ARMY ANTS
Inside the Ranks

Larger but outnumbered, an army ant soldier of the species *Eciton burchellii* is corralled by workers of a rival army ant species, *Eciton hamatum*. Their two colonies sparred for an hour in a chance meeting, then retreated without fatalities. These army ants never kill each other, but they handily devour creatures many times their size.

Linking toe to toe, *Eciton burchellii* army ants (left) use their own bodies to form massive nests called bivouacs. The nomadic raiders keep no permanent nests but suspend their bivouac beneath a log or woody overhang (right). *E. burchellii* is one of 150 army ant species in the New World; more than 170 other army ant species thrive in the tropics of Asia, Africa, and Australia.

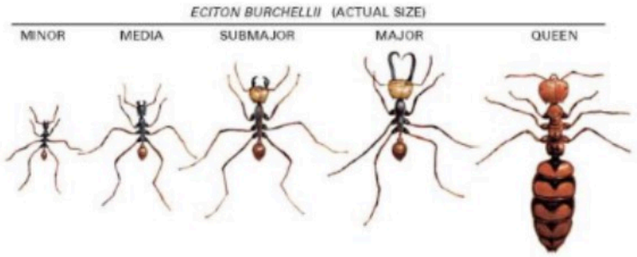
Text and photographs by Mark W. Moffett

NGM MAPS. SOURCE: GORDON C. SNELLING

FORGET LIONS, TIGERS, AND BEARS. Forget even our own famously aggressive species. When it comes to the art of war, it's army ants that will make you break into a cold sweat. Armored tough, with machete jaws, these masterful fighters hack and dice prey vastly larger than themselves by acting in numbers beyond easy comprehension. Imagine hordes of spear-wielding humans at a wooly mammoth's feet. That's the scale of army ant operations when they're attacking a tarantula or scorpion. Army ant colonies succeed at making tens of thousands such kills each day. Folklore to the contrary, their prowess does have limits. Their dragnets don't take down livestock or people (though some African species occasionally live up to that image).

I went to one of the best places to observe army ants in action, Barro Colorado, a six-square-mile island in a lake created by the Panama Canal and home to perhaps 50 colonies of *Eciton burchellii*, the most studied army ant in the world.

The ways of *E. burchellii* helped give rise to the name army ant. Their colonies are huge, ranging from 300,000 to 700,000. They are mobile, moving from nest site to nest site. Though not all army ant species share these characteristics, there's one hallmark they have in common: a shock-and-awe hunting strategy. Other ants search for food individually, sometimes using scouts. Army ants set out en masse. Being blind, they can't see what's ahead of them, but moving in such numbers they easily overwhelm their prey. For *E. burchellii* that's usually non-army ants and large arthropods. They can also kill, but don't eat, lizards, snakes, and frogs that fail to get out of the way. Their attack formation is called a swarm raid. As many as 200,000 ants leave the nest in a swarm that broadens into a fan as wide as 15 yards. Specialized birds follow the raiders, picking off prey as it scatters in vain attempt to survive.

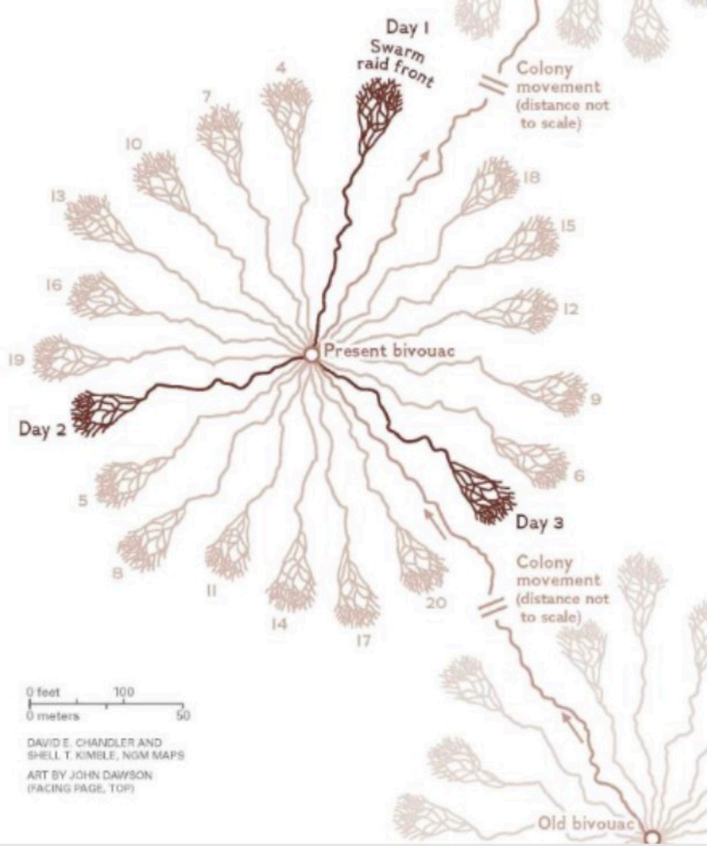


In Her Majesty's Service

Carrying the pupae of the next generation (below), a colony on the move marches the length of a football field every day. *E. burchellii* alternate between nomadic and stationary phases, linked to the colony's reproductive cycle. Four sizes of workers (above) live to nourish and protect the queen (close-up, facing page). The three smallest workers kill and carry the colony's prey and also feed the queen and the larvae. Majors, or soldiers, defend the colony. Workers live only a few months, but the queen survives for several years. Her demise before the birth of a new queen would send the colony into chaos—and doom it.

Camp Cycles

A colony bivouacs at one site for about 20 days as the larvae enter the pupal stage. There the queen lays as many as 300,000 eggs. Raids fan out in a pinwheel pattern that assures the ants cover fresh hunting ground. When new workers emerge from the pupae, and the new eggs hatch into larvae, the colony marches again, with larvae in tow. For the next two to three weeks the ants cover roughly a hundred yards a day, raiding as they go, and bivouacking nightly along the way.



DAVID E. CHANDLER AND SHELL T. KIMBLE, NGM MAPS

ART BY JOHN DAWSON (FACING PAGE, TOP)

Teamwork Delivers the Catch

A fragment of what might have been a centipede, ripped apart during a swarm raid, comes back to the bivouac in the jaws of a submajor; a media worker lifts from behind to keep the end from dragging. The smallest workers, the minors, act as living roadfill, at bottom. Along with some media workers, they hunker down in potholes to smooth the path.

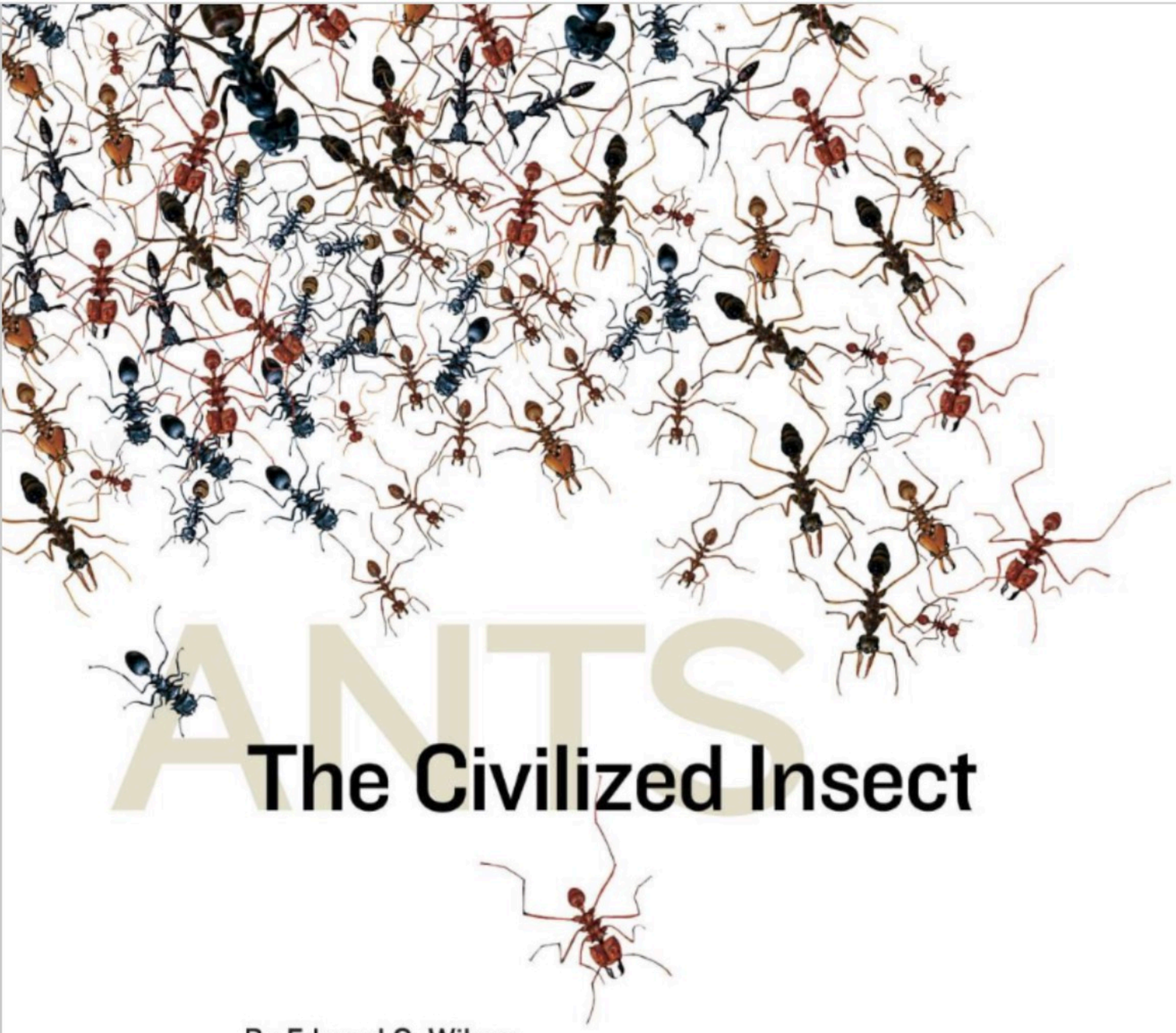
Warrior Caste

Terrorizing any potential enemy is the full-time job of *E. burchellii* soldiers. They don't hunt, they don't clean, they don't tend the young. They can seem clumsy as they patrol the edge of the trail (top left), flaring their oversize jaws. If intimidation tactics don't send foes running, soldiers bite—and the attack is often suicidal. Because the tips of their jaws are bent like a fishhook, with a knife blade along the inner margins (top right), the soldiers can't extract them. Amazonian tribes have used soldier ants to suture wounds, snapping off the bodies and leaving the heads in place. The *E. hamatum* soldier penetrating my thumb (right) also pivots her abdomen to sting, delivering a poison that turns my skin red.

All for One, One for All

Back from the front lines of a swarm raid, a submajor (above) is cleaned of blood-like hemolymph shed by insect prey. Workers on a raid mark the trail with pheromones for others to follow and to find their way back to the colony. Ants returning laden with food use the middle of the trail, forcing unencumbered outbound ants to the sides. Other ant species that use the same trails for days or weeks take time to maintain them, clearing debris and moving soil. Nomadic *E. burchellii* don't have that luxury; each day brings new terrain. Faced with an engineering challenge, like a gap between leaves (left), minors and medias link their bodies to form a living bridge, and the army marches on. □

Swarm Watch video of army ants in action, and send e-greetings at **ngm.com/0608.**



ANTS
The Civilized Insect

By Edward O. Wilson

In Japanese the word "ant" is intricately written by linking two characters: one meaning "insect," the other meaning "loyalty." Altruistic and cooperative toward one another, nestmates readily go to war to preserve their colony. Renowned biologist and lifelong ant observer Edward O. Wilson introduces our new occasional series on these highly social creatures.

ANTS ARE OUR CO-RULERS OF THE LAND. An estimated ten thousand trillion strong worldwide, they weigh very roughly the same as all of humanity. They abound everywhere except on icy mountain peaks and around the Poles. From underground to treetops, they serve as the chief predators of insects and other invertebrates and the principal scavengers of small dead bodies. Although their 12,000 known species compose only about 1.4 percent of the world's insect species, their share of the collective body weight is easily ten times greater.

I was first drawn to these remarkable creatures almost 70 years ago as a boy in Washington, D.C. Inspired by the tales of Frank Buck and other wildlife adventurers, I launched my own expeditions from our family apartment into the "jungles" of Rock Creek Park. Ants especially intrigued me because of an article by William M. Mann in the August 1934 NATIONAL GEOGRAPHIC: "Stalking Ants, Savage and Civilized." Mann was also director of the National Zoo, hence doubly my hero. The myrmecological lineage continued decades later with Mark Moffett, who earned a Ph.D. under my direction at Harvard and whose groundbreaking photography of ants focuses in this issue on army ants.

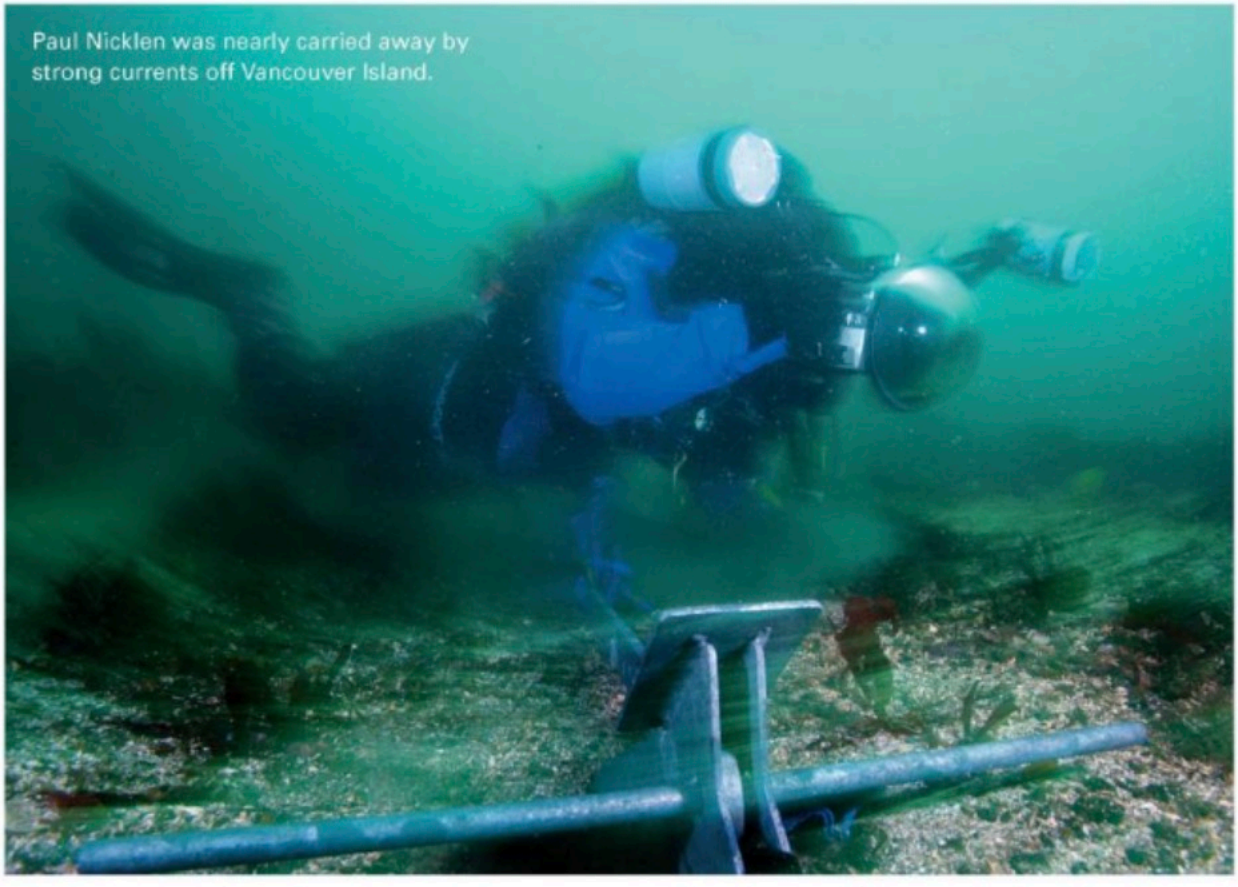
Wilson at 13, looking for bugs in Mobile, Alabama, during the summer of 1942.
ELLIS MACLEOD

Ants are important for more than their ubiquity and environmental impact. They also exhibit social behavior as exotic as any we may ever hope to find on another planet. For most of each year colonies consist only of females: queens that reproduce for the colony and infertile workers that conduct all the labor. Males are bred and kept for short periods, exclusively for the insemination of virgin queens. The communication systems of ants are radically nonhuman. Where we use sound and sight, they depend primarily on pheromones, chemicals secreted by individuals and smelled or tasted by nestmates. Since the brain of an ant weighs less than one-millionth as much as a human brain, it is not surprising that a given species produces just ten to twenty signals. Unlike human language, these messages are entirely instinctual.

These marvelous little creatures have been on Earth for more than 140 million years. The most complex social organizations among them, such as those of the army ants and leafcutter ants, rank with Earth's greatest wildlife spectacles. Ants easily outlasted the dinosaurs, and they will easily outlast humanity should we stumble. □

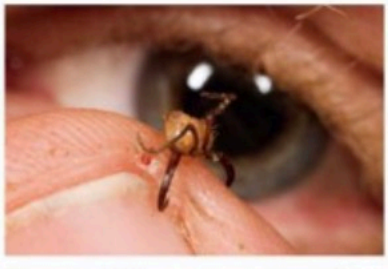
ART BY JOHN DAWSON (FACING PAGE). TEN SPECIES REPRESENTED LIFE-SIZE, FROM SMALLEST TO LARGEST: *OLIGOMYRMEX* SP. (AFRICA, ASIA, AUSTRALIA); *SOLENOPSIS INVICTA* (FIRE ANT, NATIVE TO SOUTH AMERICA); *OECOPHYLLA* SP. (AFRICA, ASIA, AUSTRALIA); *POLYRHACHIS* SP. (AFRICA, ASIA, AUSTRALIA); *CEPHALOTES* SP. (CENTRAL AND SOUTH AMERICA); *DACETON ARMIGERUM* (SOUTH AMERICA); *ATTA* SP. (NORTH AND SOUTH AMERICA); *ODONTOMACHUS* SP. (GLOBAL TROPICS); *MYRMECIA* SP. (AUSTRALIA); *CAMPONOTUS GIGAS* (SOUTHEAST ASIA)

INSIDE GEOGRAPHIC



Paul Nicklen was nearly carried away by strong currents off Vancouver Island.

ON ASSIGNMENT **Anchored Away** "The current was so strong I couldn't control my legs. They were whipping around like pieces of plastic in the wind," says Paul Nicklen, photographer for "Where Currents Collide." The waters off Vancouver Island roared with dangerously fast currents, some of which, he remembers, "could take you straight to the bottom." Nicklen first tried to stabilize himself by sticking one arm in the mud while taking photos with the other. Other times, he clung tenaciously to underwater ledges like a dry-land rock climber. But he knew he needed another way. "I got an idea from how the animals in the story anchor themselves," he says. Nicklen finally took a boat anchor and a rope, and secured himself to the bottom.



The mandibles on an army ant's head grasp Mark Moffett's thumb.

ON ASSIGNMENT **Ant Man** "Ants provide an alien continent to explore," says Mark Moffett. "There is high drama at our feet." He should know: "For three years I was in charge of Harvard's ant collection, which is the biggest in the world." Moffett, who wrote and photographed this issue's story and is working on a book about the insects for the Harvard University Press, observes the creatures with a very special tool—his camera. "For me, a camera is a portable microscope. If the ants happen to do something cool, I press the button," he explains. He also lets them run right over him. "You have to ignore discomfort while taking pictures. Ants can attack in huge numbers, but I don't notice it." He recently received an honor worthy of notice. Eminent biologist—and Moffett's doctoral adviser at Harvard—Edward O. Wilson named a new species of ant for him: *Pheidole moffetti*.

PHOTOS: NATHAN MOLLER (TOP); LESLIE SAUL-GERSHENZ