# 1998 Mineralogical Society–Schlumberger Medal

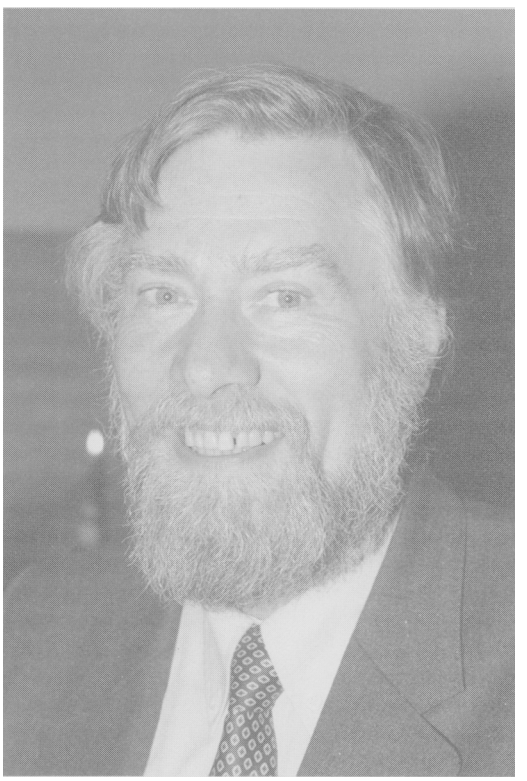
Presentation, by the President, to Professor E. K. H. Salje, 7 January 1999

Professor Salje: It gives me great pleasure to present the 1999 Mineralogical Society–Schlumberger Medal for 'scientific excellence in mineralogy and its applications' to you following Council's unanimous decision to make you the recipient. The award is given in recognition of your distinguished work on the thermodynamics and kinetics of mineral stability, involving over 200 articles on phase transitions in oxides, superconductors and aluminosilicates. Your application of Landau theory and the concept of ferroelasticity to minerals is presented in your prestigious 1990 book *Phase Transitions in Ferroelastic and Coelastic Crystals*, which opened up new insights into the time and temperature dependence of mineral stability, and which has gone on to be published in a student version.

You studied, researched and taught at Hanover in Germany, a place that has supplied Britain with five kings and a composer, Handel, although I regret that we cannot provide an Hallelujah chorus to accompany this citation. Your 1970 Diploma in Physics included a study of polarization fluctuations in Nd-YAG lasers; your 1972 PhD, also in Physics, involved the ferroelectric properties of $KIO_3$ and its use as a quantum-optical switching device, while your 1978 Habilitation in crystallography concerned the symmetry constraints of structural phase transitions in crystals with perovskite structure. You were lecturer and then Professor at an early age in Hanover, with periods of research spent in Bradford, Yorkshire, and, in contrast, in Paris, before becoming Head of Department at the Institute for Crystallography and Petrology at the University of Hanover in 1983, a post from which you resigned to become Lecturer and later Reader and then, with a personal chair, Professor of Mineral Physics at Cambridge before occupying the prestigious Chair of Mineralogy and Petrology.

You have studied an amazing range of compounds and minerals from tungsten and arsenic oxides, lead phosphates, vanadates and arsenates through iodates, K Cd sulphate, K double sulphates, and Na nitrate to the minerals calcite, aragonite, sillimanite, andalusite, albite, anorthite, cordierite, ilvaite, leucite, sanidine, titanite, tridymite and others, for many aspects of their structures and phase transitions including for instance, in feldspars and leucite, that vexed subject of Al-Si order-disorder.

As this is the first award of this medal to a mineral physicist, I feel I should make clear that physics is supposed to be a much more precise subject than either geology or mineralogy. Everything in physics works according to



Prof. E. K. H. Salje

equations, laws, principles and mathematical solutions with the arm-waving inexactitudes of many petrologists causing physicists to suffer inelastic shudders of painful unsynchronized vibrations more usually known as disdainful surprise. When it cannot be predicted when an event will happen or even if it will ever happen — a common situation in Earth Science and one not unknown in mineral transformations — physicists may recall the Uncertainity Principle, introduced by one of your fellow countrymen, but not I'm sure a principle applied in your own work, although I understand you were, in your Hanover days, unwilling to possess a watch and relied on others alerting you to immediately pending events like giving a lecture, which must have introduced a good deal of the essence of the Uncertainity Principle.

The use of fundamental physics to understand transformation-induced microstructure in minerals using diffraction and other methods has yielded major advances in unravelling the mechanisms of change in many experimental compounds and natural minerals. Your research has had important applications in superconductivity and you are Co-Director of the Research Centre in Superconductivity at Cambridge so that your work fully meets the applications aspect of the award.

In conclusion, I am delighted to present this very well-earned medal to you.

## Acceptance Speech by E. K. H. Salje

President, ladies and gentlemen

I am most grateful for the reward which I see as a recognition for the work done by a large scientific community in the UK. Mineralogy is one of the oldest scientific disciplines which has developed into a truly multidisciplinary field of activities. The input from other disciplines, such as physics and mathematics, has helped to make the understanding and analysis of minerals and their properties a thoroughly quantitative area of teaching and research. Mineralogists use the same experimental tools and the same theoretical concepts as physicists or chemists. Their unique contribution lies in the application of such expertise to natural materials and their interaction with the environment. If we wish to understand the impact of environmental changes, we need to understand the behaviour of minerals in their environment. Equally important is the observation that natural minerals, their thermodynamics stability and their kinetic behaviour allow us to assess the stability of man-made materials under similar conditions. Novel materials can be found by carefully analysing materials which nature has already produced. I firmly believe that mineralogy makes an important contribution to the understanding and control of natural processes. I hope that the Mineralogical Society can remain at the forefront of progress of mineralogical sciences.

# 1998 Max Hey Medal

## Presentation, by the President, Professor B. E. Leake, to Dr M. Lee, 7 January 1999

Martin Lee: It is a great pleasure to present you with the 1998 Max Hey Medal for research of excellence carried out by a young worker, normally under 35 years, within the fields of mineralogy, crystallography, petrology or geochemistry.

You obtained a First Class Honours BSc in Combined Science, including geology, from Leicester University in 1986 and a PhD from the University of Newcastle-Upon-Tyne in 1990. This PhD involved the study of the diagenesis of Permian carbonate rocks, especially the role of trace elements and isotopes in calcite cements in tracking down the evolution of carbonate-evaporite systems during meteoric diagenesis. From this field you transferred, in 1990, to your first Postdoctoral Research Assistantship in the University of Essex, studying meteorites using Transmission Electron Microscopy or TEM. This work, in collaboration with meteorite research

groups in the Natural History Museum and the Open University, studied isotopically anomalous acid-resistant residues of primitive meteorites revealing new forms of meteoritic diamond and discovering a new mineral $Si_3N_4$ — would seem to me to be hard to analyse with so much nitrogen — which is interstellar, i.e. pre-solar system in origin, which you named nierite. As if this were not enough, you also discovered nano-diamonds at the KT boundary and identified terrestrial carbon and nitrogen isotopic ratios in them. You continued to use the TEM method in your second PDRA position at the University of Edinburgh, in which you are studying the microtextural evolution and chemical reactivity of the alkali feldspars from igneous rocks, in association with Past-President, Professor Ian Parsons. Indeed you are a joint author of a paper presented at this Winter Meeting of the Mineralogical Society on the relevance of feldspar honeycombs to the origin of life. You already have over 30 publications and the number will shortly, perhaps has already, exceeded your iso-anno-scriptum number, which for those ignorant of this little-known Research Assessment Factor, measures whether your number of publications equals your age (number equals zero) or is positive (publications exceed age) or negative (publications are less than age).

I believe you are a keen long distance runner, a skier, a superb cook and the possessor of a large, no enormous, appetite of legendary immensity which is obviously necessary to fuel your continuing wide range of sporting and scientific activities which extend beyond those already listed, to field trips to the Permian of Durham, experimenting on feldspars in cold Scottish burns and tackling adders by flattening them under applied body weight — more than adequate justification for your alleged copious consumption of chocolate.

Your work has involved some very delicate TEM and SEM work, not only on meteorites but also on feldspars and their microtextures, dissolution, weathered surfaces and even the nature of perthites in feldspars which have undergone diagenesis, in which you made the totally unexpected discovery that microcline had replaced the albite lamellae in the orthoclase.

Dr M. Lee

In conclusion, Council's unanimous decision to award you the 1998 Max Hey Medal, is self-evidently justified without more ado.

## Acceptance speech by Dr M. Lee

Mr. President, I am exceptionally honoured to accept the Max Hey medal. It is not with false modesty that I say that there are many better (and younger!) mineralogists, petrologists and geochemists that could have received this award.

I am also embarrassed to accept this medal in the company of highly talented mineralogists at the Aberdeen Winter Meeting and to share a platform with Ekhard Salje, the Schlumberger medallist. As is traditional with award speeches, I would like to pay tribute to people with whom I have worked and have made my research so interesting and rewarding. In comparison to previous recipients, my path to this award has been unconventional, embracing micropalaeontology, carbonate sedimentology, meteoritics,

igneous petrology and environmental mineralogy. Although such a mixture of subject areas may imply a lack of direction to some, I have benefited greatly from this diverse experience and from working with a range of excellent Earth and planetary scientists.

I started Earth Science at school and received tremendous encouragement from my parents who would happily loiter for hours in chalk pits on the North Downs whilst I hunted for marcasite nodules. I took a combined science course for my degree at Leicester, including both geology and archaeology. It was while I was unsure on which time frame to concentrate that I took some courses in planetary geology and astronomy, most with Allan Mills. I was immediately impressed with the way that Allan effortlessly straddled geology, astronomy and physics, frequently incorporating all three in a single lecture and sometimes in the same sentence. In addition to planetary geology, I greatly enjoyed John Hudson's lecture courses on palaeontology and carbonate sedimentology. I can still remember the look of horror on his face as I started on the third continuation sheet of an answer for one of his examination problems. I felt that if he did not want long answers, he should not ask such interesting questions!

Following completion of my degree, I was torn between doing a PhD in carbonate sedimentology and a MSc in micropalaeontology and applied for both. Fortunately for me, the PhD project was funded and I went to Newcastle upon Tyne to work with the late Gill Harwood on Zechstein carbonates in County Durham (the "local grot rocks" as they were affectionately known by other members of the Geology department). These rocks certainly were grotty, having suffered pervasive fabric-destructive dolomitization. However, the history of this diagenesis was fascinating and had been largely ignored. The project was not without other excitements, such as dodging air rifle-toting locals in some of the less salubrious parts of Sunderland and diving among barracuda on the Florida reefs.

Having finished my PhD in 1990, I rashly applied for a postdoc with David Barber at Essex University, who was looking for somebody to work on presolar grains in meteorites using TEM. To this day, I do not know why David took me on, especially because I knew nothing of pre-solar grains and had never used a TEM. However, once I obtained some TEM images, I was convinced that this was the field in which I would specialize. The microscopy group in Essex at this time was very dynamic and I learned an enormous amount about techniques, especially from Keith Moulding. This was also a very exciting time for meteorite research and I collaborated fruitfully with Richard Greenwood and Bob Hutchison at the Natural History Museum and Colin Pillinger's group at the Open University, especially Monica Grady and Sara Russell. Sara in particular kept me supplied with absolutely fascinating samples to characterize, some containing curious new forms of extraterrestrial diamond and rather stranger materials such as grime from her cooker (no diamonds, unfortunately!)

After two very enjoyable years at Essex, I attended a meeting on TEM applications in Southampton, organized by Barbara Cressey. Also speaking at the meeting was Ian Parsons, who showed an amazing set of images of alkali feldspar microtextures, most taken by Kim Waldron, his postdoc. Fortunately for me, Kim had decided to return to America and Ian took me on as her replacement. My time at Edinburgh has been very productive, especially the partnership between Ian, an igneous petrologist and mineralogist and myself, sometime meteoriticist and sedimentologist. Although unknown to me at the time, Ian had predicted that feldspar microtextures would play a major role in mineral weathering and indeed we have shown this to be true. This initial work has subsequently led us into fields including siliciclastic diagenesis, organic-mineral interactions and the origins of life. I must take this opportunity to thank Ian for his years of encouragement, his boundless enthusiasm and willingness to explore unconventional lines of research (the image of Ian sampling lichens from a granite quarry faces is especially memorable).

My research has been especially enjoyable because I have been able to work with some excellent scientists and good friends. At Edinburgh, these people include Damian Carrington, Nic Odling, Pauline Thompson and, most importantly, Maxine Akhurst. I must also mention Phil Bland, Mark Hodson and Sara Russell, who are all currently at the Natural History Museum. In addition to being depressingly younger than myself, they have all made a major impact on Earth and planetary science and represent outstanding prospects for the future. I hope that I too will be able to continue to work in mineralogy and to fulfil the expectations that accompany the Max Hey medal.