A NEW PERSPECTIVE ON ANTS

Text and Drawings by Joel Morrow

What wonder strikes the curious, while he views
The black ant's city, by a rotten tree
Or woodland bank! In ignorance we muse:
Pausing, annoyed, we know not what we see,
John Clare

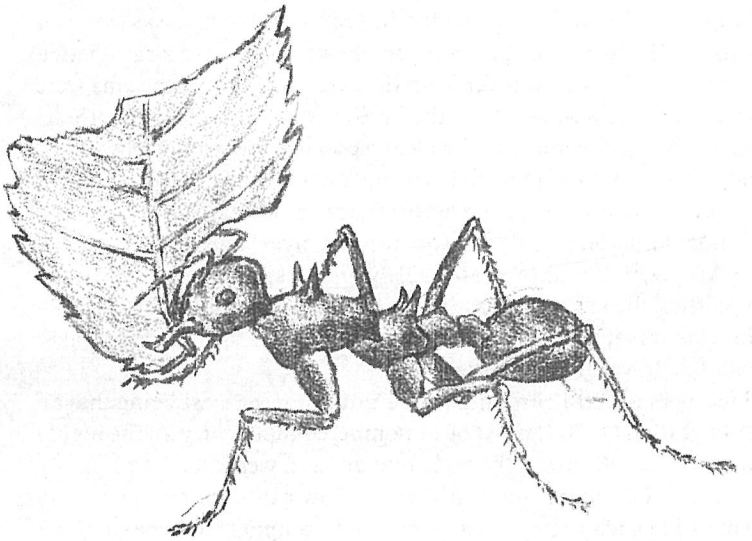
The earth goes to ruin, one could say, by the putrefaction of organic residues.... Progressive evolution is saved by that which arises out of the activity of formic acid [in the ants].
Rudolf Steiner

Sometime before Baltic amber ceased to encase the wasp tribe in glossy stones, an errant member of the wasp family apparently shed its wings and descended into the soil.* That wingless wasp became the progenitor of the most wide-ranging of insect families on the planet, the *Formicoidea.* To this day, the Formicoidea, or ants as they are commonly called, remain wingless wasps living beneath the earth. As creatures of this earth, they have become successful beyond belief, spreading in staggering numbers a web just below and just above the surface of the soil, the area called the diaphragm of the earth by Steiner in his Agriculture Course. Out of 10^{18} individual insects crawling and flying over the planet, 10^{15} are ants, a figure which simply boggles the mind (Williams 1964). Ants survive from the artic tree line to Tierra del Fuego, from Siberia to Tasmania, and most astoundingly, on every oceanic island from Iceland to Tristan da Cunha. Whether spread by ships or somehow indigenous is not known. Ants permeate the soil with the thoroughness of the earthworm, but unlike the earthworm, their role in the ecosystem is not really known to conventional science. Yet, somehow these wingless centaurs have overrun the humus layer of the planet, proliferating into more genera and species than all other eusocial insect groups combined, and literally dwarfing their close relatives, the bees and wasps.

Generally we only notice ants as pests. Their pervasiveness is known to picknickers the world over, is known with fear and loathing to areas invaded by fire ants, to orchardists plagued by aphids, and known with despair to gardeners in the tropics where the attines are prevalent. What follows might well be typical of the human relationship to ants. Wolfgang von Hagen, against the sage advice of the local Mayan Indians, planned a vegetable garden in Belize.

> The Miskito men lamented all this work. It was useless, quoth a toothless elder, to plant anything but bananas or manioc, as the *Wiwis* were sure to cut off all the leaves.

*An impressive record of insect evolution is contained in solidified conifer resin, very abundant along the Baltic coast.



In compost gardens the leaf-cutter ants nurture a species of fungus apparently found nowhere else in nature. Without leaf cutters and other ants, we probably could not breathe.

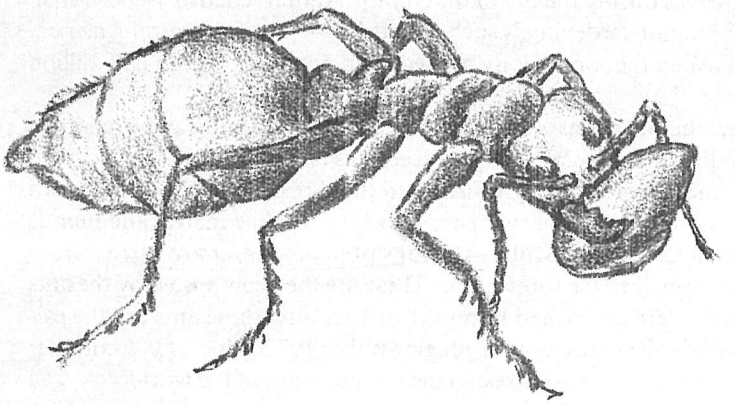
> Without the slightest encouragement, the Miskito Indians would launch forth on the tales of the ravages of the *Wiwi Laca*, but unswayed by the illustrations, like Pangloss I could only remark that all this was very well but let us cultivate our garden. In two weeks the carrots, the cabbages, the turnips were doing well. The carrots had unfurled their fernlike tops, the cabbage grew as if by magic. From our small palm-thatched house my wife and I cast admiring eyes over our jungle garden. Our mind called forth dishes of steaming vegetables to replace dehydrated greens and the inevitable beans and yucca. Even the toothless Miskito elder came by and admitted that white man's energy had overcome the lethargy of the Indian. Then the catastrophe fell upon us. We arose one morning and found our garden defoliated: every cabbage leaf was stripped, the naked stem was the only thing above the ground. Of the carrots nothing was seen. In the center of the garden, rising a foot in height, was a conical peak of earth, and about it were dry bits of earth, freshly excavated. Into a hole in the mound, ants, moving in quickened step, were carrying bits of our cabbage, tops of the carrots, the beans—in fact our entire garden was going down that hole. I could see the grinning face of the toothless Miskito Indian. *The Wiwis had come:* (Weber 1972)

It took a generation, however, to discover how the Atta ants use the vast quantities of leaves they pull down under the ground. At first, it was assumed that the ants ate the leaves, or perhaps pre-chewed them into a masticated pulp for their larva, but this was far from the case. In reality, these ants were prodigious gardeners, well versed in the latest (or perhaps oldest) methods of organic gardening. The ants pile their leaf pieces in underground chambers, not as food but as compost material. The ants lick the leaf pieces and then chew the fragments into a wet pulp, adding a drop of clear anal liquid as a compost innoculant. The ants then sow tufts of mycelia on the completed heaps. The Atta were found to subsist solely on this special morel-like fungi that grew on these little heaps. Lastly, to complete this picture of ant agriculture, the ants travel around collecting insect feces for their compost piles. Rodale couldn't have done it better!

Several features of Atta gardening are unique, not the least being that an insect should garden at all. It must be remembered that nearly all the highly intelligent animals, right up to the early human race, were and are primarily *gleaners* of the food chain, not cultivators. How can such an apparently simple form of life such as an ant carry out such complicated behavior? Yet such a phenomenon may well indicate an unforeseen level of life activity, perhaps important to the ecosystem in general and agriculture in particular. Just as their close relatives, the wasps, have recently become important allies in alternative agriculture, so may somewhat different lessons and uses be derived from the depths of the ant world.

One of the mystifying features of ant gardening has to do with weed control. Though entymologists have observed ants transplanting their chosen fungi to newly prepared sites, they have also determined that many other fungi spores are transported on the legs and bodies of the ants as well as the leaves. Yet no one is certain why only the special ant fungus ever grows in their plots, despite the multitudes of "weed seeds." Sometimes ants appear to be "weeding" with their mandibles, but other entymologists suggested that the ants were ejecting a form of herbicide from their metapleural gland. This gland has been shown to be the primary sterilizer of their brood chambers, cleansing the space of microorganisms by the use of phenylactic acid, indolylacetic acid, and B-hydrozydecanoic acid. Certainly the unique biochemical smell of many ant colonies is apparent to human gardeners who spend a lot of time on their knees. The red ants especially eject a strong melissa-like scent. However, entymologists don't agree on what inhibits the weed growth in ant gardens, since ant anal secretions appear to promote the fungal growth of their chosen fungus species. All they know is that when the ants abandon a garden, the myriad fungal spores of other species spring up immediately.

That is, all spring up except for one—*the very fungus the Atta cultivate!* That fungus *only* exists in ant gardens and never appears to form spores. Somehow—and this is hard to believe—ant activity has resulted in the



Harvester ants gather seeds and maintain subterranean graneries. Any stored seeds which germinate are cast out and sprout in the ant fields surrounding the nest. Harvester workers are especially large with powerful mandibles for cracking seeds. Some workers become permanent "mills" and spend their days grinding and masticating the cracked grain. Ant saliva transforms grain starch into sugar, creating the so-called "ant bread."

selection of a nearly sporeless fungal species that entirely depends on ant existence, much as modern hybrid corn depends on human intervention. For this reason, taxonomists can't even make final identification of the ant fungi, since spores are the criterion for fungal genus and species. Propagation of these fungi depends on the ants, who make "softwood cuttings" for transplanting into new compost chambers. These cuttings evidently depend on the ant's specific proteolytic anal enzymes, which include allantoin, allantoic acid, ammonia, and 21 amino acids. That Martin (1969) only found nutrient material in the fecal fluid (as opposed to fungicide) may arise for the same reason that researchers can't milk "ant-cows" (aphids). Only ant feelers have the right touch, not to mention the fact that ants may not fertilize and weed in the same pass. In other experiments, Maschewitz (1970) showed that the fluid contained strong antifungal and antibiotic activity. I believe ecological agriculture will eventually learn much from these tiny creatures.

At all events, the queen makes a little packet of the mycelia when she is ready to depart for a new nest. In her winged phase she carries the plant material in her esophagus at the base of her labium. During the early days of the new colony, she employs only liquid fertilizer. Good mother that she is, she never eats during this period, but digests her own wing muscles for the sake of her children (human mothers, take note!). Only when the first brood emerges as workers does the business of leaf collection begin. And though the colony grows slowly in the first year, a three-year-old nest may contain 2,000 chambers with 250 community gardens. The fifty thousand

ants that live there may move 85,000 pounds of earth and compost and 12,000 pounds of leaves during the life of the colony (Autuori cited in Weber 1966). No wonder human gardening is such a hardship in parts of Central America. Martin calculated that one colony housed from one to two-and-a-half million ants!

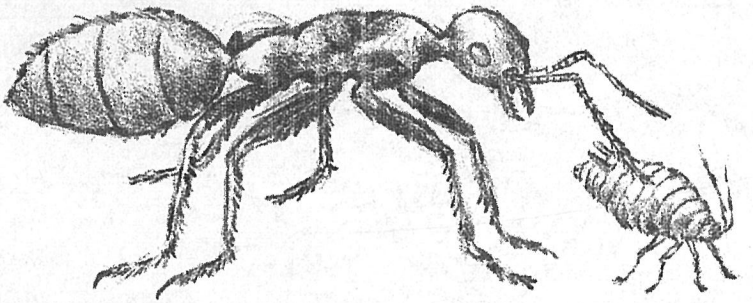
However, the problems *Atta* provide for human farming and orchardry (even extending to destruction of pine seedlings in Louisiana by *Atta texana*) is offset by their ecological significance to the forests of Central and South America. *Atta* are the primary means by which organic matter and humus are built up in the jungle. Millions of tons of plant matter are carried from the forest canopy into the forest floor. These are then composted by the ants and eventually left as finished humus. Furthermore, these ants are the primary means of soil aeration in the jungle (Weber 1972). Now, if you consider the role of the tropical rain forest in the maintenance of the world's oxygen levels, you may appreciate the ecological role of these ants. No wonder that Weber questions their destruction, especially in wilderness places where human beings may have no right to be—places which are, so to speak, the lungs of the earth.

Without ants, it is possible that carbonic decomposition products would have built up in the atmosphere long before humans initiated industrial pollution. Without ants the breathing systems in higher organisms might not have been possible. In fact, Steiner goes so far as to say that without ants we simply could not breathe. Ants appear to be king-pins in the breathing system of the earth.

Folk wisdom appears to have been aware of this, though the tales seem quite fantastic at first reading. In Grimm, a prince pulls his horse off the track to avoid trampling an ant colony. As he passes by, the ant-king emerges and calls after him: "Because you have spared us, we will save you!" And sure enough, the prince is soon burdened by a humanly impossible task—but not impossible for 20,000 ants! And since we have spent some time with the leaf-cutter ants of Central America, we can refer to a similar passage in the *Popul Vuh*. In Mayan mythology, two youths are saved from death by leaf cutters who gather flower petals from a forbidden garden, unseen by the night watch of soldiers who surround the wall. But this mythical side of ants cannot easily tip the scales for "the terrible destroyers of the cassava and plaintain fields" which the Spanish noted on their very first trips to the new world.

It may be, however, that these folk tales may not be myths at all. In his *Nine Lectures on Bees*, Steiner describes ants as the primary agents for the healthy decomposition of forest soils.

> In our country this is perhaps less taken into account, but when you go further south, the simple folk, the peasants, will often say out of a kind of instinctive knowledge: one must not destroy these ant-heaps, for they prevent the

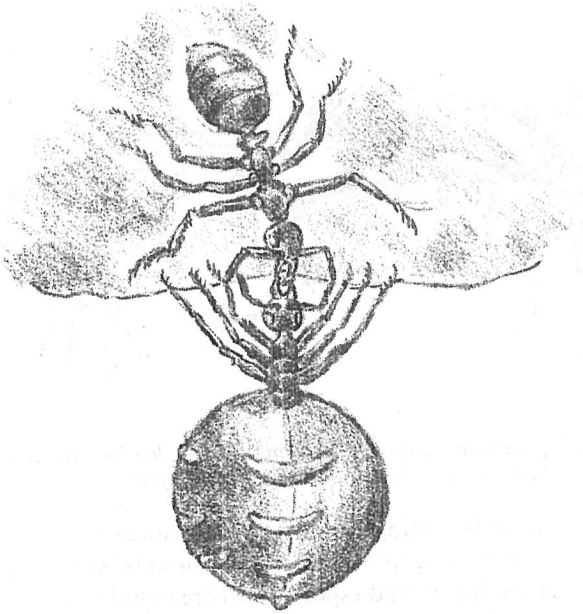


Ant dairy farmer milking an aphid. Researchers using soft brushes have never been able to milk an aphid, but ant antennae have just the right touch.

> forest mould from becoming harmful. Those who are still wiser, will say something quite different if you walk with them through the forest, and especially where trees have been cut down and young trees are growing up. Then these people who are wise in their noses, not in their top-story (one can be wise also in one's nose) when these people go where the trees have been felled and young trees are being cared for, they will say: "Here, it will all go well; it does not smell so mouldy as it often does; there must be an ant-heap near, and it is proving its usefulness." These people smell this; they are clever with their noses. Much homely and useful knowledge is derived from a clever nose! Unfortunately, modern civilization only regards the cultivation of the brain, and rejects all that is instinctive; instinct has become merely a word.

Here Steiner points to a primary role played by ants in the formation of healthy humus. The agent for this process, he goes on to say, is biochemical —a continuous fine injection of formic acid and other substances into the atmosphere of the humus layer.

> You see, here is a tree, and the tree has bark. The bark decays when I cut down the tree; then it moulders. People say: "Well, let it rot away." Just try to imagine all that moulders away in the forests, fallen leaves and so on, within the course of the year! Men are willing to let it all rot away, but Nature orders it otherwise. Everywhere there are ant-heaps, and from these ant-heaps formic acid enters into the soil of the forest. When you have both forest soil and an ant-heap, it is the same as if you take a



Honey pot ants of the southwest desert swell to enormous size. Certain workers become permanent "bottles" for the storage of honey dew. They spend their lives hanging from the ceilings of underground larders.

glass of water and add a drop of something else to it; the whole contents are at once affected. If you put in salt, all the water is at once made salty. If you have an ant-heap, then the formic acid goes in the same moment into the forest soil, and all the soil which is already decaying is saturated with this formic acid.

So it is also with the lifeless substances of the woods. Even physical science as it is today, concludes that the earth will one day be quite dead. It would indeed be so for a state of things would eventually come about when decay would prevail, then the earth would be dead. That this will not be so, is because wherever the earth decays it is in the same moment penetrated by all that is yielded up by the bees, wasps and ants. The bees, it is true, give it only to the living flowers, the wasps for the most part also to the living plants. But the ants give what they hand over in the formic acid directly to what is mouldering and dead; in a certain degree they rouse it to life, in this way doing their part that the earth in its decaying substances shall still retain life.

Ants apparently provide a corresponding activity in the realm of decomposition to the formative and suppressant hormones in wasps. (See "The Role of the Wasps in the Ecosystem" *Biodynamics*, Spring 1988.) Ants, too possess a stinger, but it is far more residual and less forceful than the wasp. The wasp and bees spread over the plant and insect world a fine dilution of suppressant formative hormones (cytokynins, histamines, acetylcholine, etc.). These hormones, also present in all plants, bring about maturation, the tendency *against* rampant growth, and the gradual shrinking that leads to healthy seed formation. In ants the active sting is suppressed and transformed into an injection of biochemical substances directly into the soil itself.

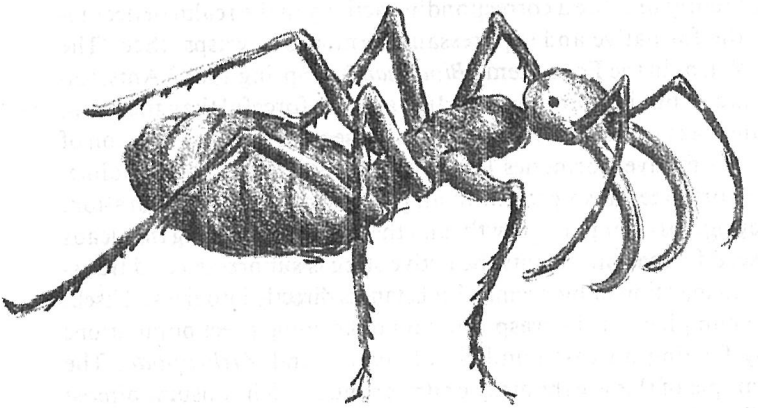
Ants also complement the wasp function of keeping insect populations in check by feeding on vast numbers of *Insecta* and *Arthropoda*. The extreme example of this are the army or driver ants, which consume almost every crawling thing in their path. Wheeler (1909) calls these ants

> The Huns and Tartars of the insect world. Their vast armies of blind but exquisitely cooperating workers filled with an insatiable carnivorous appetite and longing for perennial migrations, accompanied by a motley host of weird camp-followers. . . .

These ants sweep the floor of the forest like a vacuum cleaner, devouring crawling insects, caterpillars, scorpions, small lizards, even sleeping pythons!

The biochemical role of ants begins at the nesting stage, which in some species (such as the leaf cutters) is expressed in a special process by which adults and larvae *exchange* nutritive substances. This is called trophallaxis or mutual feeding. The adult feed the larvae and also lick their bodies. Entymologists have discovered that the juvenile secretions of larva contain substances necessary for the nitrogen metabolism of the colony. Whereas the pheromones of the queen provide the "behavoral motive" for the colony, the larvae provide substances essential for its life. The two hormones balance each other, perhaps in the same sense that the vegetative and seed producing potential in plants spring from two opposite poles. The colony, shaped like a vast series of tunnels and catacombs, becomes permeated by these digestive substances. Another method by which ant chemicals are distributed over the floor of forest or field is achieved by trail marking. The ant stinger exudes substances along the foraging trail. These trails radiate outward in all directions from the colony, just as roads used to radiate from Ancient Rome. However, the most thorough method by which ant chemicals are spread is through licking during their foraging and gardening activities. Everything is handled as thoroughly as possible, chewed and mixed with saliva and/or anal fluids.

Though the role of ants as tillers of the ecosystem is sometimes acknowledged by biologists, the role of the ant by-product, formic acid, can hardly be found in biochemical literature. This stands in stark contrast to the great

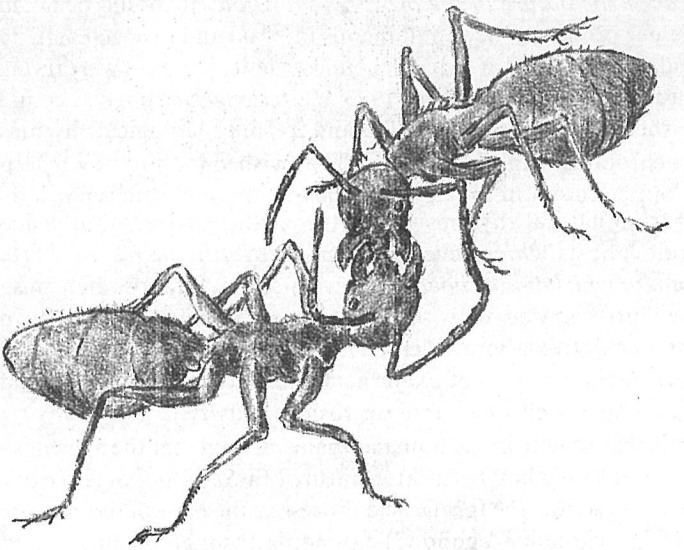


Army ant soldiers with their sickle-shaped mandibles are the grim reapers of the excess insect populations in the tropical forests of America and Africa. A bivouac of army ants can devour a comatose python (i.e. digesting its prey) in a matter of hours. Army ants — called Driver Ants in Africa — live entirely without shelter on the surface of the forest floor. The bodies of workers form the nest for brood and queen, who are borne along on the march. The 17-day bivouacs correspond to the growth phase of the larva. The colony then halts and broods for approximately the same length of time, the nest being a huge woven mass of ant limbs hanging from a branch. Army ants and leaf cutters form a polarity in their tropical habitat, just above and just below the soil surface.

importance Steiner gives to formic acid for human life. The only common reference to formic acid refers to the consumption of wood alcohol by alcoholics, which is biochemically transformed into formic acid in the human body. The large amount of formic acid which results viciously attacks the nervous system, causing blindness.

Formic acid *in very high dilution* plays a key role in the energy-producing processes in all cells (*Biochemical Concepts*, Saunders 1975). The energy is used to power the enzymatic reactions in the cell. Steiner, however, indicates that this points to an ongoing process passing from greater nature into the human organism. Highly dilute formic acid is taken in directly from many vegetables — tomatoes and nettle spinach, for example — and can also be produced in the human body from oxalic acid. Oxalic acid is found widely in the plant kingdom — in clover, wood sorrel, the beet family, really in very many plants. Oxalic acid combines with glycerin in the body to create highly dilute formic acid, normally enough to regulate the decomposition by-products in the body (especially uric acid) just as they do on the forest floor. In middle-aged and older people, however, the normal process of metabolic combustion is not complete, resulting in toxic residues. In *Fundamentals of Therapy* Steiner and Wegman write:

> If something which ought thus to be dissolved fails to be



Trophollaxis, or shared secretions, is the vehicle of the "community intelligence" or "group soul" of the ant. Ants continually "kiss," sharing their respective hormones via their salivary secretions. The kisses impart information concerning the brooding, foraging, nest building, feeding, hygenic, and defensive needs of the colony. Unlike bees and wasps, all ants are social, having developed long before their kin, from a very early wasp offshoot. Ant brains are also among the most developed of the insect world, having fused the usually separate insect nerve ganglia into a larger globe. Ants can be trained to navigate mazes with up to ten dead-end alleys. In some respects a single human mind is similar to an enclosed ant colony, seething with woven limbs, flashing antennae, and a constant exchange of secretions. Try gazing into an ant nest, and you may experience that this is not merely a metaphor.

> dissolved, it will accumulate within the organism and may then constitute a foundation for conditions of gout or rheumatism. Here it is that the formic acid as it arises within the human organization plays its dissolving part. If the necessary amount of formic acid is produced, the organism will properly remove those products which are tending to the lifeless state. If the force to create formic acid is unduly weakened, rheumatic and gout-like conditions are the outcome. By introducing formic acid into the organism from outside, we can then come to its support, giving it what it is unable to create for itself.

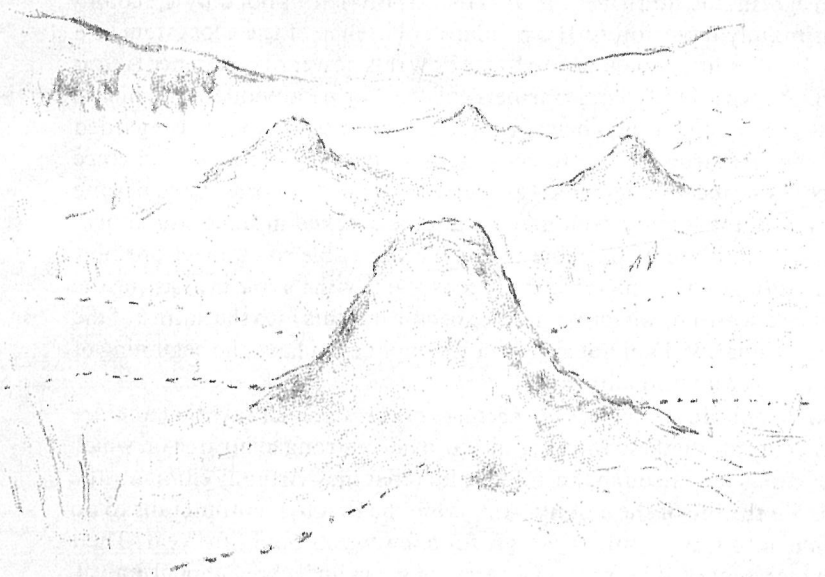
In this way we see a process found widely in nature (and brought to expression in the ecosystem through the ant) spiral inward, become con-

densed, and through the way the process is condensed in the human organism, *give evidence for the nature of the process as a whole.* It should be noted that here Steiner points to the simultaneous internal and external activity of formic acid as a key to what older alchemical views of nature were trying *legitimately* to achieve (22 December 1923 *Mysteriengestaltungen* Lecture 13). They wished to see how human life and its inner biological rhythms were fully synchronous with wider nature. They wished to show how a deep significance can be found in the fact that the human organism is partially emancipated from natural rhythms—how the emancipated rhythm undergoes a metamorphosis *which reveals still more deeply the nature of the greater rhythm to which it is attuned.* Steiner notes that for those alchemists the formic acid process was really *the* archetype of an immense activity in nature. In their primitive laboratories the legitimate alchemist would try to experience the transformation of oxalic acid and glycerin into formic acid as the physical expression of an intense cosmic activity.

What then is this activity in the human organism, such that the alchemists considered it a primary key to greater nature? In *Spiritual Science and Medicine* Steiner describes the formic acid process as the basis of the intricate framework of individuality (egohood) extending throughout the human organism—in the sense that *human* protein is *highly* individualized in each separate person. Formic acid provides a delicate web-like scaffolding, which becomes the physical basis for the primary ego coherence of the human form. He asserts that the foundation of this ego-coherence depends upon an activity generated by the formic acid in the household of nature.

It is essential to note that Steiner's conception of the ego is not merely psychological in nature. He describes this scaffold as the primary structure holding our peculiarly *human* constitution together. Gradually, however, as the person ages, this scaffolding becomes weakened. The forces of the etheric or life body—which insert the ego into the physical body—diminish. "Only in people with creative imagination," Steiner adds, "do we find a half-conscious dreamlike remnant of such power." In many cases, however, Steiner says that formic acid—the excretion of ants—must be taken as a medicine. In other words, the force generated by ants must be directly injected into human beings (in high dilution) or diluted in a warm bath (just enough that you can still smell it).

Whenever the activity of formic acid is too weak in the body, the processes of decomposition go awry just as they sometimes do on the forest floor. Unwanted residues left over from protein metabolism remain uncombusted—especially from the consumption and excess consumption of animal products. These accumulate as uric acid in the system, causing inflammation and other illnesses. An insufficiency of formic acid may first appear as a gradual loss of the ability to control one's life situation (2 January 1924 *Three Lectures to Practising Physicians*) or an inability to think with clarity and zest in middle age. Steiner asserts that the healing of these symptoms (and the heal-



Fire Ants. In "Nine Lectures on Bees," Steiner connects ants and electricity; "It is actually much more difficult to telegraph in a district where there are no ant-heaps, for the electricity and magnetism necessary for telegraphing depend on formic acid. When the telegraph wires go through towns where there are no ant-heaps, it is from the fields outside the town that power must be collected to enable the electric streams to pass through the towns."

I thought this pretty far-fetched until I read that fire ants have an irresistible and destructive attraction to electrical components. This phenomenon is of serious concern to the builders of the new super conductor in Texas. It made me wonder what the apparent excesses of this particular species were telling us. The fire ants may have a special message for our electrically charged world—and for all we know, perhaps a special usefulness.

ing of the tendency toward inflammation) depends upon the coherence of the ego structure. Unlikely as it may seem, this force is aided and maintained by the activity of those pesky little creatures, the ants!

What seems still more unlikely is Steiner's assertion that ants contain a force and the biochemical residue of a force which is *greater than the human individuality*. That, however, is the foundation of its healing power in the organism and ecosystem. At the physical level, this ant force must be regarded as the "teacher" of the body's tottering scaffold.

How can we describe this force which stands at the root of the ant's physical and social organization? According to Steiner, this force can be found as the seed of a social organization higher than any accessible to humans at the present time. In ants it is as if the common human tendency to put one's self first were burned away by a consciousness of the needs of the develop-

ment of a whole people. In human life Steiner calls this transformation of human egoism the Spirit Self. In ants the "Spirit Self" is not only the colony but ultimately devotion to the primary coherence of the ecosystem as a whole. It takes little imagination to see how this power of coherence is condensed into what biodynamic farmers call the "farm individuality" which is orchestrated by the farmer herself. The ant *force* may very well be regarded as "an ego-like structure" in the ecosystem which brings about that balance of forces described in Steiner's *Agriculture Course.* (This may be so despite the fact that ant activity itself may need to be checked in some situations.) Furthermore, it seems possible that if we were able to connect our new understanding of the ant's role in the ecosystem with its role in assisting the human ego scaffold, we might derive specific insights into the nature of the farm individuality. I am not sure, but we might even have the beginning of a new biodynamic preparation.

How do ants do it? In his *Nine Lectures on Bees* Steiner says that ants are able to concentrate these forces (which provide a strong living tree on which the self can grow) through the unlikely fact that they virtually eliminate the male from the life of the colony. Ants were the first hymentopterans to do so. Male ants appear only fleetingly for a few weeks out of the year. Their appearance is marked by a great gathering of wings and a brief nuptial festival. Steiner claims that many far-reaching negative effects in our civilization will be eliminated only when our aggressive and one-sided dependence on sexuality is transformed by those very formative forces reflected in the ants.

However, we may never reach this stage—the stage of the transformed self—if we do not understand how these apparently insignificant creatures reflect "a much greater consciousness than the human of today" (29 September 1905 Berlin). Despite the fact that the ants are far simpler forms of life than human beings, Steiner insists that these insects are farther along the evolutionary path than humans are. The consciousness of the ant hill *in its whole structure and function* lies on a plane just above where our human thinking leaves off (ibid). Considering the sorry and destructive effects of human thinking today, that might be a good plane to get to—sooner than later! This is just the point where human thinking begins to become truly creative.

At present, human beings are the dominant agricultural ants on the planet. The damage caused by leaf cutters and aphid farmers is minute compared to the swirling depth of poison circulated by human agriculture. Perhaps only when we infuse our present agricultural methods with those laws of nature expressed in ant chemicals rather than human ones, will we prove ourselves to be the rightful inheritors of the earth. Hitherto, according to Steiner, the role of "guardians of progressive evolution" has been occupied, not by humans, but by ants!

> A forest where no ants are causing the decay of root stocks is an indication of terrible damage being done to

> earth evolution. The earth goes to ruin, one could say, by the putrefaction of organic residues. Just imagine that wood from which vegetation has been expelled passes over into a kind of mineral condition, is decayed. Now, through the fact that ants do their work, there is a continual high potentizing of formic acid in the earth and air in the region of the forest. Progressive evolution is saved by that which arises out of the activity of the formic acid and that which is being decayed so that the dust does not dissipate and fly away into the cosmic all but can provide material for the further development of the earth. Thus we see that such substances which apparently are only expelled substances from insects or other animals can be seen as being the saviours of the further development of the earth when their function is understood.

It is not clear how these "expelled substances" might be employed in agriculture, but one reference in "Nine Lectures on Bees" suggests to me the possibility of using formic acid either as a soil spray (along with 500?) in early spring or perhaps as a seed bath.

> What is beneath the earth longs as seed for the formic acid above, for renewal of its life. Every winter the spirit of the earth actually strives to take leave of the earth. The spirit of the earth benumbs the earth in winter, to quicken it again in spring. This happens because what waits as seed beneath the earth draws near to the formic acid which has arisen through the whole intercourse of the insect world and the plant world throughout the preceding year. The seeds do not merely grow in oxygen, nitrogen and carbon, but in formic acid; this formic acid stimulates them in their turn to develop oxalic acid, so that once more the formic acid of the succeeding year may come into existence.

It remains a question to me whether we can acquire such a total paradigm shift—really an entirely new basis for ecology—soon enough to align our behavior with these vital forces working within the cycle of the year. Without these insights, I am certain that irreparable damage will be done to the earth. I am thankful, at least, that the ants have laid out a trail of scent for us to follow, so well marked and heavily travelled!

THE ANTS

John Clare

What wonder strikes the curious, while he views
The black ant's city, by a rotten tree
Or woodland bank! In ignorance we muse:
Pausing, annoyed, we know not what we see,
Such government and thought there seems to be;
Some looking on, and urging some to toil,
Dragging their loads of bent-stalks slavishly;
And what's more wonderful, when big loads foil
One ant or two to carry, quickly then
A swarm fleck round to help their fellow-men.
Surely they speak a language whisperingly,
Too fine for us to hear; and sure their ways
Prove they have kings and laws and that they be
Deformed remnants of the fairy days.

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Sources Not Named in the Text

Farb, P. *The Insects* (New York, Time Inc. 1962)
Linsenmaier, W. *Insects of the World* (London, MacGraw, 1972)
Morley, D. W. *The Evolution of an Insect Society* (New York, Scribners, 1955)
Steiner, R. *Nine Lectures on Bees* (1923) (Spring Valley, N. Y. St. George Publications Reprint of 1964 Ed.)
Weber, N. *Gardening Ants, The Attines* (Philadelphia, American Philosophical Society, 1972)
Wheeler, W. *Ants* (New York, Columbia University Press, 1910)
Wilson, E. O. *The Insect Societies* (Cambridge, MA, Harvard University Press, 1971)