Lewis Thomas was already a distinguished physician, researcher, and teacher when, in the early 1970s, his writing began to attract attention outside the medical community. He was born in 1913 in Flushing, New York, and was educated at Princeton and at Harvard Medical School, from which he earned his medical degree in 1937. A specialist in pathology, the study of disease, he has written numerous scholarly articles and held positions at the University of Minnesota Medical School, New York University—Bellevue Medical Center, and Yale University Medical School, among other institutions. From 1973 to 1983 he was president and then chancellor of the Memorial Sloan-Kettering Cancer Center in New York City. In 1971 Thomas began contributing a regular column called “Notes of a Biology Watcher” to The New England Journal of Medicine. Though published in a leading medical journal, the essays in the column are as suited to the general reader as to the specialist: in a clear, graceful style, Thomas writes about subjects ranging from hormones to nomadic tribes to literature, often exploring crucial questions about how nature works and how we fit into it. The essays have been collected in The Lives of a Cell (1974), which won the National Book Award, and The Medusa and the Snail (1979). The most recent books by Thomas, both published in 1983, are The Youngest Science: Notes of a Medicine Watcher, a memoir of his life in medicine, and Late Night Thoughts on Listening to Mahler’s Ninth Symphony, a collection of essays.

On Societies as Organisms

As in many of his essays, Thomas here considers the connections between human beings and the rest of the natural world. He develops his basic analogy, suggested by the essay’s title, with the aid of several brief analogies, producing a complex yet clear and often witty comment on the orderliness in nature. The essay first appeared in The Lives of a Cell.

Viewed from a suitable height, the aggregating clusters of medical scientists in the bright sunlight of the boardwalk at Atlantic City, swarmed there from everywhere for the annual meetings, have the look of assemblages of social insects. There is the same vibrating, ionic movement, interrupted by the darting back and forth of jerky individuals to touch antennae and exchange small bits of information; periodically, the mass casts out, like a trout-line, a long single file unerringly toward Childs’s. If the boards were not fastened down, it would not be a surprise to see them put together a nest of sorts.

It is permissible to say this sort of thing about humans. They do resemble, in their most compulsively social behavior, ants at a distance. It is, however, quite bad form in biological circles to put it the other way round, to imply that the operation of insect societies has any relation at all to human affairs. The writers of books on insect behavior generally take pains, in their prefaxes, to caution that insects are like creatures from another planet, that their behavior is absolutely foreign, totally unhuman, unearthy, almost unbiological. They are more like perfectly tooled but crazy little machines, and we violate science when we try to read human meanings in their arrangements.

It is hard for a bystander not to do so. Ants are so much like human beings as to be an embarrassment. They farm fungi, raise aphids as livestock, launch armies into wars, use chemical sprays to alarm and confuse enemies, capture slaves. The families of weaver ants engage in child labor, holding their larvae like shuttles to spin out the thread that sews the leaves together for their fungus gardens. They exchange information ceaselessly. They do everything but watch television.

What makes us most uncomfortable is that they, and the bees and termites and social wasps, seem to live two kinds of lives: they are individuals going about the day’s business without much evidence of thought for tomorrow, and they are at the same time component parts, cellular elements, in the huge, writhing, ruminating organism of the Hill, the nest, the hive. It is because of this aspect, I think, that we most wish for them to be something foreign. We do not like the notion that there can be collective societies with the capacity to behave like organisms. If such things exist, they can have nothing to do with us.

Still, there it is. A solitary ant, afield, cannot be considered to have much of anything on his mind; indeed, with only a few neurons strung together by fibers, he can’t be imagined to have a mind at all, much less a thought. He is more like a ganglion on legs. Four ants together, or ten, encircling a dead moth on a path, begin to look more like an idea. Theyumble and shuffle, gradually moving the food toward the Hill, but as though by blind chance. It is only when you watch the dense mass of thousands of ants, crowded together around the Hill, blackening the ground, that you begin to see the whole beast, and now you observe it thinking, planning, calculating. It is an intelligence, a kind of live computer, with crawling bits for its wits.

1 An Atlantic City restaurant. [Editor’s note.]
At a stage in the construction, twigs of a certain size are needed, and all the members forage obsessively for twigs of just this size. Later, when outer walls are to be finished, thatched, the size must change, and as though given new orders by telephone, all the workers shift the search to the new twigs. If you disturb the arrangement of a part of the Hill, hundreds of ants will set it vibrating, shifting, until it is put right again. Distant sources of food are somehow sensed, and long lines, like tentacles, reach out over the ground, up over walls, behind boulders, to fetch it in.

Termites are even more extraordinary in the way they seem to accumulate intelligence as they gather together. Two or three termites in a chamber will begin to pick up pellets and move them from place to place, but nothing comes of it; nothing is built. As more join in, they seem to reach a critical mass, a quorum, and the thinking begins. They place pellets atop pellets, then throw up columns and beautiful, curving, symmetrical arches, and the crystalline architecture of vaulted chambers is created. It is not known how they communicate with each other, how the chains of termites building one column know when to turn toward the crew on the adjacent column, or how, when the time comes, they manage the flawless joining of the arches. The stimulus that set them off at the outset, building collectively instead of shifting things about, may be pheromones released when they reach committee size. They react as if alarmed. They become agitated, excited, and then they begin working, like artists.

Bees live lives of organisms, tissues, cells, organelles, all at the same time. The single bee, out of the hive retrieving sugar (instructed by the dancer: "south-southwest for seven hundred meters, clover—mind you make corrections for the sun drift") is still as much a part of the hive as if attached by a filament. Building the hive, the workers have the look of embryonic cells organizing a developing tissue; from a distance they are like the viruses inside a cell, running off row after row of symmetrical polygons as though laying down crystals. When the time for swarming comes, and the old queen prepares to leave with her part of the population, it is as though the hive were involved in mitosis. There is an agitated moving of bees back and forth, like granules in cell sap. They distribute themselves in almost precisely equal parts, half to the departing queen, half to the new one. Thus, like an egg, the great, hairy, black and golden creature splits in two, each with an equal share of the family genome.

The phenomenon of separate animals joining up to form an organism is not unique in insects. Slime-mold cells do it all the time, of course, in each life cycle. At first they are single amebocytes swimming around, eating bacteria, aloof from each other, untouching, voting straight Republican. Then, a bell sounds, and acrasin is released by special cells toward which the others converge in stellate ranks, touch, fuse together, and construct the slug, solid as a trout. A splendid stalk is raised, with a fruiting body on top, and out of this comes the new generation of amebocytes, ready to swim across the same moist ground, solitary and ambitious.

Herring and other fish in schools are at times so closely integrated, their actions so coordinated, that they seem to be functionally a great multi-fish organism. Flocking birds, especially the seabirds nesting on the slopes of offshore islands in Newfoundland, are similarly attached, connected, synchronized.

Although we are by all odds the most social of all social animals—more interdependent, more attached to each other, more inseparable in our behavior than bees—we do not often feel our conjoined intelligence. Perhaps, however, we are linked in circuits for the storage, processing, and retrieval of information, since this appears to be the most basic and universal of all human enterprises. It may be our biological function to build a certain kind of Hill. We have access to all the information of the biosphere, arriving as elementary units in the stream of solar photons. When we have learned how these are rearranged against randomness, to make, say, springtails, quantum mechanics, and the late quartets, we may have a clearer notion how to proceed. The circuitry seems to be there, even if the current is not always on.

The system of communications used in science should provide a neat, workable model for studying mechanisms of information-building on human society. J. M. Ziman, in a recent Nature essay, points out, "the invention of a mechanism for the systematic publica-

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2 Pheromones are chemical substances released by an animal that influence the behavior of other animals in the same species. [Editor's note.]
3 Mitosis is a process of cell division: chromosomes, which transmit and determine hereditary characteristics, are duplicated and then distributed to identical new cells. The genome (end of paragraph) is the complete set of chromosomes. [Editor's note.]
4 Amebocytes are single-celled organisms. Acrasin (next sentence) is the signaling substance released by one class of slime mold. [Editor's note.]
5 Springtails are small wingless insects that leap rather than fly. Quantum mechanics is a theory of physics explaining the motions of atomic particles. Quartets are musical compositions for four instruments or voices; Thomas is referring to string quartets composed by Beethoven. [Editor's note.]
tion of *fragments* of scientific work may well have been the key event in history of modern science." He continues:

A regular journal carries from one research worker to another the various observations which are of common interest. A typical scientific paper has never pretended to be more than another little piece in a larger jigsaw—not significant in itself but as an element in a grander scheme. *This technique, of soliciting many modest contributions to the store of human knowledge, has been the secret of Western science since the seventeenth century, for it achieves a corporate, collective power that is far greater than one individual can exert* (italics mine).

With some alternation of terms, some toning down, the passage could describe the building of a termite nest.

It is fascinating that the word "explore" does not apply to the searching aspect of the activity, but has its origins in the sounds we make while engaged in it. We like to think of exploring in science as a lonely, meditative business, and so it is in the first stages, but always, sooner or later, before the enterprise reaches completion, as we explore, we call to each other, communicate, publish, send letters to the editor, present papers, cry out on finding.

**Meaning**

1. What is the primary subject of Thomas’s analogy: human society, societies of other life forms, or both? What is the primary subject compared to? What, then, is the main idea of the essay?
2. What is the difference between the two analogies presented in paragraphs 1 and 3? According to Thomas, why is the first “permissible” and the second “bad form” (2, 4)? What about the behavior of insects makes us “uncomfortable” (4)?
3. “Organism” is a crucial word in Thomas’s essay. What definition of it emerges from paragraphs 4 to 6? Combine this definition and one from a dictionary to arrive at your own understanding of the word’s meaning.
4. What does Thomas mean by “It may be our biological function to build a certain kind of Hill” (paragraph 11)? What would our hill consist of? What do we have to do before we an build it?
5. Consult a dictionary for the origins of the word “explore” (paragraph 14). Why does Thomas say that the word has to do with sound, not with searching? How does this point about the origins of the word serve as a fitting conclusion to Thomas’s essay?

6. If you do not know the meanings of the following words, look them up in a dictionary: aggregating, ionic (paragraph 1); larvae (3); cellular, ruminating (4); neurons, ganglion (5); forage (6); quorum (7); embryonic, polygons (8); stellate (9); synchronized (10); biosphere, photons (11).

**Purpose and Audience**

1. Does Thomas’s purpose seem to encompass argument as well as explanation? If so, where is the argumentative purpose evident in the essay, and what is Thomas arguing against and for?
2. What functions are served by paragraphs 5–10 and 12–14? What does each group of paragraphs establish? How does each group relate to Thomas’s main idea and purpose?
3. Where is it evident that Thomas wrote this essay for the scientists reading a medical journal? Where does he seem to be addressing nonscientists as much as scientists? Do you feel that Thomas considered most of your needs for background information and explanation in writing this essay? Explain your answer.
4. Does Thomas’s essay persuade you that we humans may function as an organism just as insects do? Why, or why not? Whether you agree or disagree, to what extent do you find the comparison between insects and us “embarrassing” (paragraph 3) or somehow demeaning?

**Method and Structure**

1. Besides the central, extended analogy and the two analogies in paragraphs 1 and 3, what other analogies do you see in this essay? What function does each one serve?
2. Which paragraphs in the essay treat animal behavior, which human behavior, and which both? Why does Thomas arrange the examples of animal behavior in the order ants, termites, bees, slime-mold cells, fish, and birds? Why does he devote more space to animal behavior than to human behavior?
3. What functions are served by the first paragraph of the essay? How does the last paragraph relate back to the first one?
4. **Other Methods** Thomas relies on process analysis (Chapter 4) for paragraphs 6–9, a substantial part of his essay. What processes does he analyze in these paragraphs? Why do you think he devotes so much attention to them?
Language

1. In paragraph 2, what seems to be Thomas's attitude toward those "in biological circles"? What words or phrases support your answer? In paragraph 3, is Thomas being serious or ironic—that is, saying one thing but meaning another? How do you know? (See irony in the Glossary if necessary.) How are the attitudes expressed in paragraphs 2 and 3 related?

2. Thomas often describes animals as if they were human beings. In paragraph 6, for just one example, he says ants behave "as though given new orders by telephone." What other similar examples do you find? Why does Thomas cast animal behavior in human terms?

3. The opening paragraph mentions two features of the behavior of animals (including humans) that find expression throughout the essay: animals congregating in groups, and animals communicating. Where do you find these ideas repeated or restated in the essay? Why does Thomas return to them so often?

Writing Topics

1. Thomas believes that human societies have much to learn from the communal accomplishments of insect communities. Think of an experience you have had with committee work or with some other group project. Then write an essay showing how Thomas's analogy did or did not hold true in that instance.

2. Think of a situation in which humans have behaved stupidly, evilly, or violently in a group: spending money to be in on the latest silly fad, for instance, or rioting in a mob. Write an analogy in which you compare the behavior of the group in that situation with the behavior of an animal such as a monkey or a riled dog or a shark. Specify as many parallels between the two as you can, but don't force the analogy beyond reason.

3. Consider a human achievement with which you are familiar or which intrigues you: it could be in science, social science, medicine, space exploration, or technology (television, computers, special effects in movies). Read about the circumstances leading to that achievement and write an essay demonstrating how they do or do not illustrate the following sentence quoted by Thomas (paragraph 12): "This technique, of soliciting many modest contributions to the store of human knowledge, ... achieves a corporate, collective power that is far greater than one individual can exert."

Writing Topics

1. A friend or relative and an animal such as a rat, mouse, lion, fly, or cat

2. Living one's life and either driving a car wherever one likes or running a train

3. On fixed tracks

4. Suffering grief or humiliation and suffering a physical wound

5. A church or synagogue and a family

6. Writing an essay and cultivating a garden, playing someone in chess, or making something out of modeling clay

7. Learning to play a musical instrument and learning to walk

8. Developing a relationship with someone and reading a biography or autobiography

9. Waiting on tables in a restaurant and running a marathon

10. Registering for classes and assembling a model or a piece of furniture from a kit

11. Making an important but risky decision and gambling money on a sporting event or card game

12. A catalog of college courses and a department store or flea market

13. Becoming disillusioned with a friend and learning the truth about Santa Claus

14. Meeting the parents of a girlfriend or boyfriend and going to the dentist

15. Sunday afternoon and a time warp

16. Learning a computer language and learning a language like French or Spanish