about five hundred feet, and passing through a gap enters a narrow valley, shut in by walls of rock absolutely perpendicular and of great height. Half a mile further this valley turns abruptly to the right, and becomes a mere rift in the mountain. This extends another half mile, the walls gradually approaching till they are only two feet apart, and the bottom rising steeply to a pass which leads probably into another valley but which I had no time to explore. Returning to where this rift had begun, the main path turns up to the left in a sort of gulley, and reaches a summit over which a fine natural arch of rock passes at a height of about fifty feet. Thence was a steep descent through thick jungle with glimpses of precipices and distant rocky mountains, probably leading into the main river valley again. This was a most tempting region to explore, but there were several reasons why I could go no further. I had no guide, and no permission to enter the Bugis territories, and as the rains might at any time set in, I might be prevented from returning by the flooding of the river. I therefore devoted myself during the short time of my visit to obtaining what knowledge I could of the natural productions of the place.

The narrow chasms produced several fine insects quite new to me, and one new bird, the curious *Phlaegenas tristigmata,* a large ground-pigeon with yellow breast and crown and purple neck. This rugged path is the highway from Máros to the Bugis country beyond the mountains. During the rainy season it is quite impassable, the river filling its bed and rushing between perpendicular cliffs many hundred feet high. Even at the time of my visit it was most precipitous and fatiguing, yet women and children came over it daily, and men carrying heavy loads of palm-sugar of very little value. It was along the path between the lower and the upper falls, and about the margin of the upper pool, that I found most insects. The large semi-transparent butterfly *(Idea tondana)* flew lazily along by dozens, and it was here that I at length obtained an insect which I had hoped but hardly expected to meet with—the magnificent *Papilio androcles,* one of the largest and rarest known swallow-tailed butterflies. During my four days' stay at the falls I was so fortunate as to obtain six good specimens. As this beautiful creature flies, the long white tails flicker like streamers, and when settled on the beach it carries them raised upward, as if to preserve them from injury. It is scarce even here, as I did not see more than a dozen specimens in all, and had to follow many of them up and down the river's bank repeatedly before I succeeded in their capture. When the sun shone hottest about noon, the moist beach of the pool below the upper fall presented a