JANUARY

Thursday 8th January

EIGHTEEN years ago today, I first flew out from London to California. A new beginning. And, for someone who had lived most of his life in England, a huge change. So many things were different. The quality of the light, for instance. It penetrated, had a revealing clarity I'd not previously seen. I have splintered memories: a glimpse of the Golden Gate bridge, a great ochre harp shimmering in ochre beyond the flecked blue ocean; sudden alarm at a brief, ground-shuddering earth-tremor; violent rain in a storm from the Pacific.

Whilst I was in California I absorbed new styles of thinking,

new ways of doing science. Things that seemed to have grown from the place, from the landscape and from its people.

I am a plant geneticist, and had gone to California to begin work in a new area. As well as swapping continents, I was swapping plants: from wheat to maize. And I was quickly captivated by the bold magnificence of the maize plant, the vigour of its growth. With a summer crop in California and a winter crop in Hawaii we had two generations a year: six months in between to plan new crosses and consider the outcomes of the previous ones.

It was an exhilarating time in plant genetics. I worked long hours with enthusiasm, returning from the heat of the field drenched in pollen and sweat. Around the world, other groups were using a variety of different plants for genetic research: wheat, barley, rice, tobacco, even snapdragons. New concepts were coming from all directions, new areas of research were continually opening up in front of us.

And then, on top of all this, there began at that time a shift in thinking that was eventually to propel plant genetics on to an entirely new plane. This shift was based on a unifying idea. An idea rooted in the concept that all plants are essentially as one, that the different species of plant have more in common than they do that divides them. That cacti, tree-ferns, redwoods, oats and sunflowers are more similar than different. The idea was that concentration of effort on the study of a single species would advance understanding of all.

As acceptance of this idea grew, so the next question arose: which single species? In the end, the species that many plant biologists settled on was the thale-cress: *Arabidopsis thaliana*. Thale-cress? What is thale-cress? You've probably never heard of it. A squat rosette of leaves that bolts to a height of a foot or less, flowers, then dies shortly thereafter. Scattered about in the

neglected parts of gardens, in wasteland or on walls. Inconspicuous and ignored; common, but unfamiliar.

So why was thale-cress preferred? Because it has attributes that are perfect for the plant geneticist, making it our own *Drosophila* (fruit-fly). First, it's easy to grow in glasshouse and laboratory, its small size allowing many thousands of plants to be grown in limited space. Second, it has a relatively short generation time: seed to seed in six weeks in the lab. That's eight generations a year, rather than the two with maize. Four times as many new crosses every year, each one bringing new insights, deeper understanding. Third, thale-cress has a relatively small genome, a property of great potential to a geneticist. Determination of the DNA sequence of the entire genome, the totality of the DNA that contains the genes, was therefore a more realistic proposition than for other species. It would be the first sequenced plant genome. An exciting prospect since the DNA is the key to understanding how a plant grows. If we knew the sequence of all of the genes of the thale-cress we could really get to grips with solving some of the most important questions in plant biology.

So I returned from the brightness of California to life in Norfolk, with my mind enriched, with a livelier, more creative approach to science. Swapped plant again, from majestic maize to humble thale-cress, and am glad to have done so. In the past decade, the unifying idea has been realised with spectacular success. The genetics of thale-cress has been developed to a level of huge sophistication. We now use this genetics to probe the hidden secrets of plant life. Thus revealing knowledge of things as diverse as the formation of flowers, the germination of seeds, even the mysterious but familiar process of growth itself (my own area). The recently completed thale-cress genome sequence has revolutionised our approach: telling us about new genes we didn't know were there, sharpening our approach

to our experiments, giving sight of something fundamental to life itself.

So the idea worked, and continues to work, with a degree of success I doubt even the most enthusiastic of its original proponents could have envisaged. Through the lens of thale-cress, we can see deep into the lives of the plants we encounter in our everyday lives.

It's been exhilarating to have been involved in all this. The momentum of the progress is such that I know it will continue for some time to come. Yet within my own part of it I've come up against a barrier. Where next?

Friday 9th January

In the last year or so the work of my research group has been going well. In particular, in 2002, we experienced a renaissance. New ideas sprang to mind. Subtle experiments tested these ideas. As a result, an important discovery was made. This resurgence reached its peak in the spring of 2003, when we published a paper describing that discovery.

And although the excitement was sustained for several months thereafter, towards the end of 2003 I began to experience a sense of unease. Associated perhaps with the failing of the light at the approach of winter. I was becoming aware that I couldn't see where to go next. That I had no sense of how to advance further.

Of course science is always like this. There are peaks and troughs. I've experienced both. But the problem with being in a trough is that it is a place from which the view is limited. There is the feeling of being trapped with no way out. And always the question of how long the entrapment will last. A self-sustaining state: at the time when new vision is most needed, it is most unlikely to come.