

# Marauders of the Jungle Floor



ARTICLE AND PHOTOGRAPHS BY MARK W. MOFFETT

**L**AY on the jungle floor, watching a battle more strange and terrible than any fantasy writer's dream. Before me, a two-inch-long centipede was caught in the jaws of death. While little ants fought to pinion the victim, a giant soldier crushed it between powerful mandibles (*left*). The predators, among the most impressive ants I have ever seen, belonged to the species *Pheidologeton diversus*. I call them marauder ants. Along with my wife and assistant, Deborah Fletcher, I had come to the island of Celebes in Indonesia to observe them.

My understanding of the marauder ant had progressed enormously since my initial studies of dried museum specimens at Harvard University, where I am a doctoral candidate. During two years in tropical Asia, I had grown to admire how the multisize worker ants divide the colony's labors, uniting in an intricate foraging strategy.

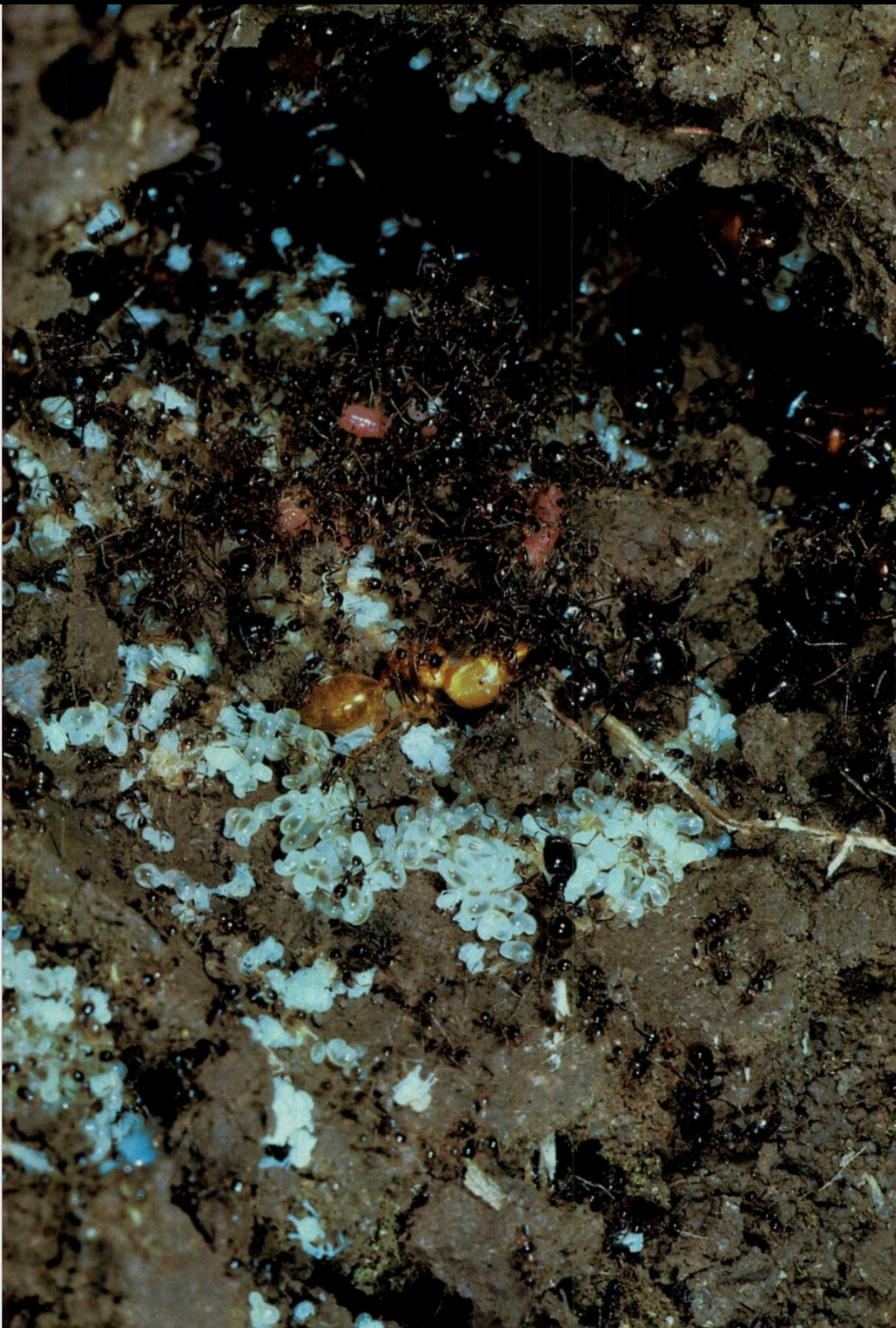
Exhibiting a trait known as polymorphism, the species has evolved with different physical castes, each specializing in its own social tasks. Most of the workers are tiny minors, just over

a tenth of an inch long (*above*). Then there are intermediate-size workers, called medias, and ferocious-looking majors, like the soldier at left, about three-quarters of an inch in length.

Amid the many active minors, the larger ants resemble giant beasts of burden, like elephants parading through hordes of men. Indeed, observing marauder ants along one of their foraging trails is much like visiting an Asian bazaar. One sees the commotion of the ants working on the construction of the trail and the constant rush of all sizes of workers to and from the nest. The returning workers are laden with an astonishing variety of foods in different colors, shapes, and sizes. In some cases minors stand guard at the trail edge, warding off intruders. Studying *Pheidologeton* and other ants in habitats from India to New Guinea has deepened my appreciation of the amazing complexity of ant societies.

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**U**NCOVERING a marauder ant nest in the Philippines, I discovered a seething world of adult workers busily tending the next generation, still in the formative stages of eggs, larvae, and pupae (**left**). Scattered chambers around the core are packed with media and major workers that have their abdomens distended with food. Called repletes, they serve as living

pantries, regurgitating food for other members.

All ant societies are composed entirely of females; males exist only to fertilize the queen and then die. Only the queen (**above**), who may boast a thousand times the body weight of a minor worker, is fertile. All workers

are her daughters. Occasionally she spawns new queens, who fly off to mate and start new colonies. Her wings shed, this hopeful marauder monarch (**below**) attaches her newly laid eggs to her body and protects them by hobbling along with her back section scrunched forward.

The hundreds of thousands of ants in a marauder nest can



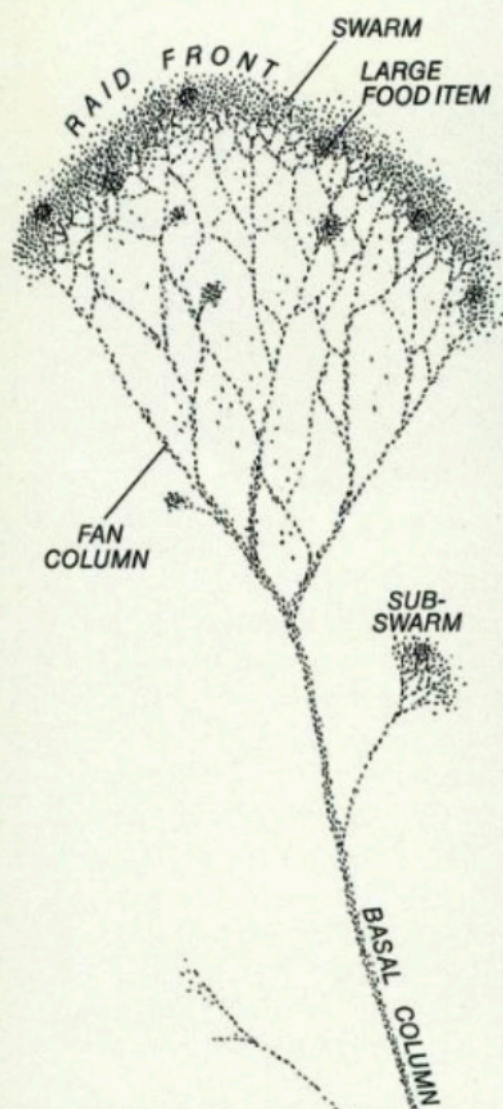
PHEIDOLOGETON SILENUS  
ABOUT EIGHT TIMES LIFE-SIZE



PHEIDOLOGETON DIVERSUS, ABOUT 4 X

make excavating a colony very painful. Though they lack stingers, hundreds of minors biting simultaneously have a considerable effect, and majors can draw blood. Debbie and I learned to tuck our pant legs into our socks (**left**) so that the ants weren't a problem until they swarmed up our clothes to our necks and arms. Every few minutes we ran from the nest to help each other scrape them away.





### Raiding pattern

Miniature highway with ephemeral exits, the marauder ants' trunk trail serves as a vital food artery to the colony's nest. Raiding columns branch out—sometimes expanding to form a fan-shaped network with a broad swarm of ants in the vanguard.



**E**XTENDING from each marauder ant nest, a carefully constructed trunk trail facilitates foraging. Trails often reach an inch across and can even have a soil canopy (*above*). Primary trunk trails may last weeks or even months.

I have seen trunk trails as long as 300 feet, the equivalent of about 30 miles when scaled to the size of a minor worker. Traffic is often very heavy, with several hundred ants passing by each minute; sometimes the number surpasses a thousand. The trail is central to the whole foraging pattern; it is the artery through which all food flows to the nest.

Construction of this highway is a grand-scale

effort, enlisting workers of all sizes. Constant maintenance is required as leaves and twigs falling from above block the passage of food. Media and major workers function like heavy-duty road machinery, dragging away relatively large objects, such as twigs, or knocking them away with upward shoves of their massive heads. Like Indian mahouts riding elephant-back, minors are often seen atop their major sisters, even while they are engaged in road maintenance (*top right*). When an obstruction cannot be moved, it is slowly gnawed away by the bigger workers. Meanwhile the minor workers and small medias carry bits of soil to the sides of the trail, until it has a smooth surface with walls and eventually a roof of soil.



ABOUT 9 X



ABOUT 6 X (ABOVE); ABOUT 7 X (BELOW)



I never saw a marauder ant searching for food on its own. To my surprise I found that the ants forage in groups, like army ants. Columns of workers advance from the trunk trail, then retreat. Some columns develop into massive swarm raids, connected with the trunk trail by a basal column of ants (*diagram, facing page*). Tens of thousands of workers can participate in such a raid, which commonly reaches six to twelve feet across.

Food is collected along the advancing front. Vegetable matter, mostly seeds, constitutes about half of the diet. Prey like this worm (*left, bottom*) makes up most of the other half. Even formidable quarry such as this hapless frog (*left, middle*) may succumb when overwhelmed by sheer numbers.

0 1 2 meters  
0 5 feet

DIAGRAM BY JOHN DAWSON  
AFTER MARK W. MOFFETT

TRUNK TRAIL

ANT COLUMN

TO NEST





## Foraging strategies

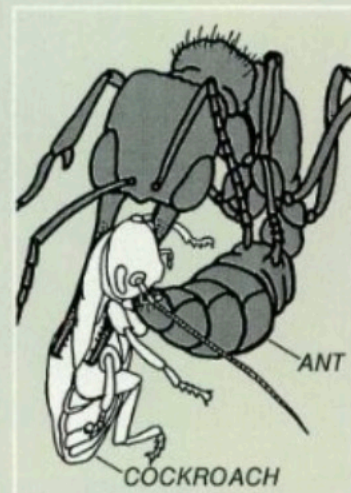
**A**S DIVERSE as they are numerous, the world's 15,000 or more ant species employ a variety of strategies to search out and appropriate their food. Unlike marauder ants, the workers of many species are solitary hunters.

The Asian jumping ant, known for its ability to make great startling leaps, may travel as far as a hundred feet from its nest—a long journey for an ant. But finding prey makes it worthwhile. This jumping ant in Hong Kong

(*far right*) has seized an unwary cockroach with its long, curved mandibles and is stabbing it in the neck with a hypodermic-like stinger (*diagram*).

Species like the jumping ant depend entirely on foods that an individual can handle. Yet many solitary foraging ants also recruit assistance for rich and intractable finds; one method is to lay down chemical trails for nest mates to follow.

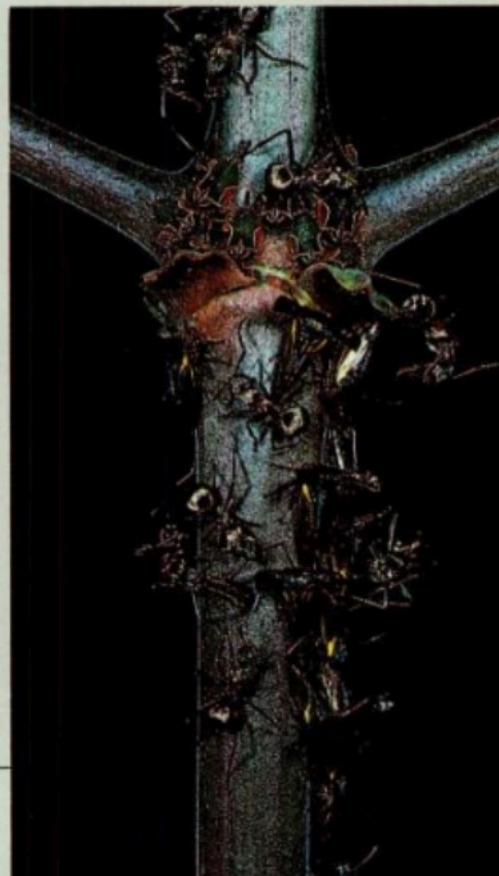
Spiny ants in Malaysia



ant species hunt only in narrow columns. This group of workers in Malaysia (*below left*), with mandibles projecting menacingly, displays the typically aggressive behavior of army ants on the march.



DORYLUS LAEVIGATUS, ABOUT 9 X; POLYRACHIS BIHAMATA, ABOUT LIFE-SIZE (RIGHT)



HARPEGNATHOS VENATOR, ABOUT 21 X



**S**OURCE of constant wonder for Debbie and me, marauder minors working together are able to pin down prey thousands of times their own weight—creatures that viewed through the ants' eyes would appear bigger than dinosaurs would look to us. Victims include spiders, cockroaches, crickets, and scorpions. After being restrained by the minor workers, large prey are then bitten repeatedly by medias and majors, and their limbs are torn off. I sometimes ponder the horrors suffered by victims of marauder ants. Without killing them, the ants render them helpless, to be

ripped asunder within the ants' nest.

While many other ants typically carve up sizable food items into manageable pieces, marauder ants do not waste the time. Dozens of minor workers join forces to carry large seeds (**bottom right**) and other hefty finds like a lizard's egg (**middle right**). They do this so efficiently that each ant often seems to bear far more weight than it could carry on its own.

Earthworms up to four inches long can demand the attention of as many as a hundred workers. Here, to help carry a worm (**below**), workers sop up its excess

moisture with bits of soil.

We were intrigued to note a semblance of traffic rules along the marauder ant trails: Ants returning to the nest tend to travel near the middle, while outbound ants keep to the sides. This is probably because heavy burdens make it difficult for inbound ants to maneuver, forcing outbound ants to the trail's edge.

A common adversary along exposed sections of a trail in India, the thief fly (**right**) sits and waits to snatch a morsel from the ants' collective grip. For defense, fierce minors often ride shotgun on the food.



ABOUT 3 X



ABOUT 5 X



ABOUT 12 X (LEFT); ABOUT 6 X



# Armed for the kill



MYRMOTERAS BARBOURI, ABOUT 70 X



MYRMOTERAS TORO, ABOUT 6 X (ABOVE LEFT); ODONTOMACHUS, ABOUT 8 X



**A**NTITHESIS of the marauder strategy is the lone hunting practiced by many ant species. Examples include a Singaporean antler-jawed ant (**left**), whose mandibles open an incredible 280 degrees. Between them are two long trigger hairs, which, when touched by some quarry, cause the mandibles to snap forward, knifing the prey. A related species, without trigger hairs (**above**), relies on its antennae to gauge the distance to its quarry, in this case an isopod.

Another kind of trap-jawed ant (**top right**) closes its mandibles violently, flinging intruders far into the air. Primitive *Myrmium* ants (**bottom right**) stun adversaries with a blow from their mandibles in much the same way that people snap their fingers. *Lophomyrmex* ants (**middle right**) can recruit assistance when hunting food but are also admirable solitary hunters. With their saw-toothed mandibles they shear off the limbs of small prey like this springtail, quickly immobilizing it.



LOPHOMYRMEX BEDOTI, ABOUT 12 X



MYRMIUM CAMILLAE, ABOUT 13 X





ABOUT 21 X (ABOVE LEFT); ABOUT 7 X

**D**EFENSE is immediate and intense when other ant species encroach on the trails of marauders.

On the edge of a trail in southern India, workers in an aggressive stance (*far left*) hold two far larger ants of the genus *Leptogenys* (*left*) at bay. Intruders are usually driven away without combat. However, when a hapless Malaysian *Diacamma* ant blunders directly into the midst of the marauders' trail,

agile minors rush forward to pin it to the ground (*below left*). With the adversary defenseless, a major worker arrives and kills it with repeated crushing blows (*below*), then drops the corpse by the side of the trail (*bottom*), where minors will bury it. During severe disturbances, the flow of food to the nest halts as ants carrying food quickly retreat.

Encounters between marauder ant colonies often result in hostilities. Fights

occur when the raid of one colony collides with the exposed trail of another. Minor workers of each army grasp their opponents with their mandibles and slowly pull each other apart. Wide battlefields can develop with hundreds of workers locked in combat, until the colony with the largest fighting force drives away its foes. Curiously, medias and majors do not participate in these battles, perhaps because they are too valuable to be risked.



ABOUT 8 X



ABOUT 14 X (LEFT); ABOUT 5 X



## On Assignment

**S**COURING the front line of each raid, marauder ants harvest a variety of plant material. When fruiting grass plants are encountered, media workers climb the stalks and pull out seeds, which the minors carry away. In the nest, media and major workers, serving as a miller caste, crack open seeds so all can eat.

Harvesting sometimes continues for days at a rich find, such as this bamboo shoot (*left*). Large fallen fruits, as from an oil palm (*lower left*), are food bonanzas, and their sap is consumed on the spot.

Often, as I watched the marauder ants' tightly orchestrated activities, the thousands of individuals seemed to merge into a single dynamic pattern. It was as if all the ants had united to form one great living creature. The trunk trail and its branches were arms thrown over the ground, from which raids reached out like fingers, combing the forest floor for nutrients, energy, and information. Then this vision would dissolve, and the individuals would reappear, their labors finely coordinated, the different castes intricately apportioning the day's tasks. Yet that vision, never forgotten, constantly reminds me that a society of ants can be as complex and worthy of admiration as any in the animal kingdom. □



ABOUT 4 X

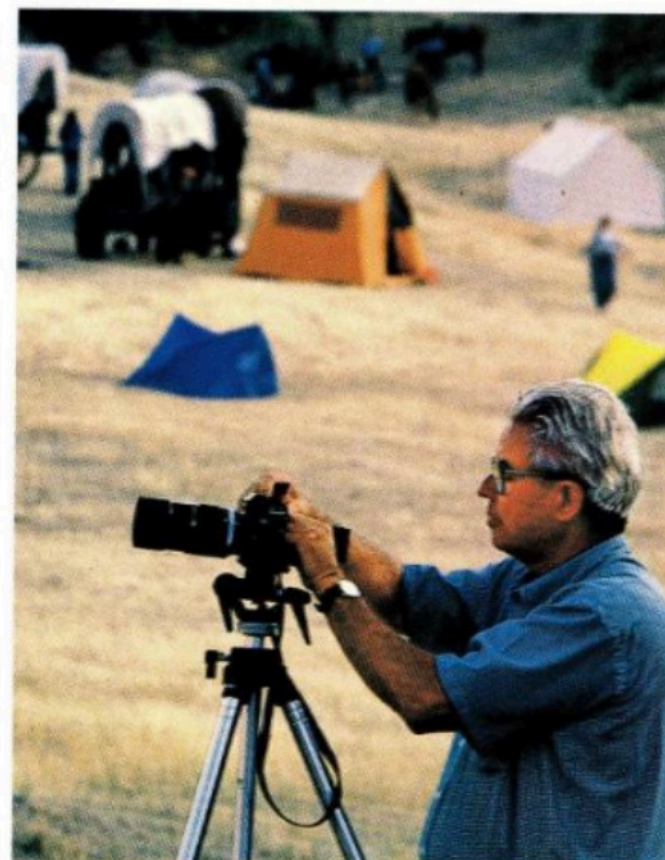


ABOUT 6 X

**F**OLLOWING THE WAGON RUTS of emigrants who crossed the continent was mostly a pleasure, says **Boyd Gibbons**. But pain helped give him important insights for his article on the Oregon Trail in this issue. Gibbons (*right*), who as a teenager lived on a Montana ranch, walked and rode horseback some 200 miles to get a taste of emigrant life. Within a week the saddle sores, blisters, and bone-deep fatigue brought him new respect for the people he was writing about. "When your lip is split or your feet blistered, it's on your mind *all* the time. Still my problems were nothing compared to what the emigrants went through for six months. I began to wonder . . . my God, could I have done this? I really came to admire their courage."

Like many emigrants, Gibbons changed careers in midstream. After practicing law and serving as deputy under secretary of the Interior Department, he helped develop policy for the President's Council on Environmental Quality in the early 1970s. His life took an abrupt turn when *Wye Island*, his book about land-development battles on Maryland's Eastern Shore, caught the eye of GEOGRAPHIC editors; he joined the magazine staff in 1976.

Photographer **Jim Amos** (*lower*) is another two-career man. The Kalamazoo, Michigan, native was perched atop a 16-year sales career with Eastman Kodak when he risked it all on the camera in his desk drawer. One free-lance GEOGRAPHIC assignment after another led to a staff job in 1969; he promptly won the Magazine Photographer of the Year contest two years running. Amos soon earned a reputation for thoroughness. On the Oregon Trail he spent days tracking down the story behind names carved along the trail (page 164). He logged 25,000 miles—more than ten times the trail's length—in his specially equipped van, often sleeping in the middle of nowhere with nothing but coyotes and Mozart's Clarinet Concerto on the tape deck for company. "I got only one speeding ticket," says Amos. "And that was on the way home."



BY JAMES L. AMOS (TOP); W. PERRY CONWAY