Abstractions

LEAD AUTHOR

When Jiri Friml's group in plant developmental biology at the University of Tübingen came across some data that went against the field's conventional wisdom, they did what comes naturally to any self-respecting scientist — more experiments. And when each successive round of data bolstered their findings (see *Nature* **435**, 1251–1256; 2005), they did the next natural thing — they celebrated.

After a few rounds of drinks, the group's exuberant conversations delved deeper and deeper into what the data meant, and what to do next. Friml talked to *Nature* about the conditions that made his team's discovery possible.

How did your 'scientific naiveté' help you make this finding?

I am not a biologist by background, and am certainly not a plant biologist. I did my master's in biochemistry/physical chemistry and I think that left me rather ignorant and consequently unbiased when it comes to old paradigms on plant physiology.

What is the benefit of applying chemistry approaches to plant biology?

It gives me a more exact way of studying plant physiology. It is also much faster than waiting weeks or months for plants to grow. You have an idea and then in 3–4 days you can have your answer.

How did you react to your first unexpected results?

The best way to interpret them is probably to go and have a few beers and reflect.

How did your formative years in a provincial part of the Czech Republic colour your approach? What is your involvement with Czech science now?

I would like to help as much as possible. I have lots of people from eastern Europe in the lab. I have some collaborations with people from the Czech Republic. I also teach at a university in Prague, once a year, for five days, from morning to evening.

How have things changed from when you started doing science in the West to now?

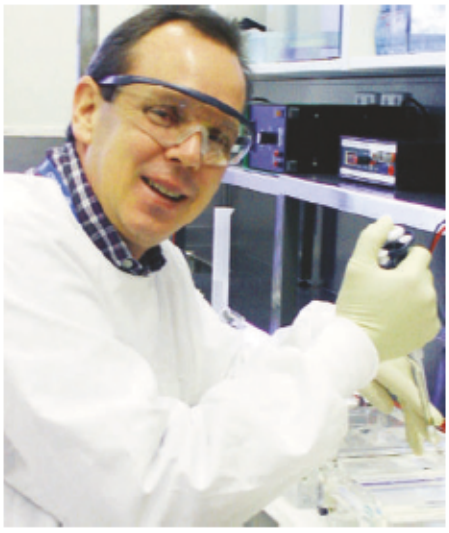
At first I felt extremely stupid compared with the other guys. Growing things such as *Escherichia coli* on a plate — to me that was magic. There were times when I was sleeping 5–6 hours a day and doing nothing else but science. It was fun. At the end of this period, these things came.

I think I was still taking the energy and creativity from the initial enthusiasm I got when I started doing science. Now I have more balance. I have a family — a small daughter. I am doing lots of hiking when I have time. I am more of a manager, but I still have time to 'play'. ■

MAKING THE PAPER

Christopher Elvin

How the search for parasite vaccines led to the production of a super rubber.



For molecular biologist Christopher Elvin, the paper on page 999 of this issue represents the culmination of a lengthy struggle with the insect protein resilin.

This rubber-like molecule first captured his imagination some ten years ago, when he stumbled across a paper from the early 1960s, which detailed the protein's near-100% resilience. "It fascinated me," says Elvin, who is based at CSIRO Livestock Industries in St Lucia, Australia. "I wanted to know how it worked. What was the mechanism?"

But it wasn't until 2001, when another team of researchers identified the likely gene for resilin in fruitflies, that Elvin was able to launch his project to clone the gene in the bacterium *Escherichia coli* and so produce the rubbery material.

He and his team found that the resulting recombinant protein could form a material with a variety of sizes and shapes, and that resilin did indeed live up to its name — bouncing back better than today's synthetic rubbers.

Elvin's first brush with resilin came while he was involved in a completely unrelated project. A decade ago, he was working on parasite vaccines for cattle. While looking through the insect literature, he stumbled across a paper by a Danish researcher who had studied the flight of desert locusts and dragonflies. In it, the researcher had documented the extraordinary elastic properties of resilin, which is found in insect joints and tendons, and enables, for example, insects to flap their wings so frequently. Elvin realized that resilin could provide clues about the molecular mechanism of elasticity. But to produce enough of it for experiments, he needed to know which gene was responsible for it.

Although the initial identification of the fruitfly gene for resilin was only tentative, Elvin was convinced by the data that the gene was the one. In 2002, he began a side project to clone the gene into *E. coli*.

At first things went well — he managed to purify the protein from *E. coli* and he had it in a soluble form. But then he ran into a serious problem: he couldn't turn the resilin into a useable solid. For a year, he and his team tried various methods of crosslinking the protein molecules so that they would form a rubbery material. One after the other, they failed. "It was very stressful," says Elvin.

Fortunately, Elvin came across another key paper, published in 1999, that detailed a simple method for making the specific type of crosslink he needed. All he had to do was mix the resilin solution with a heavy-metal complex and a solution of ammonium persulphate in glass moulds and shine white light on them. Ten to twenty seconds later, he got a solid. He was elated. "I was jumping around," says Elvin.

The researchers are now working on synthetic versions of resilin. They are tweaking the protein's sequence and structure to see what kind of properties and materials they get. For example, they hope to make the rubber stiffer and more biocompatible. Elvin says that the material should one day find a use in medical implants and other devices. ■

QUANTIFIED **DENMARK**

A numerical perspective on *Nature* authors.

For Hans-Henrik Kristensen, working at Danish biotech company Novozymes offers him the benefits of both academic and industrial research. He rarely finds funding a limiting factor and has plenty of freedom in the early, innovative stages of a project. Of course, once his team identifies a potential drug, priorities shift — business goals are established, deadlines appear and firm project plans must be implemented. Luckily, there is plenty of scope for collaboration — both with internal departments, for specific aspects of a project such as DNA sequencing, and externally with groups that share research interests. Kristensen's latest work describes a new natural antibiotic that has both the potential for commercial production and, more importantly, real therapeutic promise (see page 975).

13 papers published in *Nature* so far this year have contributing authors working in Denmark (total number of papers published = 672).

63 contributing authors on 2005 *Nature* papers work in Denmark (total number of contributing authors = 4,585).

194 papers published in *Nature* this year have contributing authors working in industry.

20 authors working in industry report original research in *Nature* this week.