visit the CNR centre in Pavia. This began a (for me) very important cooperation with Roberta Oberti, Luciano Ungaretti, Elio Cannillo and the late Giuseppe Rossi, and later with Luisa Ottolini and her colleagues. We have worked together extensively on amphiboles and staurolite, and I have been fortunate to spend a significant amount of time with them in Pavia; it has been an inspiring experience.

Sometimes I can't believe that someone actually pays me to work on minerals; they don't pay me enough, but I'm amazed that they actually pay me at all! Considering the serendipity involved in how one's early education develops, I feel that I have been really lucky to become a mineralogist, particularly at the present time. The science of the Earth is currently going through a major transition: Geology, Oceanography and Atmospheric Sciences have developed to the extent that they are no longer able to ignore one another. Flux exchange across boundaries between the solid Earth, oceans and atmosphere can no longer be ignored as our science becomes more integrated and more quantitative, and the three disciplines are now melding to form Earth Sciences. This process has been accelerated by environmental concerns that are now reaching global proportions. However, we cannot lose sight of the fact that minerals are the fundamental materials of many of these global processes, and we must understand the properties and behaviour of minerals if we are to understand Earth processes at a fundamental level. The problems to be solved are fascinating; I hope you all have as much fun working on them as I have had in the past, and intend to have in the future.

1994 Max Hey Medal

Presentation, by the President, Professor Ian Parsons to Dr S. A. T. Redfern, 5 January 1995, at the University of Sheffield

The Max Hey medal goes to 'young' scientists, that is, 35 years old, or younger, who have shown 'evidence of excellence [which] should be in the form of work published in highly-regarded, international scientific journals'. Simon Redfern, our second recipient of this medal fulfils both these criteria, the first with a few years to spare, the second with a splendid output of over 30 papers both in the condensed matter physics and in the mineralogical literature.

Simon Redfern (*left*) receiving the Max Hey medal from Ian Parsons.

Simon has actually sprung from the same stable as Ross Angel, last year's recipient, with both a first degree and a PhD from Cambridge, the latter on *Thermodynamics of displacive phase transitions in framework silicates* under the supervision of Ekhard Salje. He has been one of the leading lights in the group which has shown that the Landau model of phase transitions works extremely well for many mineral species, including feldspars. After a year as a temporary lecturer at Cambridge he moved to Manchester, in the aftermath of the Earth Science Review, but in early 1994 returned to a University lectureship in Cambridge.

Simon's work has been mostly concerned with phase transitions, in silicates, carbonates and oxides. Phase transitions have been studied using synthetic materials using *in situ* methods at high T and P. Thus he has used the high-resolution X-ray diffraction facilities at the Daresbury Laboratory synchrotron. He is an expert experimentalist, including the use of diamond-anvil cells. Words like 'spontaneous strain' and 'coupling' and 'ferroelastic' appear frequently in the titles of his papers, and there is no doubt that very real insights into the behaviour of a wide range of complex materials have come through the unifying Landau theory, to which he has made major contributions. No mineralogist working on phase transitions, whether from a theoretical viewpoint, or from a more petrological perspective, can afford to ignore these new concepts.

Simon has already received the Philips Award for Physical Crystallography, awarded by the British Crystallographic Association in 1993, so it is highly appropriate that his excellent mineralogical work should be marked with the award of the second example of the Mineralogical Society's very handsome, silver Max Hey medal. I feel sure we are backing a man with a very exciting future, of whom we shall hear a great deal more.

Acceptance by Simon A. T. Redfern

It seems strange, almost out of place, to have one's work rewarded when that work is such a reward in itself, and I would like to re-iterate one message of our Schlumberger medallist: I am very grateful to have had the opportunity to work in mineralogy these last few years. That said, it is a great additional delight to receive this handsome medal today, not least as tangible evidence that others see something of merit in my research activities, thank you.

I notice that acceptance speeches tend to be largely autobiographical. What I shall say here follows this trend, and could perhaps be entitled 'Simon Redfern's true confessions'. So I start with the confession, Mr President, that this is not my first medal. That was won over a quarter of a century ago now: a runners up badge awarded by Blue Peter for my efforts in the 'Design Val a Dress' competition! Perhaps it is fortunate for the British Fashion Industry that my path eventually led to mineralogy, however. Today's award, unlike that first one, reflects the help and opportunity afforded me by very many people, by my parents, teachers, colleagues and students in turn, and I would like to acknowledge the contribution each has made as I tell something of my story.

Mineralogists are a rare breed in the land of science, and I can't be alone amongst them in describing my career as 'the road less travelled'. I had originally intended to become an engineer, and gained a place at Cambridge in that subject. But a year out, working with Ferranti, convinced me that physics would suit me better, so I turned to Natural Sciences. Forced by the system to study crystallography and geology alongside physics I quickly discovered new and unexpected treasures. Thus I diverted from physics to crystallography and was drawn to the lure of minerals by some very fine teachers. Desmond McConnell's lectures on group theory and phase transitions opened my eyes to the existence of an elegant theoretical basis for understanding complex mineral behaviour, complexity which I discovered for myself in a final year project on the dehydroxylation of kaolinite.

I had obtained a sample of kaolinite from the Lee Moor china clay pit, and in the course of a thermogravimetric study I discovered that the activation energy for dehydroxylation increased rapidly as the reaction proceeded, which I was able to associate with a changing reaction mechanism. It was exciting to discover the microscopic intricacies of this material, a mineral that I had previously been familiar with only as the white scar on the south face of Dartmoor, visible from my home throughout my teenage years. This first experience of research taught me how powerful a few well-thought-out experiments can be.

As the end of my degree approached, I obtained a place on a teacher training course, but the prospect of abandoning mineralogy was too hard to bear. Thus it was that I applied for a NERC studentship by appeal, and was guided into the realms of feldspathology by Michael Carpenter. The start of my Ph.D. coincided with the arrival of Ekhard Salje in Cambridge. 'Meister' Ekhard set about revealing the mysteries of Landau theory and ferroelasticity to me, which we developed and applied to a number of high-temperature diffraction and infrared studies on nitrates, carbonates and plagioclases, as well as more esoteric oxides.

During my Ph.D., a scholarship allowed me the opportunity to travel to the U.S.A., where I attended a Chapman conference on perovskites in southern Arizona. The week before the meeting I had bought a second-hand car in Phoenix, and following the conference Ekhard and I embarked on an excellent adventure as we crossed the continent to New Jersey, finishing in Princeton where I visited Alex Navrotsky's lab for a short time. Long enough to carry out high-temperature calorimetry of calcite, which demonstrated that the curvature of the calcite/aragonite phase boundary in *P/T* space could be wholly attributed to the orientational disorder transition in calcite.

My second true confession pertains to an incident at around this time. At the end of my stay I sold the car, at half of its purchase price, to Kurt Leinenweber, who was just completing his Ph.D. in Princeton at the time. A little after my return to the U.K. I got e-mail from Princeton reporting that the car had catastrophically blown a piston on the freeway to Washington, leaving Kurt stranded at the roadside. Now seems an appropriate time to make a public apology: sorry Kurt! I promise henceforth to stick to mineralogy and shall steer well clear of a career as a used car salesman.

Providentially, my Ph.D. ended as Michael Carpenter was awarded a Nuffield Fellowship, so I was employed for a year teaching in Cambridge. This was about the time of the U.G.C. review, and I found myself in the right place at the right time once more, ending up with a job in Manchester.

During my time at Manchester I benefited from the proximity to the Daresbury synchrotron, the enthusiasm, support, and crystal chemical expertise of Michael Henderson, and the demands and discoveries of research students. My work took new turns, and I began exploring the influences of chemical composition and pressure, in addition to temperature, on mineral stability.

Among other new experiences at Manchester, I found myself teaching undergraduate field mapping. Up to this point, my knowledge of fieldwork was almost as extensive as that of fashion design, but fortunately I picked up the salient points more quickly than my students. One year, on the annual mapping course at Coniston, I made use of a free afternoon to visit Brantwood, which was once John Ruskin's home and lies on the opposite side of Coniston Water to the mapping area. The house contains a small museum to Ruskin. I discovered that aside from his work on art theory and criticism, Ruskin had a keen interest in mineralogy. Indeed, he wrote a small textbook on the subject called *The Ethics of Dust*, with the politically incorrect subtitle *Ten Lectures to Little Housewives on the Elements of Crystallization*. It takes the form of a dialogue between the author and some schoolgirls he was addressing as a guest lecturer. One finds snippets of continuing relevance within its pages, which prompt me to recommend this book to you. The effects of temperature and pressure on atomic positions in crystals are alluded to, as well as the intrigues of polymorphism. These have been the phenomena at the centre of my work.

Ruskin charmingly associates thermodynamic equilibrium with crystalline beauty, harmony, and rest. Current research focuses on the restless and disturbed states of minerals out of equilibrium, extending Landau's thermodynamics to kinetic theory. It is clear that mineralogy has a continuing place of importance in elucidating and underpinning our ideas about the Earth. I shall not attempt to forecast the future, but shall end with one more thought from Ruskin's account of mineral ethics: "No science can be learned in play, but it is often possible, in play, to bring fruit out of past labour, or show sufficient reasons for the labour of the future". I have enjoyed my mineralogical explorations over the last decade, which have been largely fun seasoned with toil. Thank you for today's recognition of past and current labour; I look forward to continuing to learn: the fruit of the labour of the future.