

# Kirsten Bomblies



*Her curiosity and drive have already led her into many disciplines: **KIRSTEN BOMBLIES** has dabbled in the history of art, Egyptology and journalism, seeks out nature-centered experiences wherever possible, and is an enthusiastic painter. At the **MAX PLANCK INSTITUTE FOR DEVELOPMENTAL BIOLOGY**, she studies the evolutionary genetics of plants.*

PHOTO: BERND SCHÜLLER

# Bomblies

They can't mean me! There must be some mistake," was the first thought that shot through her mind when she took the phone call in September. She had won the MacArthur Foundation's Genius Award. It also came with a small monetary prize: half a million dollars for the next five years. The program's objective is to support fellowship holders so that they can pursue their creative, intellectual and professional aptitudes. Creativity is the key factor in the choice of award winners. It's no coincidence that fellows include not only scientists, but writers, artists and entrepreneurs as well. At just 34, Kirsten Bomblies has achieved the kind of recognition that other researchers strive for their whole lives – often in vain.

Who was it that recommended her for the fellowship? The biologist, currently a postdoc in Detlef Weigel's research group at the Max Planck Institute for Developmental Biology in Tübingen, still doesn't know who it was. "But it must have been someone who knows me well," she says. She immediately e-mailed everyone it could have been: "If it was you, thank you so much!"

Thale cress, *Arabidopsis thaliana*, is the object of Kirsten Bomblies' research. Usually measuring just a few centimeters, it's a plant with small white flowers; a simple weed that grows around field borders and pushes up between the pavement in urban areas – so unremarkable that it's hardly given a second glance. Goodness knows, there are prettier plants: why not sunflowers, violets or orchids?

"Most of the plants we think of as beautiful are genetically more complicated and have a much longer lifecycle. Sunflowers, for example, take months to flower. Orchids even take years," explains Bomblies. That

would be inconvenient for the kind of genetic experiments the scientist conducts. With *Arabidopsis*, it takes only about eight weeks from germination to when the next round of seeds matures. And the nondescript little plant has a very manageable genome, with just 125 mega-base pairs, and does not require very much in the way of care – large populations of the plant can grow in very small spaces due to its small stature.

## A GREEN THREAD THROUGH A TURBULENT LIFE

The young biologist wants to understand what can go wrong when plants start to change genetically. A simple wish, but it entails a really big question: How does evolution work – and what about the formation of new species, otherwise known as speciation? Without this there would be no biodiversity. When pollen meets up with the pistil of another related plant, it's not always a new and healthy variety that results, perhaps one with bigger leaves or one that suddenly blossoms with pink flowers instead of white ones. Stunted offspring might be the result, with mottled leaves and an inability to form flowers and to reproduce – symptoms that look very similar to disease in plants. This can happen even if neither parent plant shows signs of disease.

From the several thousand *Arabidopsis* varieties that exist throughout the world, Kirsten Bomblies selected 300 and played at evolution with them in the lab: she carried out 1,400 cases of hybridization and arrived at 25 extremely frail offspring. These plant offspring, called hybrids, were subjected to genetic testing and the scientist discovered that they exhibit autoimmune-like defects.

Yes, even simple greenery has a very complicated immune system. It's actually programmed to fend off exogenous attacks. If the plant is set upon – colonized by mold, mildew or bacteria, for instance – it shuts down some of its cells. These then die, and brown spots form. "That's exactly what we're seeing in these hybrids in the absence of any attack from outside. And it's happening throughout the entire plant," says Bomblies. This throws their hormone levels completely out of kilter. The plant remains small and is unable to grow anything but tiny leaves. All of this has been triggered by genetic incompatibilities between the parent plants.

This interest in nature runs through Kirsten Bomblies' turbulent life like a green thread. Or rather, like a vine that goes off in all directions, regardless of where it is put. From an early age, Bomblies had to again and again get used to new places if she wanted to flourish. Kirsten Bomblies was born in Uelzen, Germany, in 1973. Her father was still a student at the time.

Barely a year old, she was uprooted for the first time when her father's studies took the family first to Osnabrück, then to Holland and, finally, to Africa for two years. When she thinks back to those days, she hears dogs barking and sees banana trees: the plantation she and her brother Arne, less than a year younger than she, used to run through to meet up with the neighbors' children. She was five at the time and the family lived in Nigeria. She went to an American school. "And I got malaria. Now that was fun!"

The family emigrated to the US in 1981. They had a motorhome and traveled across the country. Kirsten's father, now a survey engineer, was job hunting. Her most vivid memo-



PHOTO: BERND SCHULLER

Kirsten Bomblies has created 1,400 hybridizations of *Arabidopsis* varieties.

ries are of the national parks and state forests they visited. Like the sequoias they saw in Redwood and Sequoia National Parks in California. Or the dunes, some as high as 250 meters, at Colorado's Great Sand Dunes Monument. "And then there was the Olympic National Park in Washington State – it was like something from a fairytale! Dense rainforest with rich mosses and overhanging trees – a real fantasy land." They lived with relatives in Pennsylvania to start with, then spent a year in Phoenix, Arizona. But that didn't work out, so they returned to Pennsylvania and, finally, moved to rural Castle Rock, Colorado, in 1985. Owing to the frequent moves, it was hard to have any real friends. "My brother was my best friend."

Kirsten Bomblies got her first horse at the age of twelve. Hestar was exactly the same age as she was and had been trained as a cowboy's horse. "Things became interesting when we came upon cows: Hestar always wanted to herd them!" Kirsten Bomblies spent most of her free time outdoors. If she wasn't riding, she collected plants, which she iden-

tified in books and then pressed. "Even then, I'd noticed that different species grew on the mountains' southern slopes than on the wetter, shady northern side." Amazing how plants adapt to their environment! But surely she didn't already want to become a biologist? She laughs. "No, first an astronomer, then a vet."

### DRAWING TO PAY THE RENT

At 16, she began to work for a vet while still in high school. She fed the dogs and cats, cleaned out the cages, and was even permitted to administer small doses of the anesthetics and take X-rays. The vet, who was thrilled with Kirsten's interest in the job, showed and explained everything to her. She stayed there six years. It was almost logical that biology and chemistry were her favorite subjects. But she liked literature, too, and wrote poems and short stories. "Usually

funny ones. Little reminiscences of Africa or people I knew. But there was always a bit of fiction to them." She enthusiastically took part in a journalism course. Later, at the University of Pennsylvania in Philadelphia, she enrolled for biochemistry. However, curious spirits like to roam. "I registered for all sorts of other classes on the side, including art history and Egyptology."

Back then, she earned money to pay her rent by drawing, doing illustrations for geologists working in the field of paleobotany. "That was great – I love puzzles!" What she had to do was piece together stone fragments from parts of fossilized plants and then draw a "realistic-looking plant." She happily recalls: "I learned a lot about plants and their evolution doing that." Her earlier interest in botany burgeoned once more and soon sprouted new shoots in the form of a little research project in plant biology, which eventually led her to study plant genetics.

It was while writing her bachelor's thesis under the supervision of Scott Poethig that she encountered *Arabidopsis* for the first time. She was looking for the genes that caused the young offspring to grow into an adult plant. She was also searching for mutants that displayed an abnor-



The same is by no means identical: Kirsten Bomblies carefully documents the variations in the *Arabidopsis* hybridizations.

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mality in the formation of trichomes, fine hairs, on the bottom of the leaf. Whereas all leaves had trichomes on the top surface, the first ones did not have any underneath. And she also found a gene that appeared to be responsible for this.

### FLOATING IN A FAIRYTALE FOREST

“However, it turned out that my first scientific discovery came about as a result of a mistake,” she recalls with a wry smile. The gene was not responsible for the transformation into an adult plant – it actually did something else entirely: it made the leaf rotate completely. The top became the bottom. “And that’s the only reason we saw hairs on the bottom surface.” An unexpected but nonetheless interesting finding. And not the only accidental discovery in science.

So what direction was she going to take now? A doctorate? Yes – but on what subject? Kirsten Bomblies decided to first work as a biologist. “I needed a break. To live a little!” When her mentor Scott Poethig flew to San Diego to give a speech at the Salk Institute, she said, half jokingly: “Check and see whether there’s a job there for me.” He came back and had actually found her something: a job



In order to root out the causes of disease, the biologist needs to examine the plants in precise detail.

with Detlef Weigel, who was researching in San Diego at the time. So she went to the West Coast and *Arabidopsis* moved into the limelight again – this time the genes that ensure that the plants not only produce green leaves but also start to develop flowers at some point.

It was interesting work, but it was also fantastic in other ways, she recalls. She went hiking and swimming frequently, and went diving in the Pacific almost every weekend – in a very real fairytale forest. “Floating in the kelp forests was just brilliant!” Eye to eye with little leopard sharks, rays, turtles and squid that tried to hide from the divers. And she did a lot of painting, too: mainly in ink and watercolors, and occasionally in acrylic. As a member of the local art society, she took part in exhibitions, sold a few pictures and won art prizes.

Other highlights included regular visits to the opera, followed by feasts at Extraordinary Desserts. “Everyone went there afterward in their fabulous outfits.” Cakes, cream tarts and candies made from French recipes. For Kirsten Bomblies, each morsel of

cake was like a little piece of her European homeland: besides Germany, home was unmistakably Holland, too, where she often went to visit her relatives. She speaks fluent German with more of a Dutch accent than an American one.

### THE ORIGIN OF THE MODERN CORN PLANT

By 1999, she had finally made up her mind: plant genetics was just the thing for her. She moved from San Diego to Madison to do her doctoral work at the University of Wisconsin. And switched from *Arabidopsis* to corn. This meant hard field work. The corn had to be planted in an area the size of a soccer field, which needed to be weeded and the corn subsequently harvested. Her aim in this work, which also took her on a two-week research camp to the unfrequented Hawaiian island of Molo-kai, was to study the origin of corn. “It was just me and the plants – and an awful lot of rain. The loamy soil meant that you soon had tons of mud on your boots.”

Five parts of the corn genome are primarily responsible for making

More than a hobby: Kirsten Bomblies earned money from her drawings while at college.



PHOTOS: BERND SCHILLER (2)



One reason Bomblies likes Tübingen is because it is so close to nature.

corn look the way it does today. “The original plant, teosinte, comes from Mexico and is very different. It still grows in the wild there, and is scrub-bier and shrub-like. The ears are more like panicles, very small and with only two rows of grain with a rock-hard shell.” Which genes triggered the leap from two rows to four, and thus the development of modern corn? To find out, extensive crossing and backcrossing work had to be carried out on teosinte, as well as genetic analyses and knock-out experiments.

But even the most diligent of doctoral students needs some time out. And Wisconsin beckoned: climbing and kayaking with friends, including a fellow scientist from her institute. “For five years we were nothing more than climbing buddies. Either

he was in a relationship or I was. When we did eventually find ourselves single at the same time, we discovered that we’re actually a perfect match.” Now she’s married to him. Having spent some time working on two different continents, the only thing that separates them these days is a little glass screen between their desks in the lab. And even this is usually open, stoically guarded by a stuffed dinosaur. Her husband, Levi Yant, is currently writing his doctoral thesis at the Max Planck Institute in Tübingen.

The fact that Kirsten Bomblies herself has been working in Tübingen since 2004 is due to another twist of fate: at a conference in Barcelona, she bumped into Detlef Weigel, who extended her an on-the-spot invitation to come interview for a postdoc position in Tübingen. She was, however, still considering other postdoc positions in the US and the UK at the time. “But the great intellectual freedom you have at Max Planck really impressed me. You really don’t find that in too many places,” she stresses.

### IMPRESSED BY THE INTELLECTUAL FREEDOM

She finds the old, peaceful university town, with its half-timbered houses and narrow alleys, to be lovely. She enjoys being able to ride to the forest on her mountain bike in five minutes. And of course she loves the European food: “All the different va-

rieties of cheese, wine and chocolate! In the States, everything that comes from Europe is extremely expensive.” But there are some things she misses over here: Mexican food and, most of all, the small, independent coffee shops, often part of a bookstore, that have little in common with Starbucks and the like. “I practically lived in these stores in Madison while I was writing my thesis.”

Kirsten Bomblies will be packing her suitcases once again in the summer of 2009. It’s about time, too, since Harvard University in Boston has been holding open a professorship for her for the past two years. She just didn’t want to be separated from her husband once again. Her combination of subjects, genetics and evolutionary biology, is as rare as it is popular, which is why they allowed her to put off the move. Harvard! Another one of those things that many dream of but never quite achieve: first five years as an assistant professor, then three as an associate, and after that – with a little luck – tenure, an open-ended position at one of the most respected universities in the world.

Does she have any unfulfilled dreams? She thinks for a moment. She’d like to publish a book of exciting stories concerning modern evolutionary research. She would like to motivate a large audience to become more interested in science. And, at some point, she wants to help create better research opportunities for students from, for instance, South America or Africa, which have little money to devote to science.

Speaking of money, she still doesn’t know what she’s going to do with the prize money from the MacArthur Foundation. She can spend it on whatever she likes. It is intended to enable her to develop her creativity to an even greater degree – in any field whatsoever.

PHOTOS: BERND SCHULLER (2)

Maybe she'll rent a little studio in Boston where she can paint and write in peace? Maybe. The best ideas are often had when the actual project is temporarily put aside to devote oneself, with everything one has, to other things.

### **FUN ON THE JOB ALSO BRINGS SUCCESS**

If there is such a thing as a recipe for success, the one that Kirsten Bomblies follows seems to be a good one. She does not plan her life in advance, does not stubbornly pursue her career or think only of the next paper. "Sure, I like recognition. But it's not all that important to me." It's the joy of the job that urges her on, and it is also her reward. She's curious about everything she encounters. Even with all her dedication to her research, she never forgets to enjoy life. Curiosity and pleasure – aren't they the perfect ingredients for creativity? She



**Green for the greenhouse – the place of work determines the color of the lab coat.**

knows that creativity is something that can neither be conjured up nor extorted out of a 12-hour day in the lab. You've either got it – or you don't. Put like that, one could say that Kirsten Bomblies is lucky. But

biology knows nothing about luck. From a purely genetic perspective, the crossing of her parent plants appears to have produced a mutant with "creativity" as a distinguishing feature.

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