



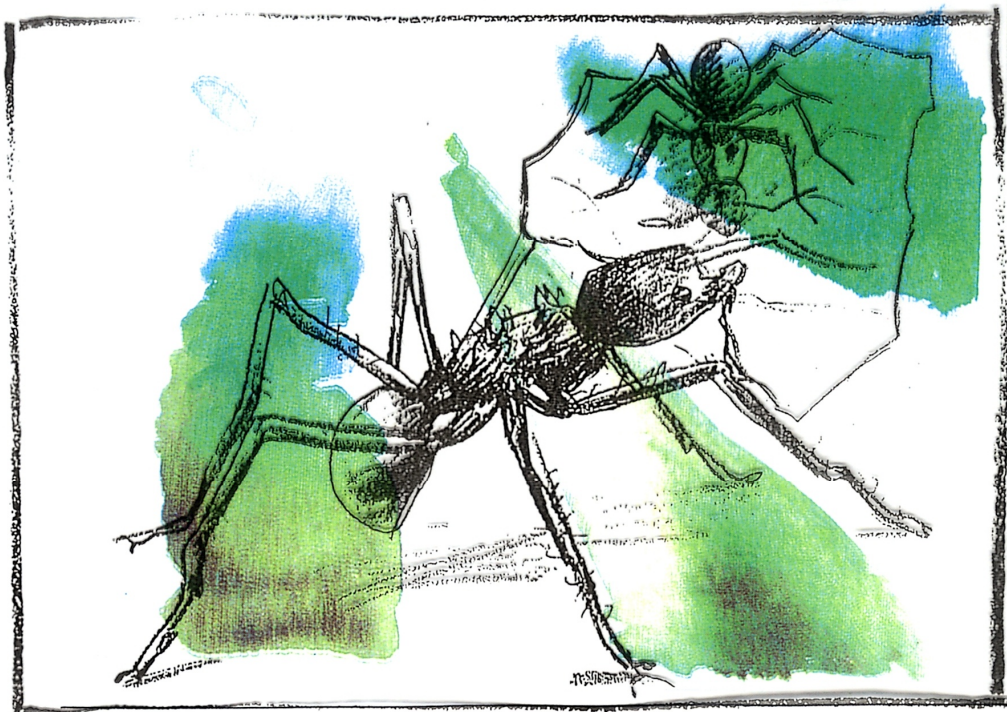
PRESENTS

DEATH CANNOT CONQUER

ADVENTURES IN THE LAND OF ANTS

FOLLOW THE ANTS
ON A JOURNEY
OF LIFE,
DEATH,
WAR, AND
UNBOUNDED ALTRUISM

YOU WILL NEVER BE THE SAME.



**PROPOSAL
FOR A NARRATIVE FEATURE FILM BASED ON
THE REAL LIVES OF ANTS IN THE RAIN FOREST**

90 MIN., COLOR, CS, DOLBY DIGITAL SURROUND

DEVELOPED AND PRODUCED BY

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TREATMENT BY

ERICH HOYT

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© PHOTOGRAPHS BY MARK W. MOFFET, TAKEN FROM NATIONAL GEOGRAPHIC, JULY 1995, AND
BY JAMES K. WETTERER, TAKEN FROM THE EARTH DWELLERS, MAINSTREAM PUBLISHING, 1998

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BACKGROUND

Humans have always sought the secret knowledge of animals and plants - the stories of the natural world. These stories provide powerful insights into who we are and about our place in the world.

DEATH CANNOT CONQUER - based on the recent highly praised book 'The Earth Dwellers' by Erich Hoyt - is intended to be the first in a collection of six nature based narrative feature films. These films will take the viewer to the edge of possibility, to the frontiers of human knowledge about the natural world. The stories are told from various individual viewpoints, from the ants of the tropical rain forest to the whales that migrate across vast stretches of the ocean, from the peregrine falcons that cast their high-flying shadows on the World Trade Center in New York, to the tiny no-light animals and plants of the deep sea, from the cutting edge knowledge of the tropical rain forest with its cancer cures and new foods to the people, animals, and plants of the great boreal forest that encircles the northern part of the Earth, the last great forest left on Earth.

All films will feature the latest state-of-the-art techniques of macro- and laser photography and computer animation together with the establishing of animal / plant points of view to give a unique look and perspective. The films will be developed for the big screen, shot in S35 mm color, digitally scanned and re-balanced before being committed back to widescreen celluloid; with DDS sound system and specially designed sound tracks. Following theatrical release, they will have TV and DVD/video releases and will be further exploited through CD-ROM, CD-I, as well as through the publication of books and other literary material. The cooperation of top world scientists and the influence of exceptional feature as well as documentary film makers will contribute to the quality of these high profile narratives.

These are the stories of magical encounters between animals and the humans who study and try to live with and learn from them. These stories uncover the lives of animals from their own perspectives. As never before, the viewer will see what it is like to **be** a peregrine falcon relying on its predator wits in New York City, to **be** a whale navigating by sound across the vast ocean, and, in the case of DEATH CANNOT CONQUER, to be a scout leafcutter ant determined to save her colony.

Join us on this extraordinary adventure.



INTRODUCTION

DEATH CANNOT CONQUER is the first film to take you down to ant-level and into an ant colony and make you identify with them and the discoveries of two kids about the ants' and their own lives.

A 12-13 year old American boy and girl meet at a boarding school in rural Costa Rica, at the edge of the rainforest.

William (intellectually curious, light-hearted, but ignorant of science and nature) challenges main character Annie (squeamish and fearful but stubborn, proud, practical, good intuition) to take on a school project on ants and the nature of success. They work together (fight, ruminate, share fears and hopes, discover things) and get to know a colony of leafcutter ants.

Throughout the film, we track the ants' point of view as their scout tries to find new sources of leaves - the essential fertilizer that enables the colony to grow and thrive. The leafcutter ants farm mushrooms using a symbiotic fungus and live in huge underground colonies of 5 to 10 million ants in 7 specialized castes organized around a solitary queen. But the leafcutters are dying due to drought and deforestation and an unknown force.

William and Annie find a mentor in Dr. Max Illa, an entomologist-hermit who lives in a cabin at the rain forest edge. He harbors a terrible secret: that the whole rain forest is being taken over by fierce mini fire ants who are kept in check in the tropical rain forest but exploit conditions once logging occurs or any opportunity presents itself. They are highly opportunistic ants bent on expansion and world domination. Dr. Illa is trying to develop a secret "scientific control weapon" in his cabin, but the real secret is learning how to live with nature.

William and Annie, mentored by Dr. Illa, try to help the leafcutters in their battle to survive in the face of man-made drought and the little fire ants. They learn a lot, but they go too far. When the rain finally comes, it arrives in torrents, and the leafcutter colony is deluged, forcing them to move to higher ground. William and Annie have to decide whether to help.

As the little fire ants prepare to take over, the leafcutter ants are dying by the millions, but the colony does not die unless the queen dies. Yet even she is under serious threat. Will the leafcutter ants, through their own resources against tough odds, surmount the obstacles and survive?

Annie conquers her fears and William and Annie achieve empathy with the leafcutter ants and the natural world. But will they achieve a true understanding of the meaning of success in ant (nature) and human terms (relationships to each other and to nature)?

Based loosely on Erich Hoyt's award-winning nonfiction classic *The Earth Dwellers* which explored the dual points of view of scientists and leafcutter ants in the rain forest, *DEATH CANNOT CONQUER* tells the story of a boy, a girl, and the struggle for survival among the ants they come to love and identify with. It takes you to the heart of the meaning of success and friendship.

So much depends on it.

SETTING

A small settlement at the edge of the tropical rain forest, in the jungle, and at a rural American/English boarding school in Costa Rica in the present day.

TECHNICAL NOTES

Ant POV shots to be photographed with a tiny movie camera carried on the back of the ants.

Tracking shots of the ants will be taken with cameras mounted on Lego trains and tiny remote control devices.

Colonies will be filmed in situ and in the rain forest laboratory in semi-captive conditions, with Plexiglas walls to allow filming in chambers deep inside the nest.

Laser endoscopes will allow filming down tunnels and deep inside the colonies of ants.

Animation will be used in some of the close-up ant scenes, particularly inside the colonies. It will also be used as a superimposition on various ant close-ups taken in-the-wild to show the invisible pheromones emitted from various mandibular and abdominal glands as tiny colored "molecules". The color indicates the message (red = come out and fight; intense red = go to war; yellow = sexual attraction; green = colony solidarity [password to show you're in the club]; orange = "follow me!"; blue = food source; purple = evacuate the nest; white = death).

CHARACTERS

HUMAN CHARACTERS

Annie

William

Dr. Max Illa

Annie's Mother

William's Father

William's Mother

Julie (Annie's younger sister)

Teacher

Attractive Girl

Other Classmates

LEAFCUTTER ANTS (*Atta cephalotes*)

Scout

Shotgun Ant

Soldiers

Virgin Queen

Winged Male

Other Winged Males

Other Virgin Queens

Queen

Pellet Makers

Harvesters

Shredders

Workers

Larvae

Pupae

OTHER ANTS & INSECTS

Little Fire Ants (*Wasmannia auropunctata*)

Bullet Ants (*Paraponera clavata*)

Swarm Raider Army Ants (*Eciton burchelli*)

Soldiers, Workers & their Camp Followers

Aztec Ants

Rhinoceros Beetle

Phorid Flies

Ant Butterflies

Aphids

Cicadas

Suicide Bomber Ants

Various other Beetles

Spiders

OTHER ANIMALS

Anteater

Antbirds

Oropendula Birds

Lizards

Spider Monkeys

Coatamundi

Pigs



Leafcutters

Gardeners of the Ant World

CHARACTER DOSSIERS

(Background profiles of main human characters)

ANNIE – Annie is rather lonely, especially since her father left the family. For her, it's the beginning of puberty, and she feels insecurity, wanting to be seen and treated as becoming a woman. She's annoyed by having women around her all the time, especially her younger sister who teases her around the dinner table. The younger, precocious sister Julie has a tight relationship with their mother. Annie's motivation for choosing ants: jealousy, stubbornness (not wanting to appear nervous or afraid), rebellion against ordinary or normal things (her sister says "you can't overcome your fear of ants, and anyway ants are boring and I've read it all.")

Annie's fear of ants is symptomatic of her wish for a sterile world. She doesn't want to see reality or nature. She is afraid to become lost and to lose control.

Annie wants to be accepted as an adult, but at the same time she is waiting for someone who brings it as a gift for her. (That's why she is so angry with William in the beginning, whom she expects to treat her with some deference. But he says, "I don't give a damn what you tell me, you're afraid of ants, it's all theory what you're telling me." And then at the end of the story, she knows she has to earn it. She cannot just act like a princess, but she has to do something to be accepted as a young woman.) Annie is half Costa Rican on her mother's side, and she has the passion, fierce spirit and complexity of many Latin women. Like many young Costa Ricans, and certainly those of mixed parentage, Annie speaks perfect English and Spanish.

WILLIAM – Lonely inside like Annie, William is even more of a rebel – but in a visible "take charge" way, as he works to take control of his life. Still, at the heart of most rebellions there is a lack of confidence, partly in his case resulting from a lack of

confrontation, having no partner to measure his powers, no order, no rules that he can go against. He can't see any structure in life. He wants to be strong and to do something in this world, but everything is nebulous. He tries to come to grips with the elusiveness of the world, tries to hold something in his hand, but nothing seems real. That's partly why ants are so appealing, so earthy, immediate, and real. Ants are the stuff of the earth.

William doesn't like to speak in public. He believes that people who talk too much are not honest, not straightforward. That's why he doesn't openly declare to Annie or anyone what he wants to do with the field project.

William is a sceptic. It's not just what you see or say that counts. He knows always that the reality of life lies beneath the veneer. This has made him into a searcher for truth. He seeks the deepest truths in the ants.

DR. ILLA – Dr. Max Illa is something of a recluse from society. Beyond the somewhat forbidding exterior, however, lies a deep, active mind and a full life with his ants, his scientific work. He is surprisingly friendly and funny when you get to know him. He is the old, wise ant guru.



DEATH CANNOT CONQUER

Treatment by Erich Hoyt,

based on 'The Earth Dwellers' by Erich Hoyt

(Technical note: Scenes written in italics are seen from the ants' POV.)

A few millimetres off the ground, the SCOUT and SHOTGUN ANT search for new food supplies and encounter various obstacles: A BULLET ANT comes threateningly close. A gorge where a stream is reduced to a trickle still provides a challenge for an ant and her sidekick to cross. The SCOUT carries the SHOTGUN ANT across on her back. They find a leaf and the SCOUT cuts it out. Seconds later, a PHORID fly buzzes and swoops low landing on the SCOUT's head.

Trying to escape from the PHORID FLY, the SCOUT drops the leaf with the SHOTGUN ANT and inadvertently runs up a GIRL's leg. The SCOUT swirls her antennae round and round as she suddenly realises she is a foreign land (a human leg) full of strange smells.

The GIRL (ANNIE) sees the ant on her and screams. Terrified, she shakes her leg and stamps on the ant but misses, while a BOY (WILLIAM) who's with her tries to keep her from doing that. (Partly from human POV and *partly from the ant's POV*).

The SCOUT escapes, picks up the leaf and the SHOTGUN ANT and scampers off.

WILLIAM starts talking about ants, while ANNIE is showing the newcomer a brief tour of the Costa Rican jungle behind her mother's house. She comments that it's dry and usually the rain forest is more luxuriant. They are starting an argument. Annie thinks it's an overreaction when William says she shouldn't step on

ants. It becomes obvious that he has a personal reason to be so strict and insistent about it. Finally he even challenges her to learn about ants. The idea strikes her as strange – as a VOICE OVER begins (to be used throughout the film mainly over ant sequences).

We hear ANNIE first. ANNIE (V.O.): "It started the day William arrived in Costa Rica and I was showing him the tropical rain forest behind our house and an ant attacked me..."

WILLIAM (V.O.) interrupts: "No, it didn't attack you; the ant was just carrying a leaf back to her colony when you nearly stepped on her."

While their voice-over discussion continues, we follow the SCOUT: She brings her leaf back to the WORKERS in the nest. We get some glimpses of the food factory and the gardens, the hand-over of leaves. There are great queues of workers waiting for leaves and too few leaves. Something strange is happening here but we can't exactly tell what it is. Finally we see: WORKERS throw dead ants into refuse pits piled high with dead bodies. What is going on here?

At Annie's mother's place, WILLIAM's PARENTS are having a farewell dinner, preparing to leave Costa Rica to travel back home to Canada. WILLIAM and ANNIE are sitting next to each other around the dinner table. WILLIAM's FATHER mentions that he must get back to work. He's a novelist, not a very successful one, forced to earn money as a reporter on any subject for a large Canadian newspaper, "The Gazette" in Montreal. This time he has to be back to report about the playoff battle in hockey for the Stanley Cup which is about to begin.

While ANNIE and WILLIAM exchange meaningful looks, ANNIE's MOTHER talks about how she wants Annie to become a scientist.

WILLIAM's MOTHER jumps in: "William has his head a bit too much in the clouds to be a scientist. I'm afraid he wants to be a philosopher, but whether he can think up a way to make a living doing that, I doubt it."

"What did you do today?" WILLIAM's PARENTS ask ANNIE and WILLIAM.

"Annie gave me the 'grand tour' and then freaked out when she saw an ant," says WILLIAM.

ANNIE grimaces. WILLIAM suggests that they work together on the school project, with an offhand remark: "You should learn more about the ants in your own backyard!"

Things are suddenly very quiet around the dinner table – except for the clanging of silverware, as Annie's anger builds. ANNIE (V.O.): "That was all he said. Oh, he's so shy, surely not talkative. The girls at school were always laughing at him behind his back. But honestly, don't girls like that? The truth is, even at the beginning, William liked to talk in pheromones – pheromones!... Ah you don't know what that is. But you will see."

WILLIAM (V.O.): "What are you talking about? The truth is you communicated your anger so clearly that no pheromones were needed."

ANNIE is ready to explode, her anger doubled by her younger sister JULIE – a precocious child sitting on her MOTHER's lap to show how close she is to her – who picks up the refrain: "I like ants but you're scared of them! Annie is scared of ants in her pants!" She makes it into a sing-song at the dinner table until ANNIE'S MOTHER manages to quiet JULIE down by mentioning Dr. Illa who studies ants and lives in a cabin nearby just inside the rain forest.

"There's nothing wrong with ants," says ANNIE'S MOTHER, trying to be liberally minded. "Look at Dr. Illa. He's spent his whole life studying ants. I'm sure he's lonely working alone over there all the time. Maybe we should invite him over sometime?"

"YES!" says JULIE.

Finally, ANNIE blurts out: "That man is crazy! I don't want anything to do with him! Do you want me to turn out like him?" She storms off and goes to her room.

WILLIAM's PARENTS prepare to leave to catch the plane back to Canada. It was William's idea to go to this Costa Rican boarding school in order to be far away from his parents whom he finds too soft and weak. Especially his father, who is unable to show his affection for his son. He leaves quietly, his good-bye present a book written by him (entitled One for All).

We glimpse just a little of WILLIAM's goodbye – a tear growing in his eye but the next moment he tosses his father's book away dismissively.

A trail of LEAFCUTTER WORKERS is going out to the bush where the SCOUT and SHOTGUN ANT have been. The WORKERS start cutting out leaf pieces, and then make their way, with leaves carried high over their heads, on the great trail back to the nest. The SCOUT meets some LEAFCUTTER SOLDIER at the entrance, exchanges pheromones, enters the nest, hands a leaf piece to LEAFCUTTER PELLETMAKER WORKER, who takes it and chops it into fine pieces, forms a pellet and inserts it into a flocculent mass. Then the SCOUT continues down, deep into nest and we glimpse MOTHER QUEEN in her royal chambers with her many attendants surrounding her.

Holidays are over, it is the first day of school. In the classroom, WILLIAM, ANNIE and OTHER CLASSMATES listen to the TEACHER who explains about the annual field project: It must be done in pairs. By tradition, the school, obsessively concerned with making successful students, asks that they do a field project about any successful undertaking. "It could be a flight to another planet, a business venture, anything." The OTHER CLASSMATES groan.

"It can be multi-disciplinary," adds the TEACHER. "But I don't want Michael Jackson or any pop star, and no football or sports stories. It must be a serious subject."

OTHER CLASSMATES: More groans.

TEACHER: "I want to know why did they win or succeed? What are the key components? I don't want philosophical nonsense or speculation – only facts, lists, statistics. You must choose a partner and work in pairs. I expect your very best work. This is the Costa Rican International Academy; you are the elite of society and you have to understand how to analyse success and grasp its essence. I want to have your projects started right away, certainly no later than the end of this week. You don't have to tell me now which project you've chosen but I do need to know who you're working with, to make sure no one is left out."

An ATTRACTIVE GIRL flirts subtly with WILLIAM. ANNIE sees it – and instantly volunteers that she and William will be doing their project together. WILLIAM is surprised and smiles.

Leaving the classroom, ANNIE takes WILLIAM aside: "Well what shall we do for our project?" (She is obviously anticipating that they would do a subject that she was familiar with from her time in Costa Rica.)

WILLIAM: "Well, it's ants of course."

"Oh sure. Very funny," ANNIE replies.

But WILLIAM is serious: "I'm doing ants."

The ATTRACTIVE GIRL brushes by as she leaves the classroom smiling.

WILLIAM: "Come on Annie, we can spend time out at your place."

ANNIE: "This is a typical male thing that you're doing, trying to force me into it. I won't do it." She storms off.

Back inside the nest, we see the MOTHER QUEEN deep inside, and the VIRGIN QUEEN EGG is laid and brought to a nearby nursery by ATTENDANT WORKER ANTS. They lick the egg repeatedly, treating it with extra special care, placing it with several other eggs and then guarding them all, sitting on them as needed to keep them warm.

The V.O. by WILLIAM continues: "By then, I had decided to go on no matter what she said. But I really didn't know what would come of it, and the thing that would happen that would turn everything upside down."

In the nest we see WORKER ANTS dying and being carried off to the refuse pits by other WORKER ANTS. The refuse pits – these ant cemeteries – are now overflowing.

Next day at school, ANNIE goes back in to talk to the TEACHER alone. She tries to get out of this match-up with William.

"But why? We had everyone all paired up," the TEACHER asks. ANNIE doesn't know what to say.

TEACHER: "OK, I'll consider it if you give me a reasonable explanation."

But ANNIE can't say anything else. Should she be a traitor and admit that William is not working on the subject of success, but on ants? No, she can't. She is a loyal person and she will just have to swallow her ant phobia for the moment.

While she is giving up we hear ANNIE's V.O.: "Of course I didn't know anything about ants, except that I couldn't stand them. All insects! It was one part of living in Costa Rica that I hated. But the incredible thing was that I almost blew my big chance. Anyway, what could I do? William really had me that time. I decided I would definitely have to find a way to get back at him."

On her quest for new food supplies, the SCOUT meets LITTLE FIRE ANTS. The music turns menacing. Immediately, the LITTLE FIRE ANTS start to attack her and she barely manages to escape, one leg slightly mangled. We follow the LITTLE FIRE ANTS to their nest: it is piled up high with dead bodies and brutally cut off limbs of other insects. There are headless termites everywhere and beetle elytra or wings, the real signs of an ant devoted to waging wars of conquest, or at least aggressive food raiding.

Suddenly, the CAMERA starts back into the air like a rocket, showing the jungle beneath: The rainforest is cut and parcelled into small pieces. That's all that is left from wilderness in this once verdant corner of Costa Rica...

ANNIE and WILLIAM have started working on their kind of field project. Over a montage showing them examining various species of ants, following their trails, notebook diaries in hand,

finally deciding to focus on the LEAFCUTTER ANTS we hear V.O. of WILLIAM and ANNIE continue, alternating in argumentative yet entertaining way. They draw maps and diagrams of the colony, make lists and observations of size, describing what each ant is doing (those above ground for now: scout, shotgun ant, soldier). The V.O. has humour too: "You thought the leaves were to keep the sun off them," WILLIAM says. "That's why they call them parasol ants." ANNIE goes on: "Well, you thought they looked like Easter bonnets on parade." There is the start of some fascination and affection now for the ants.

At end of this montage, ANNIE and WILLIAM suddenly glimpse a strange looking MAN in his mid-sixties as he digs out something and brings it inside his house in large garbage bags. "Dr. Illa...", ANNIE whispers. His forearms are full of stings and bites. He scratches his arms and grumbles to himself, one word at a time, angry about "*Wasmannia auropunctata*... these little devil fire ants who will destroy everything..."

Walking on the path through the jungle behind Annie's house, WILLIAM and ANNIE challenge each other to find out what the leafcutters eat.

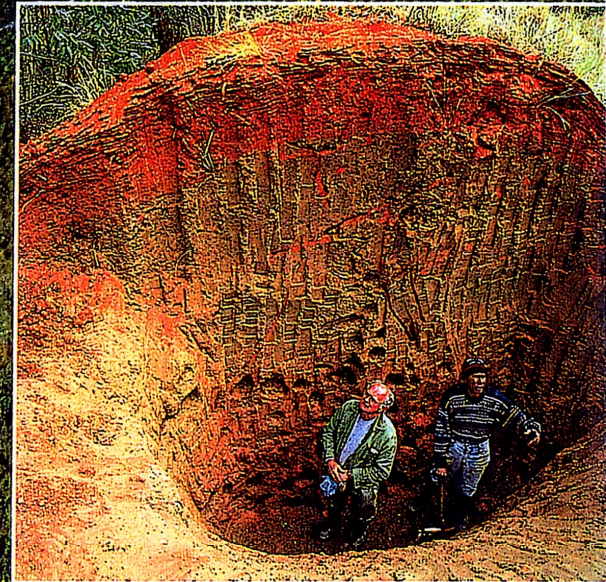
"Well, of course they eat leaves," ANNIE insists. WILLIAM: "No, I reckon they just use the leaves to make their nests."

ANNIE's anger comes up again. Why is he telling her something obviously stupid? "The only thing you want to do is to protest at any price. What's your problem? Think about it: What are they doing the whole time? Cutting out leaves! They wouldn't go to that much trouble if they weren't eating them."

WILLIAM does not agree. He suggests an experiment to set out different kinds of food on the ground and see what they take. They should forget about leaves for the moment, he insists.

Worlds underground

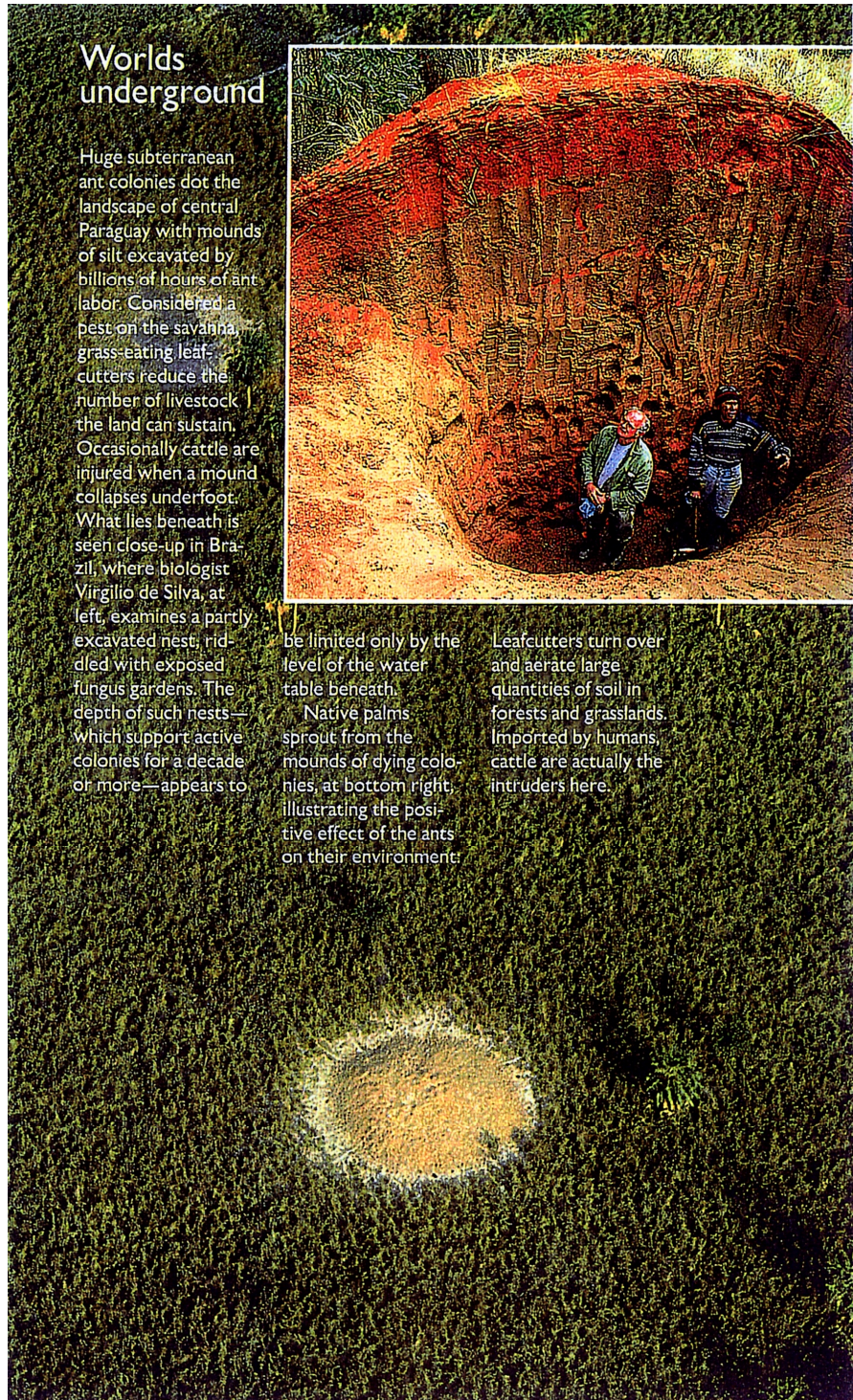
Huge subterranean ant colonies dot the landscape of central Paraguay with mounds of silt excavated by billions of hours of ant labor. Considered a pest on the savanna, grass-eating leafcutters reduce the number of livestock the land can sustain. Occasionally cattle are injured when a mound collapses underfoot. What lies beneath is seen close-up in Brazil, where biologist Virgilio de Silva, at left, examines a partly excavated nest, riddled with exposed fungus gardens. The depth of such nests—which support active colonies for a decade or more—appears to



be limited only by the level of the water table beneath.

Native palms sprout from the mounds of dying colonies, at bottom right, illustrating the positive effect of the ants on their environment.

Leafcutters turn over and aerate large quantities of soil in forests and grasslands. Imported by humans, cattle are actually the intruders here.



So WILLIAM and ANNIE put out various dead insects they find, plus fruits and other odds and ends. They set up a makeshift blind behind a bush. Many different kinds of ants come including the BULLET ANTS and other scavengers, even some birds, but no leafcutter workers.

Then they try leaves – difficult to find in the drought. The LEAFCUTTER SCOUT comes to inspect them but doesn't touch them.

"They're not hungry," WILLIAM says.

The SCOUT and the SHOTGUN ANT continue to search for leaves, but find very little. The sun is baking. We see dead leaves and undergrowth. The SHOTGUN ANT is languid, suffering, and the SCOUT licks her, offers her a regurgitated bead of nourishment. The PHORID FLY returns to bother them, to try to lay eggs on them to parasitize them, but the SHOTGUN ANT, despite her weakened condition, manages to fend off the PHORID FLY, saving the scout's life.

As the camera pans across the vast burial pit full of the broken, withered bodies of so many dead ants, we notice, off to the side, looking on, are a few dozen small, yellowish LITTLE FIRE ANTS. They are biding their time, weighing the best opportunity, the chance to move in and wage their ever expanding war for territory and the spoils of war. A big LEAFCUTTER SOLDIER moves into frame, going over to investigate. The LEAFCUTTER SOLDIER is 25 times the size of the LITTLE FIRE ANT workers. The LEAFCUTTER SOLDIER is surrounded and stung to death. But for now only we in the audience know this, not William and Annie.

On his own, WILLIAM catches a few LEAFCUTTER WORKERS, including the SCOUT and the SHOTGUN ANT, as

they carry leaves along the trail, and brings them into a makeshift formicarium that he sets up in Annie's house.

"What have you done here? Is this just to find out if they eat leaves?" ANNIE asks.

"Come and see; they don't eat leaves", says WILLIAM.
"They're putting them on the floor. See!"

"They're not hungry."

WILLIAM is exasperated with ANNIE and the ANTS. He lets them go near their colony.

The LEAFCUTTER WORKERS run back to their colony, meeting the SOLDIERS at the entrance. They swirl antennae and then the SOLDIERS grab them and execute them, decapitating them - all but THREE WORKERS who manage to escape while the SOLDIERS are busy executing the others. These go off and start cleaning themselves, licking their limbs and sides,

....as we hear the V.O. of WILLIAM and ANNIE explaining the smell of humans having touched the ants, means that these ants, unless they can clean themselves thoroughly, will be killed as well when they return to their colony. "Everything is smell or scent in an ant colony: pheromones.... but we are getting ahead of ourselves."

Suddenly, the massive blade of a shovel comes in the picture: WHOOMP!

It is WILLIAM's shovel digging down. A spadeful or two below the surface it exposes a tunnel and two chambers the size of a human head.

From the ant's POV, we see a sudden flood of light and for a few seconds the ants freeze or move in slow motion as if stage struck. One LEAFCUTTER PELLETMAKER has been caught putting a green leaf pellet into a mass of fungus while another ant is picking the fungus and offering it to a LEAFCUTTER WORKER.

WILLIAM's right eye is magnified 10 x through a loupe.

"What IS that stuff?" says WILLIAM.

Now ANNIE's eye is magnified.

"Whatever it is; that's their food," says ANNIE.

Then they see one LEAFCUTTER WORKER carrying a nestmate's body over her head.

It is the SCOUT carrying the body of the SHOTGUN ANT. Following her with their eyes, she drops the carcass into an overflowing burial pit: a pit filled with thousands of DEAD ANTS.

"Look Annie!" says WILLIAM. "It looks like some bizarre ritual. The ants are praying over their dead."

But, while WILLIAM philosophises, ANNIE has something else in mind: catching the SCOUT, bringing her to the house, putting just a tiny dab of yellow paint on the SCOUT's reddish back and bringing her back to her nest. Then she thinks twice about it and puts the SCOUT some way outside the nest where she can clean herself before going back to the nest. For this time WILLIAM just watches her, smiling to himself: Annie obviously is on the way to overcoming her ant phobia.

WILLIAM and ANNIE continue to observe: The SCOUT cleans herself, then receives something (a bit of food?) from a new SHOTGUN ANT who then hops on the back of the SCOUT and both EXIT.

All around LEAFCUTTER WORKERS exchange things between selected colony members. This is indeed food though WILLIAM and ANNIE do not know what it is; they suspect the ants are eating the substance which looks like the tiny inflated tips of a spongy substance. With the limited food resources, the food goes to the MOTHER QUEEN and to the growing VIRGIN QUEENS which are now LARVAE, soon to be PUPAE.

The mystery of what they may be eating – if they are eating – causes WILLIAM and ANNIE to go to Dr. Max Illa's log cabin. WILLIAM drags ANNIE there. Since the first moment he heard about him, WILLIAM was fascinated and became curious. This man must know a lot. He's an entomologist, an insect scientist, and he lives right here.

In front of the door, WILLIAM is too shy suddenly to knock. "Go on," says ANNIE (intimating that it is the man who is supposed to take the lead). But finally, in exasperation, she has to do it herself.

DR. ILLA opens the cabin door and quickly steps outside, but doesn't invite them in. His arms are clearly full of marks. ANNIE doesn't want to show her repulsion and asks: "What are the leaves for? What is that stuff the ants are eating?"

DR. ILLA: "Which ants are you talking about?"

ANNIE: "The ones that carry the pieces of leaves over their heads – we're doing a school project on them."

DR. ILLA: "Ahhh, the leafcutters or fungus ants. They use the leaves as fertiliser to feed their mushroom fungus gardens," DR. ILLA explains. "They're vegetarians, or more properly mushroom eaters, fungivores, and that's what they live on."

WILLIAM ventures a question asking how he and ANNIE might study and learn more about ants "- to understand the ants' ideas." (WILLIAM doesn't mean "ideas" exactly, but that's how it comes out, and he's a bit embarrassed.)

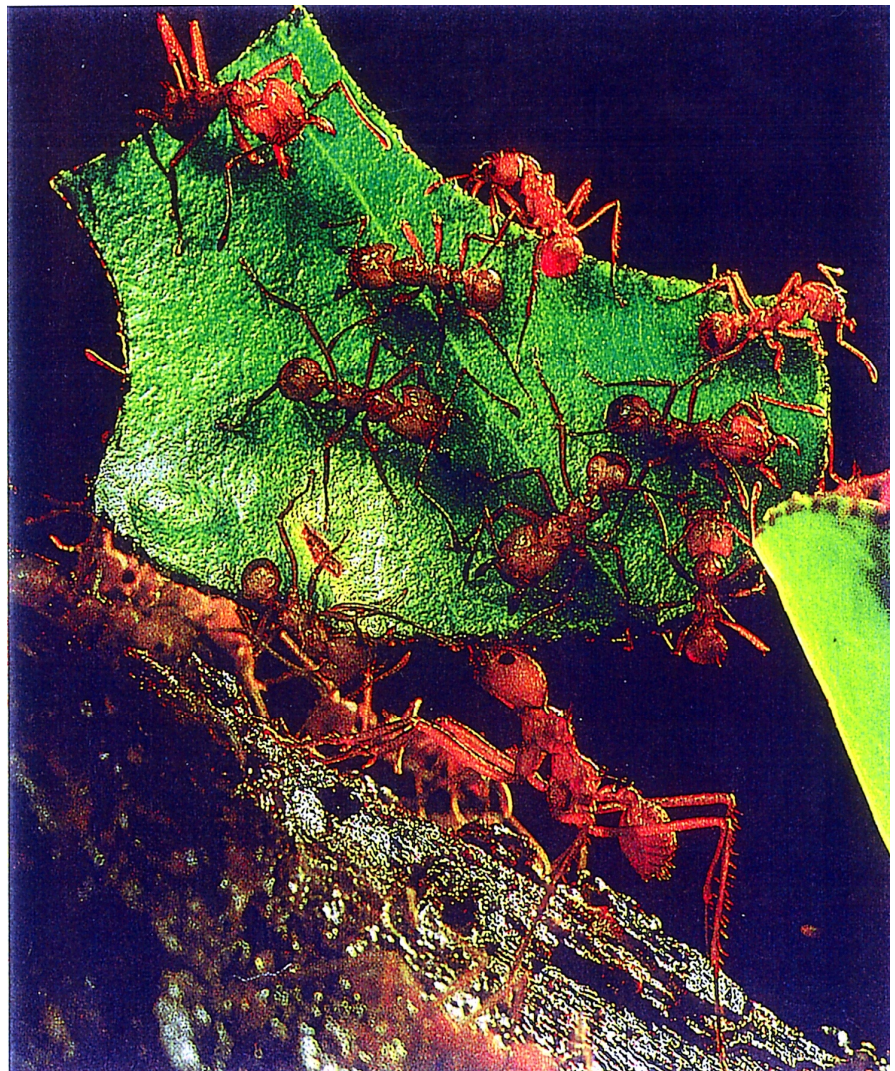
"What do you want to know?" DR. ILLA replies.

"I want to know how it is when everyone has his exact place and knows his function," WILLIAM answers without hesitating.

"That's a big, deep question, young man. The first thing you have to do with any study of animals or humans is to devise a way to identify individuals," DR. ILLA says. "We study the individual to learn about the role in society... and we study the society to investigate the meaning of the individual." His comment hangs in the air. As WILLIAM and ANNIE say goodbye, they try to peer into his living room. But it's very dark inside. Dr. ILLA puts his arm up to block their view and they notice even more the deep injuries, some very recent, the bites and scratches all up and down his arms. But before WILLIAM can ask him about it, DR. ILLA shuts the door quickly.

Walking back to Annie's house, ANNIE tells WILLIAM, "See, I knew we had to mark the Scout somehow...."

Behind Dr. Illa's house, the LITTLE FIRE ANTS are clearing the way, executing any and all comers and spreading their territory to the edge of his log cabin. We see the footsteps of ANNIE and WILLIAM passing by, unaware of the creeping danger.



Back in their growing makeshift lab, ANNIE has brought a computer for keeping track of individuals and preparing the castes lists, and even has secretly brought a microscope from school. In a montage, we see them working and notice their different skills that work together so that we realise they would not have been able to study ants alone. ANNIE is much better in handling the computer. She's the practical one, very reactive (if you would say "never", she will always say "yes, I will"). WILLIAM, on the other hand, has the philosophical and theoretical ideas.

ANNIE and WILLIAM now set about trying to identify individual ants and castes. They measure sizes (head widths) and note lists of jobs done by each size of LEAFCUTTER ANT within a colony. They find 7 castes. Finally, they focus on the largest caste next to the mother.

Like an underground city, we see the LEAFCUTTERS of the various castes, each doing a series of particular jobs. As the SCOUT hands a leaf over to a SHREDDER, the SHREDDER cuts it up into pieces. Then, several PELLETMAKERS take the pieces and chew them into pellets to insert into the mushroom gardens. The HARVESTERS stroll through the gardens weeding and plucking fresh mushrooms which are fed to the colony. The MINIMAS are the tiny workers who surround the QUEEN licking and feeding her, taking her EGGS as they drop from her gaster onto the chamber floor. The EGGS are kept warm until they hatch into LARVAE which are placed right on the gardens so the food is close at hand. The last caste we focus on are the big SOLDIERS who just stand around, seeming to do nothing.

"This caste was the soldier or major caste," says ANNIE's V.O.: "I knew that they were probably males – standing around doing nothing was a dead give-away – although William wasn't so sure. They certainly didn't work. I supposed they were just staying ready to fight."

WILLIAM and ANNIE watch the SCOUT and new SHOTGUN ANT bring a fresh leaf into the colony. With the tiny dab of yellow paint on her back, it is easy to keep track of her.

Shifting to ant POV, we see the trail of summoned WORKERS stream out of the nest following the route from which the SCOUT came.

WILLIAM's V.O.: "There were still so many pieces that just didn't fit. How did the ants talk to each other? How do they all know where to go?"

WILLIAM: "We've got to go in deeper, and find out what's really happening inside."

When ANNIE and WILLIAM come back to their "lab" they find a mysterious box that someone has anonymously sent to them with a note: "The language of the ants. Use with care." Inside they find citronella, a naphthalene ball, and six other bottles with odd scents.

Down in the leafcutter nest, the VIRGIN QUEEN meanwhile is changing from wriggling larvae to immovable pupae, wrapped in a mummy shroud and waiting for her new life. But we get a glimpse of a conflict within the colony as well. At the other side of the chamber, only a few inches from the giant baby mouse-size LEAFCUTTER QUEEN, several LEAFCUTTER WORKERS are trying to lay eggs. Methodically, the LEAFCUTTER QUEEN sets about destroying their eggs though she refuses to harm the apparently competing LEAFCUTTER WORKERS. Only her eggs will be allowed in this colony!

For WILLIAM this supports what he always thought. "You see, every ant is doing one role, playing its part in a perfect superorganism. That's why it's so successful. Weaknesses or

departures from the order are not tolerated. Only the queen is supposed to lay eggs; not the workers, so the other eggs are simply destroyed." ANNIE has her own thoughts about it. "Horrible! Destroying another ant's eggs. You really think this should be a model for our life? You think genetic determination is better than free will?"

It is ANNIE who wants to find out more about it now. She proposes to change the positions of individuals inside the colony. Will they take on different tasks? WILLIAM is deeply impressed with Annie's idea. "Let's say if one ant could change place, what would happen? Is it allowed or not?" ANNIE (V.O.): "I always thought if my mother had not demanded that my father be home more often, that he help around the house, that he would not have left. Maybe that wasn't the main disagreement, but I do think a leopard never changes its spots. But ants, well we know they're different..."

That is how both kids leave the observation stage, and begin to think about the experimental invasive procedure (thus mirroring the development of science), and soon they will see what happens...

WILLIAM and ANNIE move part of the colony to the makeshift formicarium in Annie's house (their lab). They dig deeply into the colony.

The LEAFCUTTER COLONY is now deeply exposed, though the workers move into action to repair the hole.

WILLIAM and ANNIE gently sort the workers by size. They put mushrooms in one box, leaves in another. They take the tiny LEAFCUTTER HARVESTERS and put them with the large leaves to see if they will cut them up and carry them. They put the SCOUT and some other large SHREDDERS, plus a few SOLDIERS in with the garden to see if they will weed it and cut the tips for food.

After some hours, it seems there is no success. ANNIE (V.O.): "We had the right idea but not the right way to stage it. Dr. Illa chuckled when he heard what we'd done and said that we would need to kill the entire caste and then we would see some real changes." When we refused to kill a whole caste of ants, he told us that it was an experiment that the famous entomologist E. O. Wilson had done, his one-time mentor at Harvard. Wilson found that the ants would definitely fill in for each other, and that even if you reduce the entire colony to only the queen, she would rebuild the colony and do all the work until she had replaced all the castes, one by one, starting with the smallest castes first, the big soldiers last.

Outside at the LEAFCUTTER COLONY, WILLIAM and ANNIE are arguing violently. ANNIE: "I don't see what's wrong with replacing a few workers and soldiers that we removed with workers and soldiers from another leafcutter colony in the forest. You know the one on the way to school? We've taken some of their forces as it is, left them vulnerable, and besides why shouldn't it work?" WILLIAM: "It's like doing a human organ transplant; it's not that easy. If we don't do it right, there could be rejection." ANNIE: "These are just ants for god's sake." WILLIAM: "You just don't get it, do you? Go on, you're so stubborn, do what you have to do; I'll watch you make a mess of it."

WILLIAM follows ANNIE along the path until they come to the SECOND LEAFCUTTER COLONY. Using tweezers and tubs, ANNIE removes about 50 WORKERS and SOLDIERS. WILLIAM smiles, but only because of ANNIE's obvious discomfort at having to pick up and move around the big SOLDIERS, though she is getting much better. At one point, a big SOLDIER falls on her arm, but before it can bite her, she brushes it off with a reflex action. Then she carefully picks up the SOLDIER again and puts it in the tub with the others from the same caste. "Dios mío," ANNIE says, reverting to Spanish. "Sorry, little fellow."

WILLIAM and ANNIE return to the LEAFCUTTER COLONY with the hole where they have dug down and removed sections, still clearly evident. They empty out the box full of soldiers, workers and bits of the other nest.

First one SOLDIER, then another tentatively explore the foreign nest, through the gaping hole, as large WORKERS who are repairing the nest stroll over, swirling their antennae.

WILLIAM: "So how will we tell them apart? The ants in the two colonies are identical." ANNIE: "Oh, no, look."

The first large WORKER, having determined that the soldier is not from the same colony, lunges at the big ant – a suicidal mission. The battle is on, as the introduced SOLDIERS and WORKERS fight the members of the colony in hand to hand combat. These two colonies are obviously enemies. It does not matter that they are the same species. It is a vicious, heart-rending battle.

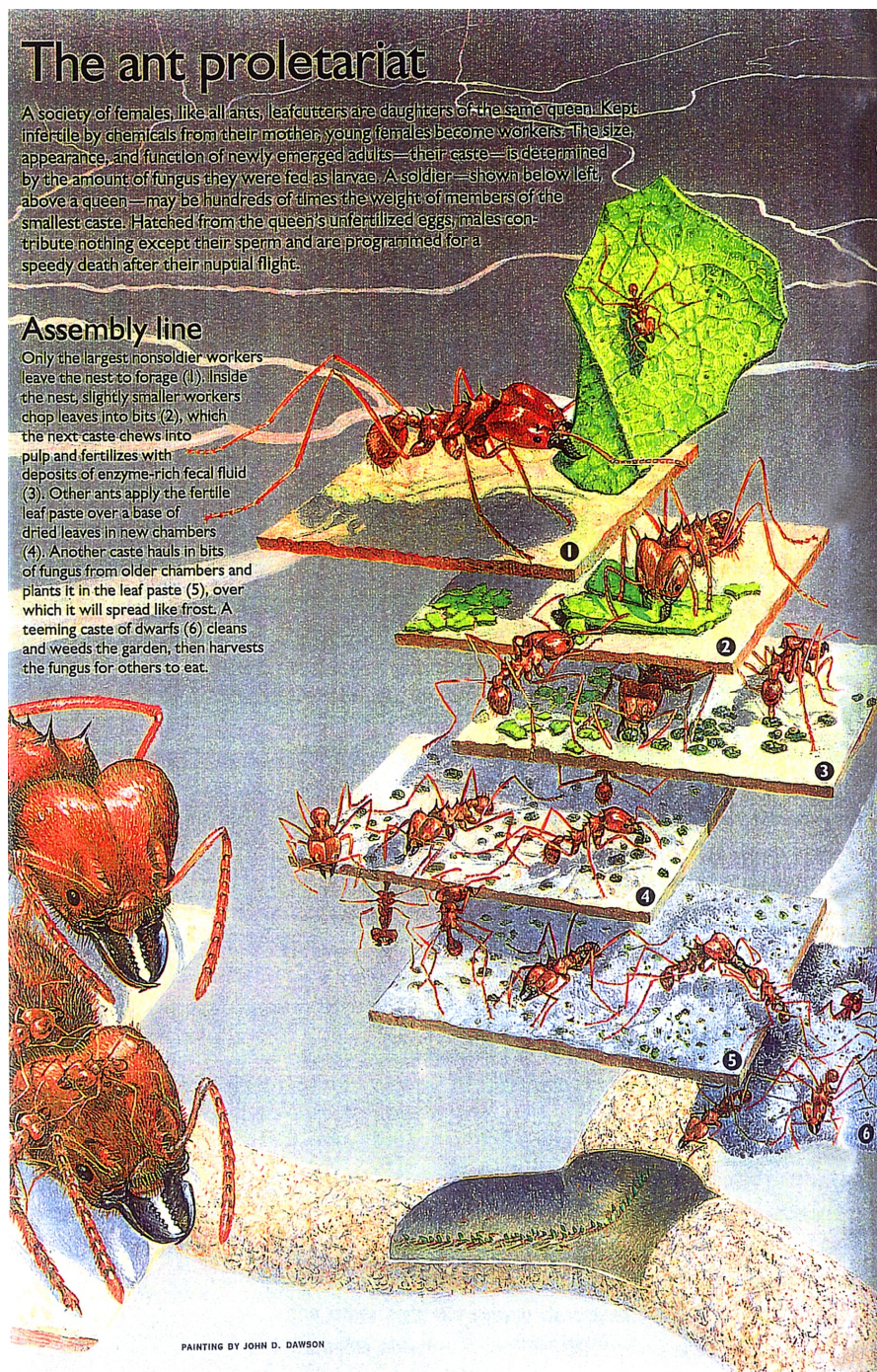
WILLIAM is fascinated as he observes – so fascinated that he doesn't even bother to tell ANNIE: "I told you so". There are only two different types of behaviour for the two ant colonies in this case: fighting till death, or fleeing. In accounts of ants enslaving other ants there is also assimilation, but this does not come into it now. WILLIAM and ANNIE illustrate these results through the material they are making – video, drawings, polaroids, etc. – and WILLIAM even starts to make a list of possible weapons and strategies of war based on what he imagines and has seen in other ant species (mainly the evolution of mouth parts as weapons and clever ways of using them, but there are heads evolved into blocking tools, bodies with armour, and many other weapons and techniques).

The ant proletariat

A society of females, like all ants, leafcutters are daughters of the same queen. Kept infertile by chemicals from their mother, young females become workers. The size, appearance, and function of newly emerged adults—their caste—is determined by the amount of fungus they were fed as larvae. A soldier—shown below left, above a queen—may be hundreds of times the weight of members of the smallest caste. Hatched from the queen's unfertilized eggs, males contribute nothing except their sperm and are programmed for a speedy death after their nuptial flight.

Assembly line

Only the largest nonsoldier workers leave the nest to forage (1). Inside the nest, slightly smaller workers chop leaves into bits (2), which the next caste chews into pulp and fertilizes with deposits of enzyme-rich fecal fluid (3). Other ants apply the fertile leaf paste over a base of dried leaves in new chambers (4). Another caste hauls in bits of fungus from older chambers and plants it in the leaf paste (5), over which it will spread like frost. A teeming caste of dwarfs (6) cleans and weeds the garden, then harvests the fungus for others to eat.



PAINTING BY JOHN D. DAWSON

"But how do they know which ants belong to the colony and which don't?" WILLIAM asks. "They all look alike. Where do they get their orders from? How do they communicate?"

Both WILLIAM and ANNIE gaze over toward the mysterious box: "The language of the ants".

Hours later, WILLIAM and ANNIE see LEAFCUTTER WORKERS acting strangely around the box and they realise what it is: the pheromones of the ants. WILLIAM and ANNIE examine about a dozen bottles, each of which has a different label with a name and chemical symbol such as "trail substance", "evacuation - attack", "evacuation - water", "male/female sexual attractant", "help me; I'm buried", "fighting", and "war". In V.O., as WILLIAM and ANNIE look at the bottles one by one, WILLIAM says, "It turned out that all ant colonies have between 10 and 20 different chemical formulations or pheromones, produced from different exocrine glands in the body, especially in the head and mandibles and in the gaster, which they use to communicate with each other, to find and collect their food, to build and protect their colonies, to raise their young, to mate – in short, to accomplish everything they need to thrive. Vision and touch and even sound play some part in this. Sometimes a chemical emission – e.g., the distress call to summon a war party – can be enhanced by a little dance or some physical contact, but smell is the critical sense and is communicated through the antennae – that's why ants are always waving their antennae around. In addition to the communication smells, each colony has its own nest smell – even colonies of the same species fight or avoid each other. It was all starting to make sense. And it was opening up the most amazing world I had ever considered." ANNIE (V.O.): "I couldn't stop thinking about perfumes and how humans use smells, but I knew it was so much more. For one thing I couldn't figure out about male and female. Did they smell and communicate differently?" "I do think so," said WILLIAM, collapsing with laughter, "females always smell better than males, at least in humans." ANNIE (V.O.): "But this time I insisted we go ask Dr. Illa."

At Dr. Illa's door, WILLIAM cannot believe it when he hears that ant societies are entirely female. "I thought they were," says ANNIE. WILLIAM: "Sure you did!" But William is humbled by the gaps in his knowledge when he felt he was beginning to suss out the colonies.

"The males don't do any work," says DR. ILLA. "They're born at the same time as the virgin queens in a special royal brood produced once a year by the mother colony. Over the 20- or 30-year lifetime of the colonies they may produce a couple dozen of these royal broods. Both the queens and males in every royal brood are pampered while they wait for their chance to mate, and then the males die."

Part of this sequence plays over the LEAFCUTTER COLONY where we see that the royal brood is being cared for deep inside the very colony nest that WILLIAM and ANNIE have adopted.

The V.O. of WILLIAM confirms it: "Little did we know at the time, that our own leafcutter colony at the edge of the forest was already in the process of producing its own royal brood and that it would be crucial to its survival." DR. ILLA considers telling them about the magical mating sequence but then he breaks it off. "You kids are too young. You won't understand...", and he goes back to his world.

WILLIAM and ANNIE walk back to check on the LEAFCUTTER COLONY.

Behind Dr. Illa's house, unbeknownst to William and Annie, the LITTLE FIRE ANTS have spread their territory even farther from the edge of Dr. Illa's log cabin, to an area close to where the LEAFCUTTER SCOUT and WORKERS are searching for leaves. We see the footsteps of ANNIE and WILLIAM passing by so close, yet so unaware of the creeping danger.

Noticing the LEAFCUTTER SCOUT and WORKERS, WILLIAM stoops down to look: "Not many leaves out here." As WILLIAM and ANNIE watch the LEAFCUTTER WORKERS search, they suddenly notice off to the side the LITTLE FIRE ANTS.

"Hey, Annie, look at these little yellow ants! I wonder what they're up to," says WILLIAM.

WILLIAM and ANNIE watch with eager interest.

First there is the swirling of antennae, followed by the ritual exchange of pheromones. The LEAFCUTTER WORKERS swirl their antennae one by one against the line of LITTLE FIRE ANTS.

Watching, WILLIAM turns to ANNIE and imitates the action of the swirling with his hand and two fingers shaped to look like an ant with antennae. But ANNIE shouts, "William, look!" WILLIAM and ANNIE observe with surprise and mounting horror, as the LITTLE FIRE ANTS suddenly declare war on the LEAFCUTTER WORKERS.

The LITTLE FIRE ANTS surround, spreadeagle and kill the LEAFCUTTER WORKERS one by one. The SCOUT, still hobbling a little from her injured leg, and several LEAFCUTTER WORKERS escape and race back to the nest. All the way, they dispense the war pheromones ("help - send soldiers"). The trail will not only show the soldiers where to go but will tell them what to do once they get out there to the front.

ANNIE: "This is terrible! We've got to stop this!" WILLIAM: "This is life, Annie." And they get into another argument as we switch to ant POV.

The LEAFCUTTER SCOUT, emitting pheromones from her mandibles, recruits a contingent of big SOLDIERS who stream out of the nest, two and three abreast, heading toward where the LEAFCUTTER WORKERS were killed. Arriving at the scene, the LEAFCUTTER SOLDIERS go into action fighting the LITTLE FIRE ANTS. At first it looks like not much contest as the SOLDIERS destroy the first workers they see, chopping off their heads and cutting into their gasters. But the LITTLE FIRE ANTS have numbers and ferocity and they soon surround each SOLDIER in turn and perform their vicious execution. The LEAFCUTTER SOLDIERS fight to the death, legs are simply snapped off, before still-writhing torsos are snapped into pieces by fierce LITTLE FIRE ANTS. The whitish blood of ants is flowing everywhere.

ANNIE and WILLIAM initially heartened by the sight of the SOLDIERS, turn disconsolate as the LITTLE FIRE ANTS begin to kill the SOLDIERS one by one. ANNIE: "We can't just stand here." She is growing increasingly impatient. Finally, she runs off, as WILLIAM remains at the scene to witness the last stand of the LEAFCUTTER SOLDIERS.

The LEAFCUTTER SCOUT, with the SHOTGUN ANT, stands off at a short distance observing the final battle. With so many pheromones ruining the air, the SCOUT will soon be driven to call up reinforcements. About fifteen SOLDIERS remain in the midst of thousands of LITTLE FIRE ANTS.

ANNIE returns, running and out of breath. ANNIE: "We don't have the little fire ant pheromones, but we do have those of the leafcutters. We have to do something."

WILLIAM, looking at the bottle labelled "follow trail; gather leaves": "You're going to make them gather leaves?!"

ANNIE: "I don't know what else to use; it's worth a try."

Using the eye dropper, ANNIE dispenses a thin trail leading away from the battle scene into the forest.

Responding immediately are the LEAFCUTTER SCOUT and SHOTGUN ANT, but there is no sign of the other ants.

ANNIE: "William, it's working!"

WILLIAM: "Oh no, it's not." He points to where several LEAFCUTTER SOLDIERS are still fighting to the end.
WILLIAM: "The leaf-gathering pheromone must not work on soldiers. Of course, they never do any real work; they just fight."

ANNIE and WILLIAM sadly (even WILLIAM has a touch of sadness) watch the conclusion of the battle as all the remaining LEAFCUTTER SOLDIERS are dismembered and defeated. They discuss whether to bring out more leafcutter soldiers from the nest, using the "war pheromone", but what if they simply bring more to their death? WILLIAM: "They know better than we what to do to survive. I think we need to wait and see what happens."

Walking back to Annie's house, however, WILLIAM and ANNIE see ANNIE's MOTHER in her garden doing something. She is crouching near a grapefruit tree that she had just planted a few hours before. ANNIE's MOTHER (shouting): "My new grapefruit tree is covered in ants!! You just can't grow anything here!" She curses and heads into the house as WILLIAM and ANNIE go to investigate. They find to their surprise LEAFCUTTER WORKERS. At first they are pleased to see them cutting leaves out, nevermind ANNIE's MOTHER, but then WILLIAM notices some fighting. WILLIAM: "Annie! Look!"

LEAFCUTTER SOLDIERS and LEAFCUTTER WORKERS are fighting each other - soldier against soldier, worker against worker. Echoes of the American Civil War as sister fights against

sister. At the macro level with ants, the realities and parallels to human war are all too evident. Pieces of ants are everywhere. Ants are dying or dead. The fierceness of the mandibles biting into other ants is surprising in its intensity. If anything, this battle is fought even fiercer than the one against the little fire ants, perhaps because the two are apparently equally matched.

WILLIAM: "It makes no sense." ANNIE: "I was just starting to like ants. I think I'm going to go back to hating them." Both ANNIE and WILLIAM are watching the trail of LEAFCUTTER SOLDIERS arriving from the jungle. There are LEAFCUTTER WORKERS carrying leaves over their heads, but most of the approaching ants are SOLDIERS. Then WILLIAM notices something on the other side of the grapefruit tree. There is another trail and it leads in the opposite direction toward the old cacao farm. WILLIAM and ANNIE follow the trail and after 200 meters behind an old out house, discover a huge SECOND LEAFCUTTER COLONY.

As we return to the battle of what we now realise is the LEAFCUTTER COLONY vs. the SECOND LEAFCUTTER COLONY....

....we hear ANNIE (V.O.): "We suddenly realised that these were ants of the same species but from two different colonies. And they were fighting each other around the grapefruit tree where they had apparently met while collecting the leaves. It seemed a terrible waste of life. In many ways it disturbed us much more than seeing the little fire ants fight the leafcutter soldiers. It was so puzzling: why would leafcutters fight and kill other leafcutters?"

At the battlegrounds around and on the grapefruit tree, as the battle royal continues - ant against ant in a Hobbesian struggle - a huge spray can comes into view as the battle of the LEAFCUTTER SOLDIERS and LEAFCUTTER WORKERS goes on. The spray clouds the air and the ants begin dying. Another

blast and more die. LEAFCUTTER WORKERS come out to investigate the dead.

It is ANNIE's MOTHER and she has returned with some insecticide. With WILLIAM and ANNIE returning from the second leafcutter colony, following the trail reinforcements of LEAFCUTTER SOLDIERS, they do not immediately notice ANNIE's MOTHER's actions.

ANNIE, suddenly noticing her mother: "Mother, put that away!" ANNIE's MOTHER stops, is bemused. ANNIE: "You don't know what you're doing! These are the ants we're studying for our school project." ANNIE's MOTHER: "Oh all right then, but can you take them away from my grapefruit tree?"

The LEAFCUTTER WORKERS carry their dead back along the trail to the LEAFCUTTER COLONY. Inside the COLONY, near where the entrance holes had been opened and are still being repaired, the LEAFCUTTER WORKERS deposit the broken, dead bodies one by one in the massive refuse heap, already filled with ant bodies, and now attended by other insects who dart in (through the gaping hole) to try to feed on the spoils before being driven off by ants.

ANNIE and WILLIAM go to DR. ILLA and want an explanation for the fighting between two colonies of the same species. DR. ILLA is first a bit aloof, answering them with a question: "Don't you know that the fiercest battles that any species has is with its own species?" ANNIE laughs nervously but WILLIAM is deeply intrigued. DR. ILLA: "The members of any given species crave the same types of food, have the very same need for food, water and space, and yes the same desire for acquiring more territory. So that's why they fight each other so fiercely. It's no different with humans." The comment hangs in the air.

WILLIAM says, "But why now? Will they destroy each other?" DR. ILLA says that it's because there is no water. DR. ILLA tells ANNIE and WILLIAM that the drought in Costa Rica is affecting ants too. The leafcutters can't find the leaves they need; many leafcutter workers, larvae and pupae are dying in the nests. When an ant dies, the other ants pick it up and take it to a burial place inside the nest.

They now realise the problem with the leafcutter colony. DR. ILLA talks about the importance of ants to the world, that they turn most of the soil, doing much more work than all the world's farmers, and that Earth would be a much less verdant place without ants. But much more than this, that ants have social systems that can teach any organism about how to survive.

Meanwhile, ANNIE (V.O.) comes in: "We were half listening to him at the time, though later we would reflect on all of this, and it continues to have a deep resonance today. But we were just thinking about, just so concerned with our leafcutter colony. We were starting to realise this little project of ours, for us it was a project, but for the ants it was their very lives at stake."

As DR. ILLA begins to speak about what ants are for and why they are so beautiful, he is animated – his face becomes softer, glowing. DR. ILLA decides to show WILLIAM and ANNIE his secret: his living room, kitchen, dining room, hall, the whole cabin/house is filled with ant colonies in various formicaria. One colony, right at the centre, is very special and rare. He invites WILLIAM and ANNIE to look – but they can see nothing at all.

DR. ILLA: "Keep looking!" He says, over their shoulder. "There are 75 ants right before your eyes."

"Where?" ANNIE asks.



"They're the tiniest ants in the world, right?" says WILLIAM.

ANNIE moans. "Wow.... I see them!"

"Not the tiniest," says DR. ILLA. "But the slowest and the dirtiest ants in the world. You see, most ants charge about and they're very clean – the cleanest animals you'll find in the jungle. You have to be if you live in dirt and rotting wood. But these ants took a different evolutionary path. They have the ability to remain stock still for long periods of time, and they collect dirt on their hairs which act as perfect camouflage. My mentor E. O. Wilson from Harvard was the first to study these ants with his buddy, the German antman Bert Hölldobler. I'm looking at their predatory behaviour. It may seem impossible for such a static creature to catch anything, but they are like a Venus flytrap plant. They stay still until another insect is almost touching them with a convulsive snap of their jaws. This is the little fire ant pheromone: Watch what happens. "SNAP!" No one knows about this yet. They break a lot of rules of ants so they're interesting. *Bassicerus*. This is one ant that doesn't need to fight. – You won't tell anyone, will you?"

WILLIAM and ANNIE shake their heads as much to say "no" as to show their amazement at the bizarre diversity of the ant world. They look at DR. ILLA, this unkempt, strong-smelling recluse. He's a bit like his favourite ants – slow, dirty, trying to blend in and not be noticed, but remarkable all the same.

Off in a corner enclosure, well away from all the other ants, WILLIAM and ANNIE notice some of the LITTLE FIRE ANTS (WILLIAM: "Hey Annie, these guys, I mean girls, look familiar.") and DR. ILLA mentions that he is studying them to learn their pheromone system and what makes them tick. "This is a very obnoxious ant indeed. See these marks on my arms?! You probably thought I was a masochist or drug addict. The little fire ants may be tiny, but their stings are 5 on a scale of 5: painful. But, more important, their behaviour, their aggressiveness towards other ants and insects, is very threatening and dangerous.

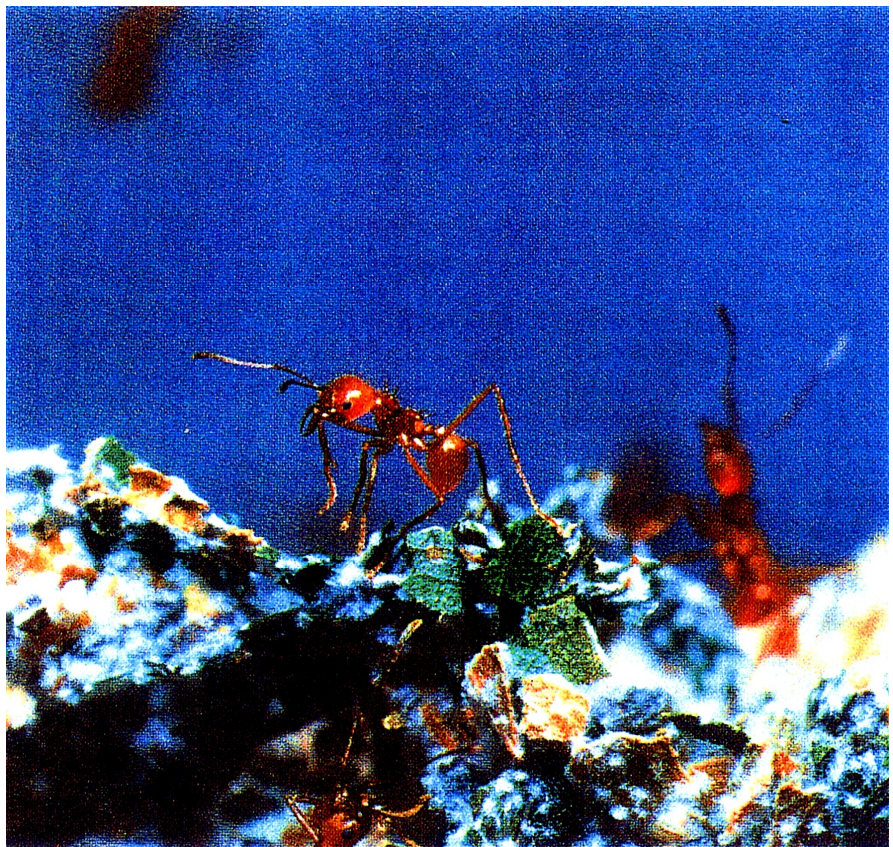
Outside, all around Dr. Illa's cabin, the LITTLE FIRE ANTS are massing. They are preparing a charge, preparing to mount the first invasion. They are coming from every direction and lining up along the wooden perimeter of the house. They have nearly surrounded it. They are looking for a way in.

WILLIAM starts to say they saw the little fire ants fighting the leafcutter colony, but before he finishes, ANNIE interrupts: she has noticed a collection of ants in amber in a case. "What are these? They're beautiful!"

ANNIE asks if this is a jewellery collection. "Jewellery?" DR. ILLA says incredulously. He opens up the case and takes out a glowing orange chunk of amber. "This, my friend, is the first primitive solitary wasp, the ancestor of the first ant. It has wings, you see; it was caught in the amber after its nuptial flight almost 200 million years ago. It was a solo hunter, I suppose a rather lonely creature, before the time of these great ant societies. But this creature may hold the secret as to why ants evolved to become social, the secret of their success."

WILLIAM and ANNIE are spellbound. "Why don't you open it up and see if there are eggs inside? Couldn't you tell about its social life that way?" ANNIE asks. WILLIAM: "Yeah, we'll make another Jurassic park with these ants! Wasn't the original one in the book supposed to be in Costa Rica or somewhere like that?"

DR. ILLA smiles. "Oh there's nothing inside. What you see are the faintest traces of the exoskeleton imprinted on the amber. If I tried to section it, my precious ant, like the smile of the Cheshire cat, would disappear entirely. There is no ant here; it's just carbon film and a few trace molecules; what you see is just a cavity. We can never rebuild the past. We can only look at it in awe. But I can tell you something else that's much more beautiful..."



DR. ILLA holds up the primitive winged ant as if giving her wings of flight, so that she might finally be able to return to earth, lay her eggs and pass her genes on to the next generation. "Something drove these animals to live together and work together and they learned how to do it in a perfect way that even humans cannot approach..." he mumbles. "They will survive us, if we don't destroy the entire Earth with ourselves."

DR. ILLA wants to tell the beautiful story of the nuptial flight, and WILLIAM and ANNIE are eager to hear it. But DR. ILLA (friendly and casual now) interrupts them: "Why don't you join me for dinner? (to ANNIE) You know, they say that if you hold the piece of amber under your chin, if it reflects amber on your skin, that means that you are a myrmecophile." ANNIE: "A myrmecophile? "An ant lover!" laughs William, "Don't you know your Greek?"

Outside and all around Dr. Illa's cabin, the LITTLE FIRE ANTS are now growing even thicker in number. Beneath the front porch, they have found a way in through the floor boards. One goes in, looks around, then comes back out. Four more go in; all come back out. More milling and waiting.

DR. ILLA cooks with WILLIAM and ANNIE – a steaming meal of beans, rice, tortillas, and very hot peppers. The sun sets while they sit down to a candlelight-dinner. DR. ILLA looks up and smiles, then turns and asks them to tell something about themselves.

WILLIAM starts philosophically: "I think we need to show and prove our worth to others, how we fit into this strong social structure of our parents, our communities and I suppose most of all our peers. My parents never gave that sense to me; there are no limits with them, it's always liberal and nice. OK, that's fine. But at the same time I felt no real love or care. In ant societies everyone has his place, a sense of belonging." "Her place," smiles ANNIE.

WILLIAM continues: "Human society should definitely change. I hate people who are not useful for society, who have no contribution to it. My father doesn't have a real job, the best he can do is just sit around writing novels that no one reads, and then he has to write up sports scores for games he doesn't even watch or care about, to make a living. I don't know," WILLIAM interrupts himself. "And then I see these two colonies are fighting each other. At first I thought, oh, it's perfect, everyone has her place, what a great concept of altruism letting oneself get killed for the others. But then these are animals that are reproductive, so how is it possible they're doing it..."

"Altruistic people are supposed to be idealistic not realistic," says ANNIE. "But what we see with ants is that altruism is necessary for their society. To make the whole system work, they must give up their lives for other members of the colony. But a human person can have a purpose for the whole and be selfish at the same time. That is how a good society works. My father is a jazz musician, he loves to make people happy. He is the best man in the world. The only thing is that he didn't make me happy when he left. I guess I should be altruistic, let him spread his joy as widely as possible."

WILLIAM: But that's the thing I just don't get. WHY does an ant have to be altruistic? If all the workers are female and the queen is the only reproductive member of the society, why would the other females give themselves up? Why wouldn't they want to have their own young and to pass their genes on? It doesn't make sense.

DR. ILLA: "Well you're not alone in being puzzled by this. Darwin had the same reservations. In fact, he thought the sterile worker castes of the ants would be fatal to his whole theory of evolution by natural selection. But he solved it by realising that animals, including humans, might also be interested in the survival of closely related individuals. For example, if you don't have any children, you might be very interested in helping a nephew or niece of your sister who shares a lot of your genes."

ANNIE: "Not my sister; I certainly wouldn't be interested."

DR. ILLA: "But you see the point. And with ants, bees and wasps, they have a peculiar reproductive system that guarantees that the workers will be more closely related to each other, and therefore more interested in helping and being altruistic, than they would be to their offspring, if they were to have them. So ants have even more genetic reason to contribute to the success of the colony than do humans with their extended families."

For WILLIAM it is like a brilliant light going on, as he suddenly realises the beauty of the ants' system.

But ANNIE's impulsive comment says it all: "With humans I guess we have this culture thing, and religion and philosophy and all the rest which complicates things. I mean why would William and I be so interested in the survival of these ants? We're not related to them."

DR. ILLA: "Well of course you are. We're all related. Ants and humans are separated by a mere 600 million years of evolution. But yes, I see your point. There is no genetic reason why you would single out leafcutter ants and be interested in their survival alone. You are interested because of cultural reasons – your project, your familiarity with them, your human curiosity about how the world works."

DR. ILLA, ANNIE and WILLIAM move outside to the porch and look into the sky when the old man starts to tell them about the nuptial flight.

As DR. ILLA talks, ANNIE becomes more animated and emotional, recalling her father's jazz music and we hear some jazz sounds now. DR. ILLA: "At first, when the virgin queens emerge from the nest, they stand in the doorway, winged Aphrodites, the

great hope for the colony. Each prospective queen walks slowly, making her glorious entrance to the wide world, her wings glistening, her body lean, lithe and shiny. All the colony comes out and stands around watching the spectacle. Antennae are swirling everywhere and the air is suffused with the chemical pheromones of unbridled sex, and then you see them taking off at once and filling the skies. It is poetry in motion." ANNIE and WILLIAM are entranced at this display of Dr. Illa's passion and enthusiasm. But then there is a sobering note when DR. ILLA adds: "The nuptial flight of your leafcutter ants can only happen after a good rain. It is so dry this year, however, I wonder whether there will be any successful reproduction. We desperately need some rain."

It is late when ANNIE and WILLIAM walk back through the jungle to her house. Even in the nearly full moon night, once they are under the closed rain forest canopy, it is dark. We hear the sounds in the jungle, a fairy-tale-like feeling, at first almost comical, then realistic and a bit frightening. They have a flashlight but it does little to penetrate the blackness. Everywhere on the sides of the path, there are eyes staring at them, briefly flickering in the beam of the light. ANNIE is still ecstatic from the poetic story of the nuptial flight. But WILLIAM is very quiet, brewing inside.

Suddenly WILLIAM trips over something on the ground, stumbles, and falls. The torch light disappears in the leaflitter, rolls under a log. They have no light anymore. It's very dark and they are lost.

ANNIE reacts angrily, crying. She is angry with herself; it's her own reaction to her fear. Lost in the wilderness, she finds that her fear comes up in her throat. That's what her initial phobia of ants was about: she was afraid to face things she can't control, afraid to face wild things.

Nervously WILLIAM gropes for the torch and he finds it, glimmering beneath a pile of leaves. ANNIE is relieved.

Suddenly WILLIAM holds her by the hand: "Look! Leafcutter ants! We must be near your home..."

In the dark WILLIAM and ANNIE try to follow the trail. Instinctively, ANNIE grabs his hand tightly. But WILLIAM has an idea to defuse Annie's fear. Telling her to stop for a moment, he turns the flashlight on his own hand and says, "Look, Annie!" WILLIAM is making a shadow ant. We see it against the trunk of a tree. WILLIAM wiggles his two fingers round and round to simulate the antennae greeting. ANNIE laughs and says, "Hey, wait, me too!" Annie's shadow ant swirls its antennae approaching William's ant and then both ANNIE and WILLIAM collapse in laughter.

WILLIAM stops: "What's the smell?"

ANNIE: "You're getting like an insect."

WILLIAM: "No, it's not pheromones; I think I smell fire."

As they emerge from the dark part of the jungle into the clearing where Annie's house is, we see the reddish-brown horizon and billowing white smoke. "Fires!" says ANNIE. "This happened once before here a few years ago; it's so dry!"

WILLIAM is much more concerned than ANNIE has ever seen him before. "Everything is dying," he says, half to himself. "If ants are dying, then the world is dying."

It is ANNIE who tries to calm WILLIAM this time. "Don't worry. I'm sure it's contained. They often burn their fields around here, but it rarely gets out of hand." Suddenly they trip over dead mammals, as they try to get home, not letting go of each other's hand. The final straw is bumping into a dead spider monkey, its face eerily human and one eye open, glassy and cocked to the sky. WILLIAM shines the light on him. ANNIE: "He's covered in ants!"

WILLIAM: "The rain forest clean up crew." ANNIE: "No, look, not just any ants – those are little fire ants." WILLIAM: "You're right!" ANNIE: "I hate those ants."

ANNIE (V.O.) (as they reach the edge of the brush and see Annie's house with the light in the window): "Something just wasn't right with William. We had shared a wonderful evening and had grown so close together. But now I felt him pulling away. I didn't know if it was me – I hope I didn't upset him too much when I suddenly became frightened – or the way our project had sort of taken over our lives, which suddenly made the fate of the ants and the forest so important. It was almost as if it wasn't worth living if the leafcutter colony couldn't have a world to survive in."

It's too late to go back to the college, so WILLIAM stays over as he sometimes does, sleeping in the lab. In the still fire-lit night, WILLIAM says goodnight to the LEAFCUTTER WORKERS in the formicarium. And now the loneliness, sadness, his private realisation overwhelms him. He sheds a few tears, then buries his head in the pillow and tries to sleep.

A telephone rings in the house. ANNIE's MOTHER knocks on the door of the room where WILLIAM is staying. "It's your father on the phone." With the time difference, he has called rather late. The news is that his father, the novelist, has been offered a job in advertising in eastern Europe and there's a great school there that William's parents want him to go to. Although WILLIAM balks immediately at the offer, he is torn. He does miss his parents after all, even though it was his idea to come to Costa Rica. He could leave now and cut his losses.

Next morning, WILLIAM alone visits the place where he and Annie got lost and the place where the LEAFCUTTER COLONY lives. He passes the completely denuded grapefruit tree at the back of Annie's house. It's the same disaster everywhere: drought and fire have killed so many animals and insects, the LEAFCUTTER

COLONY is now reduced to half. The scenes of devastation are revealed in detail.

The SCOUT returns from foraging empty-handed. She is clearly limping heavily now.

WILLIAM notices the SCOUT LEAFCUTTER with the bit of flaking yellow paint on her back. WILLIAM (V.O.): "In this moment the vision was real for me: Our world is condemned to become a desert soon. And we humans may soon be a lonely species on this planet."

Only the LITTLE FIRE ANTS obviously do not suffer. As WILLIAM walks away sadly, his huge footsteps passing by unaware, we see them sending out more and more queens to extend their colonies all along the fields and margins of the tropical forest. We see them building, taking advantage of the devastation, filling the niches. They are the creature that have evolved to take over the niche that other creatures cannot fill. They are the "last survivors".

ANNIE is waiting for William to get up for school, but when she checks in the lab and calls out, he is nowhere to be found. Later at school, William still hasn't shown up.

At home we see that working on the ant project has an effect on ANNIE's everyday life. She can't find William so she spreads her project out on the dining room table and works on her "pheromone dictionary", trying to find an "ant-way" to solve the declining fortunes of the leafcutter colony. But she is clearly worried about William, and writes his name, along with hers, very slowly at the top of the paper. ANNIE's MOTHER and SISTER are nearby, busy cleaning up, doing homework, etc.

JULIE, Annie's little sister, suddenly screams "Ahhh, ants! Annie, help!" Of course, it is meant to scare ANNIE but this time her way to react has totally changed. ANNIE quietly looks at the

ant, then at her little sister and says: "Oh, don't scream. It's just a little *Atta cephalotes* worker: one of my girls! She must have escaped from the formicarium." JULIE is quietly impressed at Annie's knowledge and lack of fear. JULIE: "Oh, yes of course, I thought it was a soldier or something." ANNIE: "Soldiers are 50 times larger, Julie, and they aren't a problem unless you step on the head and release the 'go to war' pheromone." This time JULIE is well and truly silenced. JULIE'S MOTHER, overhearing the exchange, smiles: "Come on Julie, let Annie get on with her project."

WILLIAM, still depressed, wanders around the forest, feeling lonely and lost. WILLIAM (V.O.): "I wanted to stop the devastation, but I didn't know what we could possibly do. I missed Annie but I needed a few hours to myself to try to work things out."

The VIRGIN QUEEN has grown. She and her several cohorts are the only ones getting the limited food resources now. Outside, LEAFCUTTER WORKERS are dragging a few pieces of leaves inside. The earth is dried up, cracked.

Suddenly we hear a creepy sound. Fluttering, calling ANT BIRDS, thousands of ANT BUTTERFLIES, the humming of BEETLES, the stamping of hundreds of thousands of ants on the move. It's a mortal attack of the ARMY ANT SWARM RAIDERS on the LEAFCUTTER COLONY as the LEAFCUTTERS bring home a few dry leaves. It is like an action movie, like Star Wars, as the LEAFCUTTER SOLDIERS are quickly summoned and fight to the death. The LEAFCUTTERS are no match for the massing SWARM RAIDERS, whose MAJORS have huge ice tong mandibles for subduing anything in their way and converting it to protein for the SWARM RAIDER COLONY. There are some 750,000 SWARM RAIDERS, in a flank at least 25 feet wide, conducting the raid. The SCOUT takes a dangerous path to summon more help and after a few close calls manages to retreat inside the nest, but thousands of LEAFCUTTER WORKERS die, and most of the few leaves are lost.

WILLIAM watches helplessly.

ANNIE finally finds WILLIAM and immediately wants to know where he has been, why he didn't show up the previous two days. But he asks her to be silent and just to watch the battle. "Have you ever seen swarm raiding army ants before?" asks WILLIAM. "Magnificent, terrible, lethal, but look, our girls are getting away...." ANNIE: "Some of them – but the colony is dying. If it doesn't get a virgin queen out into the world to mate, this line will die out completely."

Most of the LEAFCUTTER WORKERS do get back into the colony and the entrance holes are sealed up as much as possible. The remaining leaves outside can be collected later. We see it from the inside. Deep down in the nest, the VIRGIN QUEEN breaks out of her pupae, and soon after is fed some mushrooms.

As the SWARM RAIDERS move on, expanding their raid, yet mysteriously avoiding the area around Dr. Illa's house, they comb through most of the area of devastation. We see the SWARM RAIDERS now attacking the little yellow ants, the LITTLE FIRE ANTS. But they do not do so well against the LITTLE FIRE ANTS and are being driven back.

ANNIE: "William, where are you going?" WILLIAM: "Stay here; I've got an idea; I'll be back in a minute."

Finally the SWARM RAIDERS are in full retreat. Several LEAFCUTTER WORKERS come to the surface and open the entrance to look 'round. As the LEAFCUTTER WORKERS look out and over the scene of devastation, big drops of water cascade over them in huge splashes! It is glorious to see water after so much parched devastation. Has it come in time? Has the rainy season finally come?

No, it is ANNIE, enlisted by WILLIAM, who have brought water to the colony. Attaching lengths of hoses to each other, they

spray all around and over the roof of the nest, secretly spending water that is precious when it's the drought. And they use a lot of it.

Through pheromones, the word has spread round the colony and more and more LEAFCUTTER WORKERS, including the SCOUT and SHOTGUN ANT, have come out to investigate and get sprayed by glorious water. Several workers gather up beads of water and begin carrying it into the colony. It would appear to be a life saver.

Suddenly the water flow stops abruptly, and WILLIAM and ANNIE look at the dribbling hoses. Someone is shouting and saying: "What are you doing? Are you crazy?"

Without looking at who it is, WILLIAM and ANNIE both run off, laughing like children.

DR. ILLA, having disconnected two of the hoses, walks across the field, sees the wetness and pools of water on the roof of the colony. He looks around for signs of ANNIE and WILLIAM and shakes his head. He follows the hose marks and sees Annie's house.

At school it is obvious that WILLIAM and ANNIE have changed. WILLIAM sees the OTHER GIRL, who had flirted with him, but doesn't react this time. ANNIE catches this and tries to hide a smile. The TEACHER asks how their project is coming and WILLIAM says "Don't worry; we're working on it." Seeing each other in this new context, WILLIAM and ANNIE both laugh and make the ant head-and-antennae gesture to each other, the greeting ceremony of the leafcutter ants which is William's and Annie's secret sign of understanding.

On their way home from school, WILLIAM says, "If the leafcutters don't survive, Annie, do you realise that our project will be about failure, not about success?"

Walking toward them as they approach Annie's house, DR. ILLA stops WILLIAM and ANNIE. He confronts them about the water, and they admit it. He doesn't explain but invites them to join him in his home. It's the first time he openly admits his deep concern about the ants because of the drought and the diminished rain forest that is more and more cut down to small parcels like islands. DR. ILLA: "Humans should not interfere."

ANNIE: "But the colony is near extinction!"

WILLIAM: "And that's all that humans do is interfere! We wouldn't have this drought if it weren't for global warming and all that."

DR. ILLA: "You can't say that. Think how many trials ants have been through in a hundred million years – much longer than human existence. They've always survived. No, you should not interfere. Even if there's a catastrophe coming. Do you know what will happen now? The nuptial flight will happen now, because of the water. You've triggered it. But it will be a wasted night because there's no place for the new queen to lay her eggs, no wet and pliable ground to excavate a new colony. What you did is push this colony even closer to extinction!"

LITTLE FIRE ANTS massing in ever greater numbers around Dr. Illa's house. They share their food, pieces of LEAFCUTTER and SWARM RAIDER body parts.

ANNIE: "But we were just trying to help! We didn't know."

DR. ILLA (softening): "That's always the trouble, there's so little we do know."

"I think that we are allowed to interfere, as long as we try to correct mistakes caused by human interferences that have been done to nature before," WILLIAM says calmly.

"Yeah, you're right; in principle, you're right," DR. ILLA mumbles and scratches his forearm full of bites.

It is a full moon after a long day at school. ANNIE and WILLIAM go to see how the LEAFCUTTER ANTS are after the watering. Suddenly they realise that the WINGED MALES are emerging.

"These are the males, finally," ANNIE whispers fascinated.

"And they're getting ready for their virgin flight," WILLIAM adds.

ANNIE (V.O): "We knew that sooner or later on this night the virgin queen was going to emerge too and take her nuptial flight."

ANNIE and WILLIAM wait.

(Mixed P.O.V. of ants and humans, in most poetic way). They watch all the ants come out and start the dance, as if enacting the fairy tales of the pioneer insect animator Starewicz. To see the miracle of this, the poetry, ANNIE and WILLIAM stay behind in the bushes watching not wanting to disturb anything.

The VIRGIN QUEEN pokes her head out of the nest, then retreats back in for a moment. She walks into the chamber nearest the entrance to grab some fungus, the mushroom food. The MINIMA LEAFCUTTERS are busy harvesting a fresh crop. The VIRGIN QUEEN plucks a few of the kohlrabi mushroom pieces for herself. In the near darkness she chooses by touch and smell. It will

be her last meal for months. After she eats a chunk of it, she balls up the rest in her mouth and tucks it safely into a tiny pocket under her tongue.

As the VIRGIN QUEEN leaves the uppermost chamber, the queue of winged VIRGIN QUEENS waiting to depart extends down into the nest. The VIRGIN QUEEN brushes past them. Accompanied by her many attendants, LEAFCUTTER WORKERS, she is escorted out of the nest for the last time. The same LEAFCUTTER WORKERS who were restraining her in recent weeks in the drought are now encouraging her to depart. In the crowd of ants outside are the painted LEAFCUTTER SCOUT and SHOTGUN ANT. They are all moving around, frolicking; it looks like dancing, a celebration.

DR. ILLA secretly comes from the other side and watches in the shallows. And this ritual, the most precious and important ritual of the leafcutter ants takes place before their eyes.

Outside the moon begins to gleam in bright reflections on the leaves in the upper canopy, the VIRGIN QUEEN jostles through the crowd of LEAFCUTTER WORKERS and SOLDIERS stationed near the entrance of her colony and prepares herself for take-off. Some of the wet clay soil around the entrance sticks to her tarsal claws, and she cleans it off with her mandibles. The ground could be drier for take-off, but the easy pliability of the earth would be useful when it comes to digging out her own nest – if she would be able to mate and return to the earth to found a new colony. With predators, natural disasters, bad luck (falling in trees or water or in impossible terrain), more than 99 percent of all the virgin queens produced by a colony die without founding a new colony. Only the fittest survive.

The VIRGIN QUEEN flutters her wings. Will these things work? She is going to need them for more than one reason. A predatory ground beetle, its mandibular lance drawn, has broken through the ring of workers and is advancing toward her. She

again struggles with her wings, trying to move them up and down. As if reinventing flight, the VIRGIN QUEEN takes two steps forward and move her muscles contracting and relaxing them as fast as she can to set her wings in motion, vibrating, humming. She jumps up and takes off at a steep angle. The SCOUT and the SHOTGUN, watching from the side, are dazzled.

ANNIE smiles to WILLIAM, grabs his hand, as the celebration finishes and one by one the ants take off into the night sky. "I hope they survive. I hope we haven't ruined their chances for survival."

The LITTLE FIRE ANTS now pour into Dr. Illa's cabin. They head right away toward the formicaria. All of his precious and rare ant colonies...

The VIRGIN QUEEN is airborne, the predatory beetle snapping at her scent, and seconds later the beetle is dispatched by a contingent of LEAFCUTTER SOLDIERS. Heading up the moonlit shafts to the canopy of the rain forest, the VIRGIN QUEEN and her nestmate VIRGIN QUEENS rocket high above. As the ground falls away, we also see some of the colony's MALES taking off, while the LEAFCUTTER WORKERS begin to file back into the dark tunnels to return to work. Only the SCOUT and SHOTGUN ANT, perhaps waiting to go out on patrol again, remain outside.

Now high above the canopy, the stridulation, the sounds ants make as they fly – the same ones they make when buried under the earth – can be heard by many across the night-time jungle. It is a high buzzing sound, and it may be that the MALE LEAFCUTTERS from other colonies, also prowling the night skies with their big eyes and outstretched wings, are also attracted by the sound vibrations.

But everywhere: NIGHT BIRDS and BATS are trying to catch the VIRGIN QUEENS and MALE LEAFCUTTERS. Shadowy

demons appearing and disappearing, like stealth bombers, underlining the beauty of the dance and the flight, making the passion of the flying dance into a dangerous, death-defying mission.

WILLIAM and ANNIE and DR. ILLA are all looking up at the sky.

The LITTLE FIRE ANTS begin to raid Dr. Illa's formicaria one by one, killing all but the cryptobiotic BASICEROS ANTS who are so stealthy that the LITTLE FIRE ANTS cannot see them.

And then the VIRGIN QUEEN notices the MALE LEAFCUTTER flying toward her. Out of the blue-black night he seems to have a bead on her. With his huge ebony eyes bulging out like black marbles, he has seen her first. He streams toward her, picking her out from all others. For ten seconds male and female fly a zigzag course, zooming and twisting through the night. The MALE LEAFCUTTER starts closing in. He lurches now, then hovers, poised, ready to snatch her in flight. Their sturdy, reddish-brown bodies dock. Chitin knocks against chitin, like two ships at berth. He clings to her with his legs – yet they keep on flying. The MALE grasps the VIRGIN QUEEN's thorax in his mandibles. From behind he presses against her gaster, massaging it with his forelegs. He inserts his organ at the tip of his gaster into her cloaca at the tip of her gaster. His sperm floods out of his body and into hers. They remain entwined as other big-eyed suitor MALES approach. Seconds later they begin their descent, crashing to Earth. They are in a banana plantation a mile from where Annie, William and Dr. Illa stand. The NEW QUEEN disentangles herself from the MALE. The MALE who will never move again is already dying; he has served his purpose. The NEW QUEEN begins to search for a place to dig a new colony.

DR. ILLA shows himself. "Well that's it. Amazing isn't it? Now we can only hope that one of them, somehow, survives."

ANNIE: "Is there a chance?"

DR. ILLA: "In biology, as in life, my dear there is always a chance. This is how evolution by natural selection works. By putting the water on the colony without softening all the ground in the surrounding forest, which would have been possible, you are giving the colony a big test!"

WILLIAM: "How far away could the virgin queens be?"

DR. ILLA: "There's no wind tonight, so it could be only a mile way or less, but that's in any direction, you just don't know where they'll end up. Once in a while they land within shouting distance of their own home colony. That usually turns to grief as the mother colony will fight the daughter colony. Once the virgin queens leave, they are effectively on their own and no longer part of the mother colony."

WILLIAM: "We've got to find them; we could protect the virgin queen till she got started."

Now DR. ILLA looks at the children as if they're crazy! He doesn't want to tell them how impossible it would be to find a solitary queen ant in a square mile of jungle. Clearly, easier to find a needle in a haystack.

Walking back with DR. ILLA, WILLIAM and ANNIE once more look in on the LEAFCUTTER COLONY and are surprised to find the LITTLE FIRE ANTS storming into the many entrance holes all opened for the nuptial flight celebrations just minutes ago.

The LITTLE FIRE ANTS storm down into the nest, kicking every ant they meet, ripping up and destroying the mushroom gardens, devouring eggs, and stinging larvae and pupae to disable it, and dismembering adult ants. At the surface, the SCOUT and

SHOTGUN ANT, absent from the celebration, return with leaves for the colony to be greeted by the war. Both are killed.

As DR. ILLA opens the door of his house, ANNIE and WILLIAM following, he knows something is amiss. There are LITTLE FIRE ANTS everywhere in his house. He goes from formicarium to formicarium and finds all his ants dead or dying and the nests now occupied by LITTLE FIRE ANTS. DR. ILLA: The only one they haven't killed is my cryptobiotic *Basicros* – they couldn't find them, even in the formicarium!

ANNIE: "Look, Dr. Illa, come here!"

The LITTLE FIRE ANTS have even surrounded the piece of amber containing the ancestor of the ants. And they crawl all over his massive book collection.

"They cannot destroy their own history," says DR. ILLA. He grabs the precious amber for safe keeping, and puts it into his pocket.

ANNIE: "These are horrible ants! Why are they trying to take over your cabin? Why are they so aggressive and dominant?"

DR. ILLA: "I've been fighting a private war with these ants ever since I arrived here in Costa Rica thirty years ago. The stings don't bother me any more, but what they do to my ant colonies and to the diversity of the rain forest – that pains me. Actually, the little fire ants are fine in the diversity of the rain forest. They are kept in check by their neighbours, the many other species. It's just that when humans enter the picture and start destroying the rain forest, then these ants have the unique ability to change their reproductive system and their behaviour, become multicolonial, and they shift into overdrive. They turn into fascists, expansionist Huns and Tartars who seek to acquire new territory and to kill

every other insect in their way. We are no different. They will attack anything in their way. Perhaps they know in their genes that even the larger mammals including humans will get out of their way when they are stung by thousands of these fierce marauding ants. A few years ago, some of these little fire ants, the same species, were carried to the Galapagos Islands by accident and they have wreaked terrible havoc, destroying some of the endemic species. And this in Darwin's sacred laboratory, his own Garden of Eden! Fortunately the colonies cannot fly or swim or Darwin's finches and the marine iguanas would be suffering too."

ANNIE: "Dr. Illa, you can stay at my place tonight."

DR. ILLA: "Thanks, it will soon be morning anyway, and these ants will be gone. They won't stay if there's nothing for them to kill."

DR. ILLA retires with WILLIAM and ANNIE to Annie's house.

Early next morning DR. ILLA is already up. He wakes them and drags them out to the clearing to see all the dead winged ants. In the cold light of day, you can see the extent of the damage. Though looking for them for two minutes, he couldn't find any new queens. "It doesn't look promising for the survival of even a single one," DR. ILLA says. It's not so much a reproach as resignation and sadness on his part. Even without this, the situation for this colony was not looking very promising.

There is a procession of LITTLE FIRE ANTS leading out from all the entrance holes carrying booty (food in the form of pieces of insects, mainly leafcutter parts).

ANNIE and WILLIAM feel sad at the turn of events. To underscore the sadness, they see the DEAD WORKERS being

carried away by LITTLE FIRE ANTS. ANNIE (V.O.): "We had no idea if they might have even reached and killed the queen. We knew she would be deep inside the nest and that all her workers and soldiers would fight to the death to protect her."

Still searching everywhere, DR. ILLA says to look for broken wings on the ground as a sign that a new queen may have discarded her wings and dug herself a new nest. WILLIAM comments on all the dead males lying on the ground and stares helplessly at the dead bodies. "They don't matter at all as long as they've done their job and mated," DR. ILLA tries to console him.

Suddenly they hear ANNIE shouting. She thinks she has found the new queen. "Aren't these leafcutter wings?" ANNIE says holding them up. "And look, over there, that could be the queen."

WILLIAM: "Well done, you've found her."

ANNIE: "Pheromones, you know. Females have a better sense of smell." But WILLIAM isn't laughing.

As soon as ANNIE and WILLIAM grasp the predicament of the NEW QUEEN, they instantly want to help her. She is on dry ground and they want to protect her and help excavate her new nest. Nervously they watch the NEW QUEEN not finding a place for nesting.

"Don't touch her. Don't do anything," DR. ILLA reminds them. "It is vital to leave her alone. This is natural selection – survival of the fittest."

WILLIAM (V.O.): "We wanted to take her in to the lab, but we knew that it was not an option."

The LITTLE FIRE ANTS are getting closer to the area where the NEW QUEEN is trying to find a suitable place for her nest. A small contingent of LITTLE FIRE ANTS is already approaching her.

DR. ILLA leaves. "I have to go clean out my cabin." And WILLIAM and ANNIE leave for home, depressed. On the way, however, ANNIE suddenly brightens: "What if we spread leafcutter pheromone all over the ground in the area away from where the new queen is. That would get the little fire ants mobilised and attract them away from her." WILLIAM: "Dr. Illa says we can't move or help her, but what's to say we can't distract the little fire ants."

A flash of lightning and a huge barrel of thunder rolls down the mountains and across the forests and fields.

The NEW QUEEN is attacked by several LITTLE FIRE ANTS, but she manages to elude them by slipping under a leaf on the other side of a log. First raindrops fall, real rain.

WILLIAM (V.O.): "It was the answer to everything we wished for. We were so happy. Now the new queen could dig her nest, and there would be plenty of new leaf growth for the old colony and for the next generation."

The effect of the rain is almost overwhelming to the insects, with each drop welcomed, yet almost overwhelming in its power.

ANNIE and WILLIAM walk joyfully out to the main old nest where the nuptial flight had taken place and enjoy watching the colony in the rain. They start to dance...

The NEW QUEEN feels the growing intensity of the rain, as the music grows ever more ominous.

Soon we realise that the rain is becoming too much. Yet it continues to pour, and....

....from ANT POV, it is becoming a disaster.

DR. ILLA watches the flood wash away the ravages of the LITTLE FIRE ANTS. It will set them back six months or a year at least and give everything in the forest a chance to be strong. At least that is one positive result of the flood.

ANTS and OTHER INSECTS are being carried away, soon small mammals and lizards as well, then pigs.

The flood affects Dr. Illa's cottage and ANNIE's MOTHER, JULIE, OTHER CLASSMATES and LOCAL PEOPLE help out by sandbagging the river. ANNIE and WILLIAM join them.

From ANT POV in the original LEAFUTTER colony, the LEAFCUTTERS, with the weakened OLD QUEEN, begin to evacuate in the rain.

As the LEAFCUTTER WORKERS try to move the OLD QUEEN in the rain, they lose their footing and she is washed away, lost.

The SCOUT, whose paint dab is nearly washed off now, and the SHOTGUN ANT climb up into the canopy of the jungle, now aimless. They fall to their deaths.

The NEW QUEEN has succeeded in getting on high ground to avoid the flood, but not the rest. From the NEW QUEEN's point of view, she climbs to higher ground and then tries to dig down. It is now almost too muddy.

ANNIE sees the dead SCOUT's body on the riverbank, and picks it up tenderly, stroking it.

The flood has stopped. It is the day of presenting their field study. WILLIAM has agreed to deliver the oral part of the project on behalf of both of them. He grasps ANNIE's hand for support before going on. WILLIAM must present the project at school in public to all the OTHER CLASSMATES, and he is shy, nervous. When he announces that their topic was ants, at first the OTHER CLASSMATES and the TEACHER groan or laugh. WILLIAM shows some of their material on video and explains how he and ANNIE learned much more than they could have imagined. "We appreciate our success on this project all the more because we came so close to failure. Although we started out looking at ants, it turned out that we had taken on some of the most interesting group of animals in the world: the ant societies. And after I show you and tell you about these societies underground and underfoot, I am certain that you will have no doubt that they are the most successful group of organisms in the world – using almost any definition of success that you could imagine." ANNIE, far from arguing now, finishes his sentence – "And yet even the ant societies are in trouble. The true meaning of success is not obliterating your enemy but making a place where all can live and thrive...."

Subtitle says: "End of Term, Several Weeks Later"

On their way home from school, WILLIAM reads about the superorganism concept from the book that Dr. Illa has given him: *The Life of the Bee* by Maurice Maeterlinck, the legendary 1901 book that first talked, philosophically and poetically, about the colonies of bees and ants as single organisms. WILLIAM: "The trails of ants are like arms reaching out for food and bringing them back to the organism; the queen is the reproductive organs; the soldiers like sharp claws."

ANNIE: "So the little fire ants just have sharper claws, and much larger numbers, I mean they're a bigger organism."

WILLIAM: "And they're bent on hellraising and war, while most of the other ant colonies just get to the business of living."

ANNIE shows WILLIAM the ant in amber that Dr. Illa has given to her. WILLIAM is a little jealous. "He gave it to me because now I love ants," says ANNIE, "but it belongs to both of us." We see a close up on the ant in amber: her beautiful wings.

WILLIAM (V.O.): "Well, that's the story of our little project. I told my parents I would not go to eastern Europe with them and my father surprised me by turning the job down on ethical grounds. I was so impressed with him that I even decided to read his latest novel, the one he'd given me before he left. To my great surprise, he was talking about altruism in the book and had one or two respectable insights.... Of course our little project led to so many other things. At the end of it, I still wanted to become a philosopher, but I was determined that my approach would be informed by science and a deep and abiding respect for the natural world. And Annie..."

ANNIE (V.O.): "Let me speak for myself! I fell in love... with ants. And now I have to say that I am determined to become the 'Ant Woman' – the first female ant scientist."

WILLIAM and ANNIE walk over the fields to the forest. The flood has retreated. They talk about their future, still arguing a little and making jokes.

Suddenly ANNIE stops. "You just think and think, William, but don't you look around you? See what is here!"

And she points to the ground: It is a new LEAFCUTTER colony in the woods. "Do you think that this is the new queen who has survived?" ANNIE asks full of hope.

"What does it matter? As long that there is a new colony to carry on," is WILLIAM's answer.

ANNIE: "I suppose you're right, though I shouldn't like to admit it. OK, just this once."

THE END



ABOUT ERICH HOYT

WRITER, LECTURER, COMMENTATOR, COMPOSER,
SCIENCE AND CONSERVATION CONSULTANT,
SCIENTIFIC RESEARCHER
NORTH BERWICK, SCOTLAND

Erich Hoyt is a writer, commentator, and consultant on wildlife, nature, science, conservation, and the environment. He has mainly written books, but has also worked in a wide range of other media and has served as a scientific consultant for environmental organisations and governments. He is currently Senior Research Fellow with the Whale and Dolphin Conservation Society based in the UK and Co-Director of the Far East Russia Orca Project, a Japanese-Russian-British research project in Kamchatka, Russia. His 15 books have been translated into various languages, selling more than 750,000 copies. *Creatures of the Deep* was awarded the 2002 prize for Outstanding Book of the Year by the American Society of Journalists & Authors, Inc., New York. In 2002-2003, as a consultant to the Jason Foundation for Education's Science and Literacy in Education (SLED) project on Tropical Forest Ecosystems, Hoyt helped produce school workbooks, audio and video tapes drawing on his work with ants, insects and the rain forest. The project uses interviews with Hoyt and 19 selections from his books.

AUTHOR OF BOOKS AND ARTICLES

- .. Since 1978, Hoyt has worked free-lance as an author, journalist, and contributing editor mainly for US, British and Canadian publishers. His work has been translated into 15 languages in 25 countries. He has specialised in writing narrative non-fiction in extended feature-length articles in National Geographic, The New York Times, The Guardian, The Independent, The Sunday Times, Discover, Reader's Digest, International Wildlife, Defenders, Equinox, New Scientist, Kagaku Asahi, and more than 75 others.

- Hoyt has written eleven books for adults, seven of them with major U.S. publishers, plus four books for children (publishers include Penguin, Doubleday, Dutton, Time-Life, Discovery Channel, Simon & Schuster, Firefly, HarperCollins, John Wiley & Sons, Harvard University Press). Foreign rights include British editions for most titles, plus French, Spanish, German, Portuguese, Italian, Danish, Japanese and Chinese editions. All but one of the titles is still in print, with 750,000+ copies sold for all books, all editions.

- His books include *Creatures of the Deep: In Search of the Seas' 'Monsters' and the World They Live In*, which won the Outstanding Book of the Year award from the American Society of Journalists and Authors, Inc., New York, in 2002, *Insect Lives: Stories of Mystery & Romance from a Hidden World*(co-edited and co-authored with Ted Schultz) (1999), *Whales & Dolphins: The Ultimate Guide* (co-edited and co-authored with Mark Carwardine) (1998, 1999, 2000), *The Earth Dwellers. Adventures in the Land of Ants* (1996, 1997, 1998, 2001), *Marine Protected Areas for Whales, Dolphins and Porpoises*(2004, 2005), *Whale Rescue* (2005), *Seasons of the Whale*(1990, 1993, 1997, 1998), *The Whale Watcher's Handbook*(1984, 1987, 1996), *Extinction A-Z* (1991), and *Orca: The Whale Called Killer*(1981, 1984, 1990, 1995, 2000).

- He has written numerous chapters or extracts in books such as WWF Conservation Yearbook 1978 & 1980, Political Life in Canada, Greenpeace Book of Dolphins, The Caribbean Islands Handbook, Whales in the Classroom, The Japanese Whale Watching Reader, and upcoming titles from Sierra Club Books and Academic Press.

- He has also been a principal contributor of chapters and sections on the economic botany of cacti and other desert plants, artisanal and commercial fishing, whaling and the history of ocean extraction for Biosfera, a major new encyclopaedia on the Earth's biosphere, published 1993-1997 in Barcelona in Catalan and translated into Spanish, English (Gale, 2001) and other languages (to be produced as a TV series and CD-ROM.)

LECTURER AND COMMENTATOR

- Hoyt has presented lectures and appeared extensively on Radio & TV in the USA, Canada, UK, France, Spain, Japan, Australia, and other countries, including major network shows. Recent lectures include: Japan International Expo, 2005; Marine Mammals of the Holarctic Conference, Koktebel, Crimea, 2004; 10th Cetacean Symposium, Taipei, Taiwan, 2004; Atlantic Islands Symposium, Dublin, 2004; Wrexham International Science Festival, 2004; Flora & Fauna International, 2004; International Whale Watch Symposium, Tokyo, 2003; Edinburgh Zoo, 2002; Edinburgh International Book Festival, 2001; Scottish Seabird Centre, 2001, 2002, 2003, 2005; keynote lectures and workshops at the Turks & Caicos Islands Marine Mammal Symposium, 2000, and the Eastern Caribbean Whale Watch Workshop in Dominica, 2000; keynote lecture to Swan Whale Forum, Muroran, Hokkaido, Japan, 1998, keynote lecture to 2nd International Whale-Watching Forum, Zamami, Okinawa, Japan, 1996; keynote lecture to First Regional Ecotourism Planning and Strategy Meeting, Ogata, Kochi-prefecture, Japan, 1996; "Encounters with Whales 95" conference, Hervey Bay, Australia, 1995; Silver Bank Marine Sanctuary Conference, National Aquarium, Dominican Republic, 1994; First Japanese International Whale Watching Meeting, Ogata, Japan, 1994; European Cetacean Society, plenary lecture to annual General Meeting, Montpellier, France, 1994.

- In 1986 - 87, Hoyt was appointed Visiting Lecturer at the Massachusetts Institute of Technology (MIT), Cambridge, Mass., USA, to teach writing, including science writing. In 1992 and again in 2000, he was visiting lecturer teaching at the Graduate School, Journalism and Communications, at The Ohio State University, Columbus, Ohio, USA. In 1994, he taught writing at the University of Edinburgh, Medical School, Edinburgh, UK.

CD-ROMs

Orcas In Our Midst, Full Spectrum Multimedia, Bolt, Beranek and Newman and GTE Internetworking, Cambridge, Massachusetts, 1997. Co-presenter, consultant, partly based on two Erich Hoyt books.

Social Insects (working title), Full Spectrum Multimedia, Bolt, Beranek and Newman, Cambridge, Massachusetts, 1996 +. Co-designer, consultant.

He has contributed to several other CD-ROMs, including World of Whales (TeraMedia, 1995) which won a 1996 American CINDY (Cinema In Industry) Award and the award in the Reference, Education, News or General Entertainment category of the 1996 Annual Digital Hollywood Awards.

FILMS

Death Cannot Conquer (currently in development, working title), Vega Films, Berlin, Germany. Michael Schwarz, Producer. Based on a book by Erich Hoyt, 1996.

Life Among Killer Whales (unproduced, working title). Norfolk Films, Toronto, Canada. Based on a book by Erich Hoyt (option sold but now reverted). Treatment and outline by Erich Hoyt, 1984.

The Keeper, a dramatic feature starring Christopher Lee, written and directed by T.Y. Drake. Lionsgate Production Company, Canada. Colour, 96 minutes, 1977. Original music score by Erich Hoyt.

B-License, National Film Board of Canada documentary on the fishing industry in Canada. Produced and directed by Sturla Gunnarsson. Colour, 25 minutes, 1978. Original music score by Erich Hoyt.

Orca, Ocean Life Systems and University of Victoria. Produced by Erich Hoyt, Bruce Bott, Peter Vatcher and Michael O'Neill. Documentary on killer whales. Colour, 17 minutes, 1973. Original music score by Erich Hoyt.

RADIO

Cries and Whistles, Original script, one hour dramatic radio play, co-authored with Christian Bruyere, CBC (Canadian Broadcasting Corp.), Toronto, Canada, 1982.

SCIENCE AND CONSERVATION CONSULTANT AND RESEARCHER

- During the research for his first book, the highly acclaimed *Orca: The Whale Called Killer*, Hoyt spent ten summers in the field with whales (1973-82). He came to know both the whales and the scientists, and assisted in pioneer scientific research into killer whales in the Northwest of North America. Although not formally trained as a marine biologist, he is widely respected and known for his work with marine mammals. Besides his books and articles, he serves as Senior Research Associate for the Whale and Dolphin Conservation Society in Britain, for which he has researched and written eight investigative reports, and he is a member of their scientific advisory panel.

- In 1994 - 96, he developed and managed a programme of conservation activities to encourage environmental education and whale watching in Japan. In 1994, he also began a long-term project to research and report on the world's marine protected areas (800-page draft report completed 2001).

- Hoyt's interest in marine mammals has led to extensive work in conservation of other marine resources, plants, tropical rain forests, and many other nature, science and environmental topics. As part of this work, from 1986-1990, he was a consultant and co-designer (research, writing, co-designing exhibits) for Krent-Paffett Associates based in Boston, Massachusetts, on five US science museums. He helped to produce new exhibits on boreal and tropical forests, deserts, endangered species, medicinal plants and technology for the New York Botanical Garden and Missouri Botanical Garden, and co-designed exhibits on computers, electronics, sound, and the telephone for the Museum of Arts, Science and Technology, Hartford, Connecticut, USA and NETworks, the museum of Nynex-New England Telephone Co., Boston.

- Hoyt worked for the World Wildlife Fund (WWF-International) and The World Conservation Union (IUCN), Switzerland, as a project executive-consultant to research, write and produce a 52-page booklet on plant genetic resources conservation (1987-88). He received an extension on the WWF grant to edit and manage production for a second English edition and three language versions (1990 - 92). Project included writing grants and raising

money from 10 co-sponsors in the United States and other countries, and obtaining and negotiating commercial publication through Addison-Wesley Iberoamericana in Mexico.

- Hoyt has been a consultant on genetic resources for the International Board for Plant Genetic Resources, United Nations' FAO, Rome, Italy, and on marine ecotourism for the Minister of Tourism, Dominican Republic, the town of Ogata, Japan, and for Zamami, Okinawa, Japan. He has also been a contract consultant to the Australian Nature Conservation Agency (ANCA) to deliver plenary lecture, act as session chairman, and help design national marine ecotourism regulations. In 1995, he was asked to be on the UK delegation to the International Whaling Commission (IWC), AGM, in Dublin, Ireland, for which, he researched, wrote and delivered an official UK-submitted paper on the global value and extent of whale watching. In 1996, he was again selected for the UK delegation to the IWC, this time to the Scientific Committee. In 1999, the UK government funded his scientific paper to the IWC Scientific Committee as well as a 100-page report which was presented in the plenary session, IWC agm, held in Grenada, June 1999. Additional reports and papers on the socioeconomic values of whale watching were presented to the IWC agms in 2000 and 2001.

- .. Since 1994, he has been on the Advisory Committee (advisor on policy and regulations), La Comision Rectora del Santuario de las Ballenas Jorobadas del Banco de La Plata (Intergovernmental Management Commission of the Silver Bank Humpback Whale Sanctuary), Dominican Republic. This is the world's first sanctuary for mating and calving humpback whales. In 2001, he was asked to be on the Board of the Independent Marine Mammal Research Fund, MTN Whale Route in South Africa.

- In 1995, he was co-organizer and member of the Steering Committee for the international workshop on "The Scientific Aspects of Managing Whale Watching", held in Montecastello di Vibio, Italy, March 30-April 5, 1995. He was co-author of the report of the workshop presented to the Scientific Committee of the International Whaling Commission AGM, Dublin, Ireland, May 1995.

- In 1997 - 98, he co-organized, acted as co-chairman and edited the report of the Socioeconomic Aspects of Whale Watching Workshop, held in Kaikoura, New Zealand, December 1997.
- In 1999, he co-organized and now serves as co-director with Dr. Alexander Burdin of the long-term Far East Russian Orca Project (FEROP), funded by the Humane Society of the United States and other foundations in the UK and Germany to do pioneer research into orca populations around Kamchatka and eastern Russia. In 2000, the project was awarded the Klüh Prize for Innovation in Science (\$10,000), from the Klüh Foundation, Germany.
- In 2000-2001, he served as a consultant for Greenpeace on policy matters and for the International Fund for Animal Welfare (IFAW). His work for IFAW resulted in a book-length report on the socioeconomic benefits of whale watching worldwide. The press conference and final publication in July 2001 was widely covered by the New York Times, The Economist, Financial Times, The Times, AP, Reuters, and the BBC Today Programme, among others.

AWARDS

Hoyt has received more than a dozen awards and fellowships for his work, including:

Vannevar Bush Fellowship in the Public Understanding of Science and Technology. Massachusetts Institute of Technology, Cambridge, Mass., 1985-86. A mid-career fellowship based at MIT and Harvard University which is offered annually to eight science journalists and authors from around the world (renamed the Knight Science Journalism Fellowships).

1992 and 2000 James Thurber Writer-in-Residence, Thurber House, Columbus, Ohio.

Environment Canada Award 1986 for Best Writing on the environment.

Outstanding Article Award, American Society of Journalists & Authors, Finalist, 1994.

Francis H. Kortright Outdoor Writing Awards, two first prizes, magazines, in 1982 and 1994, two first prizes, books, in 1997 and 2000.

BBC Wildlife Awards for Nature Writing, First Runnerup for essay, 1988; Finalist for essay, 1992.

Animal Rights Writing Award, Best Book, 1994.

Science-in-Society Book Award, Canadian Science Writers, Finalist, 1997.

New York Public Library Books to Remember 1997.

Good Book Guide, Best Books 1998, Finalist.

MEMBERSHIPS

- Society for Marine Mammalogy (charter member), European Cetacean Society, American Society of Journalists and Authors, Inc., The Writers' Guild, National Association of Science Writers, International Science Writers Association, Association of British Science Writers, Society of Authors, and Authors & Artists for Conservation (founding member).

ADDITIONAL DETAILS

- Born in Akron, Ohio, USA, Sept. 28, 1950. Citizen of USA and Canada. Has lived and worked mainly in the USA, Canada, and the UK, resident in Scotland since September 1989. Married to Dr. Sarah E. Wedden, lecturer and research scientist in embryology; four children.

- Additional biographical data about Mr. Hoyt is available in Contemporary Authors (Gale, US, 1982+); International Authors & Writers Who's Who (Int'l Biog. Ctr., Cambridge, 1990+); Dictionary of International Biography (Int'l Biog. Ctr., Cambridge, 1986); Something About the Author (US, 1991); and Canadian Who's Who (University of Toronto Press, 1985+).

SELECTED PRESS REVIEWS "THE EARTH DWELLERS"

"Extraordinary... Hoyt who made his naturalist's name writing of leviathans turns now to motes, in whose realm he is just as comfortable and inspired. He fashions the ants into enchanting creatures. Fabulous stuff, commandingly told, with wit, color and grace. "

Kirkus Reviews, New York (starred review)

"A fascinating account of ants and their treasure hunters: we have much to learn about life from both."

Prof. Lewis Wolpert, CBE, FRS, University College London Medical School

"Too often, works about the wonders of the living world focus on mammals and birds. They seem more like us. Hoyt's narrative switches back and forth between ants' view of their world, and our view of them (or, more specifically, the view of the two most distinguished ant-studiers of recent times, E. O. Wilson and W. L. Brown). This is an unusual and provocative book, but ultimately a most rewarding one."

Prof. Sir Robert May, AC, FRS, University of Oxford, Chief Scientific Adviser to the UK Government and Head of its Office of Science & Technology

"Hoyt has achieved the impossible in this remarkable book. His elegant, enchanting, and humorous writing style has turned a scientifically-accurate treatise into a real page-turner. Set in the nature reserve of La Selva, Costa Rica, his story provides an utterly absorbing insight into the weird and wonderful world of ants. It is a world that is both alien and oddly familiar, as Hoyt describes the lives of ant societies that plant underground gardens, build their own bridges, make war and even display human-like feats of altruism and loyalty. Intriguingly, his ant stories alternate with the real-life adventures of two great biologists and eccentrics,

Edward O. Wilson and William L. Brown, Jr... and eavesdropping on their child-like banter, 'as they trade one-liners, barbs and fish-style ant stories', is an absolute delight."

Mark Carwardine in The Good Book Guide

"A fascinating book which takes a balanced close-up on the incredible world of ants. "

The Scotsman (Edinburgh)

"Hoyt is an excellent natural history writer...a careful, thoughtful author...Ants, not human beings, rule this planet, and he never lets that fact drift far from center stage."

Roger Caras (author, ABC-TV correspondent, ASPCA pres.) reviewing in the Miami Herald and Philadelphia Inquirer

"A modern-day Gulliver takes us to the captivating world of ants - and better yet, in the company of the engaging giants of that science. An alluring and richly fascinating account."

Thomas E. Lovejoy, Smithsonian Institution

"Why is it that we are fixated on our spheres of magnitude, the one of man, sheep and horses, when there dwells amongst us, roughly two powers of ten smaller than us, a whole cosmos of the most thrilling and highly organised creatures one can think of? Erich Hoyt leads us skilfully and with considerable wit into the world of ants, making fictional tales of extraterrestrial life bland by comparison. Intricate and fascinating, this book is not least an important contribution to conservation understanding."

Dr. Claude Martin, Director General, WWF International

"Popular science writing at its best...even the bare facts would be interesting, but Hoyt makes a fascinating whole by turning the facts into a narrative, following several specific colonies and even individual ants. Without anthropomorphizing, he makes you care about those ants, to the point that your heart begins to

pound when a flood strikes the leafcutters, putting the entire colony in danger." *The Roanoke Times*

"Almost like science fiction. Hoyt makes this [strange world] intelligible and fascinating."

Michael McCloskey, Chairman, Sierra Club

"Elegant popular science...recommended. A splendid example of complex science made accessible to lay readers. More than an engaging study of ants, it is a clear and lively portrait of the grand old men of myrmecology (the study of ants). Pen-and-ink illustrations by Ruth Pollitt complement the text beautifully."

The Plain Dealer, Cleveland, Ohio

"The Earth Dwellers is a scientifically serious but fun-reading wallow in natural history. Hoyt, writing as if he is rummaging through one of nature's most fascinating mysteries, likes a point blank approach. And it's this quality that draws the reader into the ant world with bug-eyed interest. In his exceptional ant close-up, wonder is the main ingredient of the book.

Mesmerizing!"

San Francisco Chronicle

"This interesting book describes the natural history of leafcutter, army, Aztec, bullet, and little fire ants at La Selva in Costa Rica and the myrmecologists (ant specialists) who study them. A novel aspect is the portrayal of the daily lives and interactions of ants from their sensory perspective. The book includes a who's who list of past and present myrmecologists and naturalists. A wealth of information is presented on ant biology, ecology, and evolution. Hoyt's book provides new insights and is fascinating reading."

Science Books & Films, Washington, DC

"Nicely complements E.O. Wilson and Bert Hoelldobler's own writing on ants and the rain forest..."

Recommended."
Library Journal

"An astounding book...taking readers inside the tiny
terrible world of ants."
The Daily Mail

"Erich Hoyt makes the case for ant rule in his splendid
book *The Earth Dwellers* promoting it with charm, fact-filled
conviction and sincerity in a fascinating, multi-layered book.
Delightful...some of the finest natural history writing I've read."
New Scientist

"Intriguing... enthralling... A good introduction to a
remarkable subject. (The) ant's eye view of life works
spectacularly... a few of the ants Mr. Hoyt describes are even as
likeable as the people."
The New York Times (daily edition, syndicated to US newspapers)

"I was caught up in the dramas Hoyt relates: I was
rooting for the leafcutter scout when a pair of bullet ants
approached her with less than friendly intentions. I felt myself
physically in the ant's world. One of the most arresting features
there is smell. Hoyt manages to bring this foreign dimension of
perception very much to life. His book is redolent of *La Selva* in a
way that escaped me when I was visiting the place. The book
culminates with the description of all-out war between colonies of
aztec ants in a cecropia tree near the laboratory at *La Selva*. The
drama is palpable and the fugue of war perceptible... *The Earth
Dwellers* is an unexpected and enchanting view of another
creature's world. I was charmed and humbled by Hoyt's power of
evacuation."
Roger Lewin in the Los Angeles Times (Book Review)

"A complex tale, with a cast of millions, most of them
six-legged, but also including E. O. Wilson and William Brown Jr.

Mr. Hoyt ... captures wonderfully the lighthearted joys of the (scientific) endeavors. But the real stars here are the ants. By juxtaposing the ants' and researchers' lives while giving the ants the lion's share of the pages, Mr. Hoyt elevates these insects to a level of consideration usually reserved for humans. Entertaining the reader with diverting details, he makes it easy to swallow the assumption embedded in the book's construction that ants have a perspective worth envisioning. More than mere study subjects, they begin to seem, like their human compatriots, just citizens of the planet going about their business. For those who think that ants are all about contaminating sugar bowls or being stamped smartly underfoot, there is much here to ponder."

The New York Times Book Review

Other Media

In the UK, in late 1998 and early 1999, Mr. Hoyt was interviewed by more than 50 radio and TV shows, including major national programmes, as well as by newspaper journalists.

Additional Comments

A number of successful animated feature films on ants have been released, showing that there is interest and a market: ANTZ from Steven Spielberg's DreamWorks company and A BUG'S LIFE from Disney and Pixar (maker's of TOY STORY) were two of the first to be released. While neither are realistic interpretations of the ant world, they do borrow heavily and may well contribute to a much broader interest in ants.

ABOUT MICHAEL SCHWARZ

He is trained in economics and industrial market research and speaks English, Italian and German. In the film business since 1984, he is shareholder and CEO of VEGA FILM. From 1984 to 1988 he worked as location and unit manager for numerous features before setting up VEGA in 1988. Since 1988 he worked first as production manager and later as line producer for a number of international feature films, including Roman Polanski's OLIVER TWIST, Gianni Amelio's CHIAVI DI CASA and Wim Wenders' FARAWAY, SO CLOSE, and he serviced various international tv-feature projects. He was responsible for budgets ranging from USD 1,5 to 60 million and played a decisive role in VEGA's developments.

Michael produced a prize-winning full-length feature documentary about the children of Chernobyl and the features ZOOM and BE.ANGELED. ZOOM was first screened at World Film Festival, Montreal (Cinema of Tomorrow, New Trends) and impressively reviewed by *Variety* ("... a dark, often creepy seriocomedy that's as cold as gun metal... .. highly manufactured at every level... .. very much made to be seen on the big sheet... ") and later by Joel E. Siegel after festival exposure in Washington D. C. ("... a compulsively engrossing film with a strikingly original visual style... .. ZOOM is one of this year's Filmfest revelations... "). Later on it was screened at numerous festivals including Rotterdam, Berlin (Panorama), Washington and Sotchi.

Through his outfit VEGA FILM Michael has provided executive production services for nearly 75 domestic and international feature film projects, various commercials, music videos and documentaries, or has advised producers during development and/or production.

In 1995, VEGA FILM extended their activities and development began on a slate of high quality and commercial

theatrical and tv projects particularly for the international market, covering a broad spectrum in genre, format, budget size, and potential markets.

A selection of VEGA's English language projects:

FRONTIERS OF NATURE IN THE 21st CENTURY / a collection of 6 narrative, high profile feature wildlife documentaries for the big screen, est. average budget per film USD 10 million,

STAR OF THE UNBORN / science fiction; an adaptation of the novel by Franz Werfel (world filming rights acquired).

BERLIN RUN / virtual reality thriller; parallel development of a computer game.

SCARAB / erotic psycho-drama.

THE STATE SECRET / faction thriller / political satire.

WOMEN OF WONDER / a collection (10 x 60 min.) of science fiction and fantasy films written by women, based on short stories.

INSECT LIVES. STORIES FROM THE UNDERGROUND / 'A cultural, biological, and psychological exploration of the alien world of insects'; international tv miniseries.

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