

## SUGGESTED REFERENCES

- Gordan, Deborah  
**Ants at Work: How an Insect Society is Organized**  
Free Press, 1999
- Peterson, Ivars  
*Travels of an Ant*  
Science News Oct.28, 1995
- Hoyt, Erich  
**The Earth Dwellers: Adventures in the Land of Ants**  
Touchstone Books, Reprint Edition 1997

## WEBSITES

- University of Michigan  
<http://www.umich.edu/>  
keyword: leaf-cutter ants
- Encarta Online  
<http://www.encarta.msn.com>  
keyword: ant
- *Behavior of Fungus-growing Ants is Focus of Researchers' Study*  
Smithsonian Institution  
<http://www.si.edu/opa/researchreports/9894/94ants.htm>
- *Atta sexdens (Leaf-Cutter Ant): Narrative*  
Fungus Gardens:  
Fun Facts about Fungi  
<http://www.herb.lsa.umich.edu/kidpage/factindx.htm>

## NATIONAL SCIENCE EDUCATION STANDARDS

- Science Content Standards: **5 - 8** Structure and Function in Living Systems  
Regulation and Behavior  
Populations and Ecosystems  
Diversity and Adaptations of Organisms
- 9 - 12** Interdependence of Organisms  
Matter, Energy, and Organizations in Living Systems  
Behavior of Organisms

## CREDITS

The producers thank Arte France for materials used in this program.

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# SCIENCE SCREEN REPORT

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# SCIENCE SCREEN REPORT

VOLUME 32 ISSUE 2

## ANTS - OUR TINY NEIGHBORS



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## SYNOPSIS

For millions of years *Atta sexdens*, often described as leaf-cutter ants, have been busy scurrying across forest floors to maintain their food source - fungus gardens. Today, biologists marvel at the precise farming techniques, instinctual cooperation, efficiency and coordination that have kept these remarkable creatures in existence.

This edition of SCIENCE SCREEN REPORT looks at the lives and behaviors of leaf-cutter ants, and explores their agricultural ability and the factors leading to their farming success. While leaf-cutter ants were born with the natural instinct to farm, scientists have learned that they keep their crops pest and disease free through chemicals that they biologically produce. The program explores the world of these tiny creatures and what we can learn from their cultivation techniques.

## CURRICULUM UNITS

- BIOLOGY
- BOTANY
- ENTOMOLOGY
- HORTICULTURE

## RUNNING TIME

12:40

## BACKGROUND

Nearly 9,000 different species of ants exist. Each is unique and has adapted survival instincts to its environment. One particular species, the *atta* or leaf-cutter ant, survives by growing its own food, just as humans farm crops. Biologists have studied the industrious techniques used by leaf-cutter ants to better understand how such a small creature has the ability to grow and maintain a crop that is pest and disease free.

Through research and observation, biologists witnessed a flawless and precise system that leaf-cutter ants employ in order to successfully grow their own food. This species innately knows how to plant, grow, weed and irrigate their gardens just as human farmers do.

The program explores how leaf-cutters begin their farming process through the destruction of foliage. They work diligently measuring and cutting leaves to bring to the nest. Here, the leaves are chewed into bits that will be used as soil for the fungus garden. The ants then cultivate the fungus into a thick, white, fuzzy substance.

Aside from tending their crops, these ants must adapt their nests to the wet and dry seasons. Nests can contain close to a thousand entrances with underground chambers as deep as six meters. During the dry season, these nest openings are enlarged to create reservoirs in an effort to capture available rainwater. This collection of water is used to irrigate their crops when water is scarce.

Intrigued by this species' ability to maintain crops that are free of pests and disease, scientists have conducted controlled experiments to find answers that could help farmers today. Their research observed the regimen of care given to their crops. However, when they examined the ant's anatomy, they discovered small glands on both sides of the ant that produce a chemical hormone called heteroauxin. This hormone appeared to aid in the control of plant germination and growth. In addition, the production of another chemical, phenylacetic acid appeared to protect against pathogenic bacteria and fungi. Efforts are now underway to reproduce these chemicals for use by human farmers.

Aside from being unbelievable farmers, the *atta* ant is also one of the most advanced of all social insects, living in a sophisticated society focused around their nest and its queen. *Atta* ants are bred to build new colonies. Each ant is classified into a different caste such as workers, soldiers, foragers and gardeners. They each perform specific tasks that aid in the colony's survival. In the building of new nests, these ants are said to excavate approximately 44 tons of loose soil, creating underground, fungus-growing chambers that can be up to 25 centimeters high and up to one meter in length. A colony can cover a region the size of a major league baseball field!

Both ants and humans make use of rich soil, fertilizer and irrigation. Yet, some human crops continue to be invaded by weeds, pests and disease. There is hope that our farming production might be improved by understanding more about the leaf-cutter ants and the chemicals they produce to care for their crops.

## ADVANCED ORGANIZERS

Prior to showing the program:

1. Have students research survival mechanisms developed by different species of insects.
2. Discuss food webs/chains and the connection one chain has to another.
3. Define what a fungus is and identify elements needed for it to develop or grow.
4. Identify the different ant castes and their roles within a colony.

## CRITICAL THINKING EXERCISES

1. After showing the video, ask your students the following:
  - a | What is unusual about this species of ants?
  - b | How might farmers benefit from understanding the leaf-cutter ants?
  - c | What impact could this have on future farming?
2. Have students research pest and disease control methods used by farmers. Identify which methods are most effective and less harmful to the crops.
3. Have students grow plants to study the effects different fertilizers or pest controls have on individual crops. Record daily observations in a log.
4. Discuss environmental hazards of pest and disease control methods.
5. Describe the process leaf-cutter ants follow to grow and maintain a fungus garden.
6. Outline the leaf-cutter ants' role in the food web.
7. Identify and research another species that has innate ability to grow and maintain its crops. Then, compare the two species' processes. For example, the bee makes honey, and the royal jelly is fed to larvae next in line to be queen. Also, a termite called *macrotermittinae* grows fungus for food.
8. Observe an ant farm. Measure and record the length and number of tunnels built over a given period of time.

## VOCABULARY

anatomy  
castes  
colony  
controlled experiment  
defoliating  
detritivore  
food web  
genetically  
herbivorous  
heteroauxin

mandibles  
pathogenic  
phenylacetic acid  
pheromones  
polymorphism  
pupated  
reservoirs  
social insects  
subterranean  
vertebrates

## CAREER POSSIBILITIES

- BIOLOGIST
- BOTANIST
- ENTOMOLOGIST
- ENVIRONMENTALIST
- HORTICULTURALIST