

Sample Translation

*Smell What I'm Telling You – The language of
plants and animals*

(Ruik eens wat ik zeg – De taal van planten en
dieren)

by Jan Paul Schutten

(Amsterdam: Querido, 2003)

Translated by Laura Watkinson

Contents

Chatterfoxes and prattlesnakes	7
1. Treetalk and plantspeak WHISPERING GRASS, RAMBLING ROSES, WEeping WILLOWS AND OTHER TALKATIVE PLANTS	9
2. Listen to your sense of smell FOLLOW YOUR NOSE...	23
3. Colourful language THE ALPHABET OF COLOURS AND SIGNALS	35
4. Loud and clear DAWN CHORUSES AND JUNGLE NOISES	46
5. Animals and body language INTO POSITION!	58
6. The language of dance THE MESSAGE IS IN THE MOTION	69
7. Animal school LANGUAGE CLASSES AND OTHER LESSONS	79
8. Animals working together LENDING A HELPING HAND, ERR... PAW	90
9. All lies! MASTERS OF DECEPTION	100
10. If I could talk to the animals... ANIMALS THAT CAN SPEAK TO HUMANS	109

Chatterfoxes and rattlesnakes

Near the beach, hundreds of seagulls are sitting on their nests. They're making a tremendous noise. Suddenly, a bird of prey comes along, and a seagull spots it. The gull immediately takes flight, and within half a second all of the birds are fleeing with him. How has he warned the others? You couldn't hear a cry of alarm above all of that squawking. The seagull must have let them know one way or another that he was flying away because there was a threat of danger, and not just because he fancied a bit of a flutter. How does he do that without making a sound?

There was once a researcher who wanted to know the answer to this question. He must have lain in wait with binoculars for weeks to discover just how seagulls pass messages to one another. And there are other researchers who have wanted to find out why parrots imitate sounds, how squirrels can tell which nuts are theirs or why some fish hold swimming competitions. Thousands of people have studied the language of animals. Not just to find out what sort of messages the animals pass on to one another, but also how they do it.

And that's no easy task. Because simply observing their behaviour is not enough. The scientists also have to understand how the animals live, what they eat and who their enemies are. Sometimes they have to go into the forest with super-accurate recording equipment. Or they use a microscope to follow the tracks left behind by an animal, and they study those. In other cases, they do experiments in a laboratory to see how animals react to one another's signals. And, together, all of the results of these experiments form the jigsaw-puzzle pieces that scientists use in their attempts to work out the secrets of the language of nature.

This book owes its existence to all of those researchers who have worked for years on the question of how birds, dogs, cats, fish, insects and even plants 'talk' to one another. Although, is 'talk' the right word? Mosquitoes dance, fish and birds use colours, some eels use electricity, and hippos use poo when they have

something to tell one another. Can you really call that talking? Scientists have different opinions about this question. Some say it’s talking, but some say it isn’t.

And so for this book I have decided for myself what I understand by ‘language’. If an animal gives a message to another animal and that animal does something about the message, then I call it talking. So when a sheepdog uses his tail to say he’s in charge, and a boxer reacts submissively, then I call that language. And when a man spider tests the mood of a lady spider by making her web vibrate, then he’s using a kind of language as well, as is a maize plant when it calls in outside help because it has a caterpillar munching away at it. Nature’s positively crawling with chatfinches, prattlesnakes, chatterfoxes and the odd blabbermouse!

And in the case of those fleeing seagulls, that’s language too. When the coast’s clear, they tell one another what they’re planning before they fly off on a jaunt: ‘Everything’s fine, I’m just flying off for a mo to get something to eat!’ They give a little bow, pull in their head and lift their tail. And so the birds nearby know that there’s no threat of danger. If a seagull doesn’t make those movements first, but just flies off, then the other birds know that this signal means that they have to fly away as quickly as possible too. Giving this alarm signal doesn’t take any time or effort at all and it works perfectly. No human could have come up with anything better.

1 Treetalk and plantspeak

WHISPERING GRASS, RAMBLING ROSES,

WEeping WILLOWS AND OTHER TALKATIVE PLANTS

No, trees and plants don't talk to one another about everything they've been up to. An oak tree doesn't chat about the weather with a horse chestnut, and a rose doesn't pass on beauty tips to an azalea. At least, not as far as we know. And yet they are perfectly capable of sending messages to one another and to animals. In fact, without language it's impossible for trees and plants to survive. For example, they can tell their attackers that they're poisonous and attract insects to work for them. And they even warn other plants about danger. So they understand one another very well. But how do they do it with no mouth or ears?

What plants say to avoid being eaten

Trees and plants would seem to have a hard time of it. What can a tree do when there's a deer eating its leaves? Running away is impossible. Or what should a maize plant do when there are caterpillars munching away at its leaves? It can't just shake them off. Trees and plants can move a little, but they do so very slowly. They mostly move to position their leaves better for the sun. The mimosa is one of the fastest plants. When in danger, it can retract its leaves within just a few seconds. There are very few other plants that can get away from their attackers in this way. And asking nicely whether the greedy beasts would care to dine elsewhere isn't an option either. So you'd expect that trees and plants would meet a sticky end, and that they'd all be stripped bare by deer and caterpillars. But that's not what happens. You see healthy beeches, oak trees and ferns all over the place. How is that possible?

The carnivorous Venus flytrap is an exceptional plant, because it can move very quickly. It uses its speed not to avoid being eaten, but actually to find food for itself. When a fly lands on it, it snaps its leaves shut, quick as a flash, to catch the insect and then eat it up.

First of all, trees and plants get outside help. Plant-eaters have their own enemies. Birds and people ensure that there are not too many caterpillars, and predators keep down the numbers of deer. In addition to this, trees and plants have their own ways of protecting themselves. Acacia trees are equipped with big long spines, so that an animal has to risk a few painful pricks if it wants to eat the plant. Some marsh plants have such a nasty smell and taste that there are hardly any animals that want to eat them. And stinging nettles have thousands of little needles that squirt a painful substance into their attackers.

And yet even all of these defences are not sufficient. You can certainly use sharp thorns to scare off deer, but not aphids. And goats and giraffes have no trouble at all with the spines of the acacia tree. There are even a few gourmets who delight in marsh plants. And caterpillars simply eat around the stinging hairs of the nettle. This is why trees and plants have another strategy, an excellent means by which they can gain the advantage over any animal. More importantly, they often also warn their enemies that they are employing this defence. And the enemies receive the message loud and clear, so they keep at a safe distance. Because animals understand the trees and plants perfectly.

Researchers had already noticed that locusts who are plundering a green plain in their millions will often suddenly stop eating, even when there's still plenty of food to be had. Caterpillars, deer and rabbits too will often unexpectedly abandon their food. It's as though, from one moment to the next, they decide they'd rather starve to death than carry on eating. Why is it that these animals choose to leave their favourite dinner? Even the brightest brains were baffled. Until they discovered the reason: trees can make themselves poisonous. And they use all kinds of poison to do so. Tannin, for example, a substance that makes the leaves tough and indigestible. The leaves still end up in the animal's stomach, but

they're not absorbed by the rest of the body. So the animal stays hungry, no matter how much it eats.

Plants have another method for not getting eaten: they make sure that they can't be recognised. The pebble plant, for example, has leaves that look like stones. And it works brilliantly. There are hardly any plant-eaters who are interested in eating it.

This poison is an excellent means of defence. But there is no substance so deadly that there isn't some animal that can learn how to cope with it. Ask any farmer – whatever stuff they spray their crops with, sooner or later there'll be insects happily munching away at it again without even feeling queasy. Animals get used to poison in the long run, which means it no longer works. So trees and plants approach the situation in a more intelligent way than farmers. They often let their attackers calmly dine upon them first and only become nasty and poisonous afterwards. This means that the animal has just enough time to eat a little from the tree before having to go off in search of another one. Because it can always eat from the next tree, which is not yet poisonous, the animal never becomes used to the poison. And so the poison will always remain effective. And the damage to the tree is limited, because the plant-eaters mainly eat the fresh young leaves. These contain little or no poison, because they're not that good at making it yet. When the animals get to the poisonous older leaves, they move on. This tactic does mean losing a few leaves, but that's not so bad. They just grow back by themselves.

No caterpillar would ever dream of munching on a leaf of bugle plant. This plant contains a peculiar poison that can influence the growth of a caterpillar, ensuring that when the caterpillar turns into a butterfly it will have two heads and will die.

Trees and plants usually need a few hours to make themselves inedible. And then they make it perfectly clear to the animals, by the way they taste and the way they smell, that they are inedible. People can also sometimes taste or smell this signal. Soldiers who have to live in the wild without food learn not to eat nasty bitter things. That taste is a sign that something is poisonous. And freshly mown

grass has a scent that's very recognisable to humans. It's not tannin we're smelling, but the gas that is given off when the blades of grass are damaged. The gas is saying: 'This grass is indigestible.' For us, of course, that's of no interest, but it's a completely different story for grass-eaters. This whispering grass is very useful to them, as they know that they now have to go looking for a field with grass that has not been damaged.

Cows aren't at all bothered by the warning from the grass and just keep on calmly eating. They're able to do this because they have four stomachs and chew the cud, which means that they can re-chew the grass. It is completely ground down and bacteria in the stomachs pre-digest it so well that it becomes edible. In the last stomach, the bacteria are killed and then the stomach contents go to the rest of the body as food.

Cotton grass is another plant that uses a kind of poison. Normally, this poison disappears from the plant after thirty hours. But if the plant has been munched a lot, then it stays poisonous for days. And this could be the explanation for a great mystery. For years, people have been wondering why lemmings sometimes throw themselves from a high cliff into the sea. These little rodents are crazy about this plant. If there are too many lemmings, it stays poisonous, because it keeps being chomped upon. The hungry creatures have to go looking for other food. They throw themselves into the sea in the hope that they will wash ashore in a better place.

But there is a method of defence that is even more cunning than poison. In South America, there is a variety of potato that never has any problems with pests. It has a nifty anti-pest spray to protect itself with: the scent of danger. When they are attacked, aphids give off a particular smell. The potato plant imitates this smell, and so aphids will never descend upon it. They think 'there's something funny going on here' and they keep well out of the way.

Deception often comes in handy. Butterflies usually lay their eggs on edible leaves. When the caterpillars come out of the eggs, they can immediately start stuffing themselves on the leaves. The butterflies always look for leaves where there are no other eggs. Then they can be sure that their little ones will have

enough to eat. And so some plants have fake eggs on their leaves. Little yellow blobs that look exactly like eggs. To be on the safe side, the butterflies fly on to a leaf that is not yet occupied.

Beans with bodyguards

Do trees and plants also talk to one another? You bet! But not in the way that many people think. Various books and magazines have contained articles about African acacia trees. These stories say that the trees can warn one another when they are being devoured by plant-eaters. By releasing a particular gas, they are supposed to be saying: 'Make yourself poisonous, there are bandits about.' This gas is then blown further by the wind, so that other trees that are standing downwind receive the distress signal. The acacias that are upwind cannot be warned in this way. And this is supposedly why giraffes always work their way upwind when they are eating. But even though many experts continue to tell this story, there's probably not a word of truth in it. Some fraud once had it published in an academic journal. Everyone believed him and then people told his story to other people. However, this doesn't mean that trees and plants aren't able to talk to one another. Various studies have now demonstrated that plants do indeed exchange messages.

If plants were able to talk to one another, it could easily happen via the roots, reasoned many scientists. So they searched for all kinds of ways to eavesdrop on these underground conversations. But with no success. Until two researchers found out that there are indeed two plants that send each other underground signals. These are the *larrea*, a desert shrub, and the *restharrow*. These plants grow in dry places and so cannot get too close or they'll drink each other's precious water. And so the *larrea* sends out a certain substance at the *restharrow* if its roots come too close. It's saying: 'Clear off! I'm here, so there's no room for your roots.' The *restharrow* listens politely, and then grows its roots in the opposite direction.

Haricot beans also send one another underground messages. These plants often have problems with red spider mites. These are little creatures that sometimes

gang up in their hundreds to chomp away at a plant. When the beans are attacked by these spider mites, they warn the plants around them with a substance that is given off by the roots. This substance says: 'Watch out, spider mites nearby.' The plants that are in contact with one another via their roots react to the warning. Even if there aren't any spider mites munching on them yet, they immediately implement their strategy for driving away the spider mites. They don't do this with poison, by the way, but with a much more cunning trick. They unleash their bodyguards. These bodyguards are *Phytoseiulus persimilis*, predatory mites that are the archenemies of the spider mite. These predators are alerted by means of scent. The plant sends out an SOS signal to tell the predatory mites that it is being attacked by spider mites. The predatory mites are mad about spider mites and so are happy to dash to the aid of the beans. The enemy of your enemy is your friend – no general could have come up with a better strategy.

There are other plants that use predatory mites as bodyguards. And with these plants too, even neighbouring plants that have not yet been infested by spider mites will send out a distress signal to the predatory mites. Often, root contact isn't even necessary. The plant under attack warns the others via the air. Or does it? There were some people who thought that the neighbouring plants started smelling of the SOS signal themselves because they were standing so close, in the same way as someone who stands next to a cigar-smoker will start to smell of cigars too. But during experiments it became clear that the SOS scent was so strong that the plants must have sent it themselves. It's not yet been discovered whether the plant under attack deliberately warns its neighbours or whether they listen in on its distress signal to the predatory mites. And perhaps we'll never know for sure how it works. Plants may be able to talk, but it's still tricky to interview them.

There are other plants that make use of allies from the insect kingdom. As soon as maize is attacked by a caterpillar, the plant sends out an SOS scent signal to nearby ichneumon wasps. They then head straight for the plant. These wasps don't eat the caterpillar, but lay their eggs in it. This results in the rapid death of

the caterpillar and the ichneumon larvae that emerge from the eggs then eat up the caterpillar from the inside out. And so the maize plant won't be having any more trouble from that caterpillar. This collaboration between the maize plant and the ichneumon wasp is very effective. Wasps can maybe smell the caterpillar themselves as well, but the scent given off by the big plant is much stronger than that of the little creature. And so the wasp can smell it much sooner. In addition to this, the maize plant is very well aware of when to warn the wasp. If it is attacked by any other creature, or damaged in another way, it doesn't send out a signal to the wasp.

How to get a wasp to work

We people are crazy about flowers. We think they're beautiful to look at and wonderful to smell. But the flowers aren't bothered about what we think. It's insects they care about, not people. All those beautiful shapes, scents and colours are meant for bees, flies, wasps and the occasional bird or mouse. Because they're the ones that the flowers work with. To ensure that this collaboration goes as smoothly as possible, flowers have a lot of information for these creatures. Every garden is packed with hidden messages.

Anyone who wants to understand the language of flowers and plants first has to know how plants work and how they reproduce. Just as for people and animals, it is important for plants to have offspring. That's what the flowers are for. Most flowers have an egg-cell, and when this is fertilised it grows into a fruit. Within this fruit are seeds that can in turn grow into a new plant. Most flowers have one egg-cell and a lot of very small grains of pollen. The egg-cell is hidden away at the end of a thin tube in the ovary, which you can't see. The pollen is visible though. It's the powder you find on the end of those long thin stalks in a flower. Sometimes a flower can be fertilised by the pollen from the same plant, but in most cases the pollen has to come from another plant.

Not every plant has flowers or fruits. Ferns, for example, have spores under their leaves. These are a kind of seed, from which new plants can later grow.
--

If you take a good look at flowers, you'll see that it's no easy task to get that pollen to precisely the right spot in another flower. And so pine trees make enormous amounts of pollen, in the hope that a favourable gust of wind will blow it into the flower of another pine. But pine trees are large and often stand close together, and so this works. Smaller plants have to go about it in a different way. The chance that the wind will naturally blow the pollen into another flower is much smaller. And so they call in insects to help. The insects first have to rub up against the pollen with their legs, head or back, so that they can then deliver it to the ovary of another flower. And all flowers are designed so that, one way or another, they know just how to persuade insects to do this job for them.

But how do you get the insect to want to transport the pollen from one place to another? There isn't a bee or wasp alive that would want to do it just for the fun of it. So flowers have to offer a reward to get the insects to do their work for them. Sweet nectar inside the flower is most effective. Insects are crazy about nectar. Insects drink nectar and bees make honey from it. And some of the pollen grains can sometimes be used as currency as well. The grains are packed with nutrients. Other forms of payment are vegetable oil (which bees mix with pollen to make 'bread' for their larvae), resin or wax (these are syrupy substances that insects use to make nests and hives) or aromatic substances (bees use these as perfumes to make themselves extra attractive to their fellow bees). And sometimes the plant offers its visitor a free overnight stay in a safe shelter or a spot to lay eggs.

Sometimes life doesn't seem entirely fair. To make half a kilo of honey, bees have to find ten billion clover plants. In total, that's worth over thirteen kilos of clover seed to the flowers.

So, flowers provide wages for their 'employees'. It's never very much, though, because if a bee found enough nectar after visiting just one flower, then it would have no reason to fly on to other flowers. And of course that has to happen, otherwise no fertilisation takes place. So insects fly from one flower to another to get a little bit of food from lots of places; they have to work very hard to earn

their daily bread. But in order to find employees, a plant first has to place a flowery advertisement for staff. With the right kind of perfume, they can attract just the kind of insects they're looking for.

The language of colour also plays an important role. Yellow flowers mainly attract bumblebees; bees in general love yellow and blue; butterflies often go for orange and red; and hummingbirds prefer pink, red and orange. The shape and the size of the flower also help to determine the kind of employees that are attracted. Birds drink nectar from flowers with their beaks and mice have to use their pointed noses. So these flowers have to be on the large side. Small hoverflies, on the other hand, can manage smaller flowers better because of their short noses. There are also exceptions. Bumblebees sometimes choose flowers that are much smaller than they are.

'Open sesame!'

Flowers make it as easy as possible for insects to find the nectar. They are full of signposts indicating where the goodies are to be found and what approach route the insect should use. Many flowers, for example, have 'honey guides'. These are dots or lines pointing right at the source of the nectar, like the lights on the runway of an airport. It means that the insects don't have to search for too long. People can't always see these honey guides. We see colours in a different way than insects. What to us looks like one colour may be seen by a bee as a collection of handy lines that work like a road sign. The shape of many flowers is also designed to accommodate the needs of insects. Many plants have one extra-large petal that is ideal for use as a landing strip.

Hummingbirds are the smallest birds in the world. They are able to move their wings so quickly that they can hover perfectly still in the air in front of a plant to suck out the nectar.

So, if you're a flower, should you be open to receive all visitors, or just one sort of insect? There's something to be said for both strategies. On the face of it, it seems most useful if you can be visited by many sorts of insects. This can only

increase the chances of your pollen being distributed. But a tulip that is visited by a bee that then flies on to a buttercup doesn't gain anything. The precious pollen is simply wasted, because the pollen from a tulip can't fertilise a buttercup, so it doesn't produce a 'butterlip' or a 'tucup'. A plant in a field with lots of its own kind can take this risk. Others prefer to play it safe.

For this reason, many flowers want only one sort of visitor. This often happens naturally. If a bumblebee is rewarded once by a flower, it'll be all the more eager to fly on to others of the same kind. There's one flower that leaves nothing to chance: the gentian. This flower stores its pollen carefully away in a locked cell. It's like a gate that you can only go through if you have the secret password. And big furry carpenter bees are the only ones who know the code. They know exactly how to get their paws on the pollen. As they fly up to the flower, they first make a high buzzing sound, as many bees do. Then they slowly lower their pitch. This makes the flower vibrate a little. And these vibrations make the box suddenly pop open – and out squirts the pollen onto the bee. The password has worked.

Flowers use another trick to increase the chance that a bee will visit only flowers of their kind. They open at different times and only remain open for a few hours. Bees remember these opening times and are perfect at 'clocking in'. And so the bee's breakfast may be goatsbeard nectar, its lunch red clover and its dinner evening primrose.

Do flowers and plants lie too?

So flowers and plants send a lot of messages. But these messages aren't always equally 'honest'. There are a lot of lies about as well. Because there are flowers that don't want to pay anything at all for the services of an insect. They pretend there's something nice in store for the insect, but that's not the case at all. It all turns out to be a trick to get the insects to spread their pollen. And they just keep on falling for it, no matter how often the plant tells the same lie. That's how stupid these creatures are! The woodnymph, for example, gives off a wonderful scent that is particularly attractive to bumblebees. The scent of this flower means 'dinnertime!' for bumblebees in search of nectar. But when they arrive, there's

nothing there for them. The flower's empty. In the meantime, however, the bumblebees are flying from flower to flower, and so they all get fertilised.

Flowers that want to attract dung flies or dung beetles have a different way of taking their visitors for a ride. They smell of poo, and these creatures are just mad about poo. Carrion flowers go to even greater lengths. They don't just smell like dead animals, which flies and beetles love, but they look just like dead animals as well. They're the same size as a dead creature and have lots of little hairs on them that glisten in the sun as though hundreds of flies are already sitting on them. The insects expect a dead rabbit, but all they get is a dead end...

Some flowers pretend that they're covered in aphids. They can be sure of a visit from bees and hoverflies, who are always pleased to see aphids on the menu. And then there are other sorts of flowers that pretend to be the enemy of an insect. Some bees have their own territory that they defend against all intruders. In this kind of area, you'll sometimes find flowers dancing in the wind on long stalks. They look just like an intruder flying up to have a go. And so the flowers can expect a spirited attack from the landowners. But that's exactly what they want, because in their fury the angry bees bump right into the grains of pollen.

The very best example of deception can be seen in bee orchids. They've elevated it to a real art form. They lie with their scent, their colour, their shape and the way they feel. First they entice the male bees by using the scent that females give off when they want to mate. This is so effective that the males all make a beeline for the plant. When they get near, they see the orchid, which is a dead ringer for a female bee. The colours and shape of the petals are exactly the same. And when they land on the petal to mate, it feels just like a female bee. The petal is covered in lots of little hairs, which are indistinguishable from bee fur. And of course the bee gets all covered in pollen, which he kindly transports to the next bee orchid that lures him in.

There are as many as a hundred different kinds of orchids that all look like different kinds of bees. As well as these, there are also varieties that look just like wasps, flies or other insects. So you could say that flowers are cleverer than

insects. But there are exceptions. Some bumblebees don't pay the slightest attention to the flower's plans. They simply drill a hole through a petal and suck the nectar from the flower. They're not going to let anyone get the better of them...

Not all plants entice insects in order to reproduce. There are also plants that catch insects to eat. They often live in barren places and so they need insects as an extra snack. In America, you can find pitcher plants, for example. There's a good reason why they're called that, because they look just like jugs. Their long green leaves form hollow funnels into which raindrops fall. At the top of this funnel is a sort of lid that looks like a flower. Combined with the wonderful scent of nectar, these are ideal for enticing insects inside. Once they're in the tube, the insects encounter a slippery leaf surface. They immediately lose their footing and tumble down into the water. There they drown and form an insect soup, which the plant thinks is delicious.

As well as a nasty pong, the arum uses heat to attract insects. For this reason, it is also called 'the plant with a fever'. It can get up to forty degrees, twenty degrees warmer than its surroundings. And so it offers insects a warm and cosy place to stay – for longer than the insects want, though, because although they can get in, they can't get back out. They buzz around like mad in the plant looking for an exit, but just end up covered in pollen.

There's also a carnivorous plant that grows in Europe: the sundew. This plant entices insects with its little glistening hairs that have a droplet of liquid on the tip. As soon as a fly lands on the hairs, it sticks to them and is then devoured by the plant. Yum!