



# THE GEOCHEMICAL NEWS

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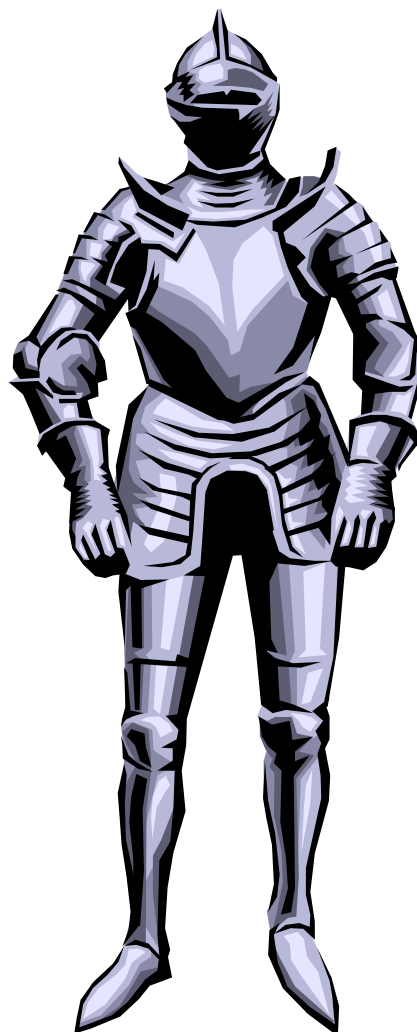


## Life Keeps Getting Better

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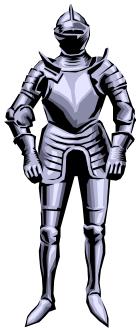
## A Portrait of Sir Keith O'Nions

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**Goldschmidt 2000**  
**Oxford, U. K.**  
**September 3-8, 2000**

<http://www.campublic.co.uk/science/conference/Gold2000>

## Keith O'Nions puts on his suit of armor and Sir Ronald Oxburgh enters the House of Lords



On June 12, 1999 the British Queen's Birthday Honours List included the names of earth scientists Keith O'Nions and Sir Ronald Oxburgh.

Keith O'Nions, Professor of the Physics and Chemistry of Minerals and Head of the Department of Earth Science at the University of Oxford, is soon to become a Knight Bachelor for services to the earth sciences. Knighthoods are purely personal honors. They do not give access to things one had no access to before and there are no sums of money associated. Knighthoods date back to the days of Saxon medieval chivalry and are conferred by the Queen via the touch of a sword on the shoulder. Knights Bachelors are not part of a particular order (such as the Order of St Michael and St George, for instance).

In addition, O'Nions will become Chief Scientific Adviser to British Ministry of Defence on January 4, 2000. This is a three-year position in Whitehall and during these three years, the position in Oxford is kept open for O'Nions. He will continue to advise his post-docs and will not move his residence to London. London is about an hour's journey from Oxford by car as well as by train. O'Nions wants to maintain his connection with the lab and the department in Oxford. He will have a car and a driver but intends to commute mainly by train.

Sir Ronald Oxburgh, Knight Commander of the British Empire and rector at Imperial College of Science, Technology and Medicine in London received a life peerage. This means that he is now a baron and thus entitled to sit in the House of Lords. The British Parliament consists of the House of Commons into which people are elected and the House of Lords, which is occupied by people who either are hereditary peers or people who are appointed as life peers. If one is offered a peerage and accepts it, one is expected to devote part of one's time to the House of Lords. Quite a number of able scientists end up in the House of Lords.

Oxburgh graduated from the Universities of Oxford and Princeton and taught geology and geophysics at the Universities of Oxford and Cambridge. He was a visiting professor at UCLA at Stanford, CalTech and Cornell University. In May 1996, Oxburgh was appointed to the National Committee of Inquiry into Higher Education in the UK, better known as the Dearing Committee.

The United Kingdom has two well-known Chief Scientific Advisers and several other scientific advisors, such as the Chief Scientist at the Ministry of Agriculture, Fisheries and Food. Sir Robert May is the present Government's Chief Scientific Adviser and head of the Office of Science and Technology. He is on leave from his Royal Society Research Professorship at Oxford and Imperial College in London. Sir Robert May was awarded the 1998 Balzan Price for his work on biodiversity, together with

Harmon Craig at Scripps [featured in *The Geochemical News* issue #98, January 1999] and Andrezej Walicki, a historian. Sir Robert May is currently responsible for advising the UK's Prime Minister, Cabinet and President of the Board of Trade on science issues.

The Council for Science and Technology, on which O'Nions has served since 1998, also advises the Prime Minister on science and technology issues in the UK, for instance with regard to developments and funding of industries and universities, also from a European Union perspective. The Government's Chief Scientific Adviser is Chairman of this Council.

Sir Keith O'Nions will become the Chief Scientific Adviser to the Ministry of Defence. Sir Ronald Oxburgh, who was Head of the Department of Earth Sciences at the University of Cambridge between 1980 and 1988 and President of Queens' College from 1984 to 1989, occupied this post between 1988 and 1993 and was succeeded by Sir David Davies. The so-called "Fairclough Guidelines" which were drawn up in 1990 by the then Government's Chief Scientific Advisor, Sir John Fairclough, state the following about the new position of O'Nions: "The CSA's role is to provide scientific analysis and advice at the highest level within MoD across the whole range of defence programmes, including R&D and equipment procurement. The role also includes initiating and leading the debate of new defence technology issues of the future and overseeing the central scientific staff. Reporting to the Permanent Under Secretary, the CSA is responsible for briefing Ministers, Chiefs of Staffs and Permanent Under Secretary in connection with these roles. The tradition of filling the post from outside the MoD emphasises the need to retain a broad external perspective on all scientific issues that can affect defence."

O'Nions was born in Birmingham on September 26, 1944. He received a B.Sc. in Geology from the University of Nottingham in 1966, then emigrated to Canada where he gained a Ph.D. from the University of Alberta at Edmonton. He moved back to Europe in order to take up a post-doc position in Oslo and subsequently was Demonstrator and then Lecturer in Geochemistry at the University of Oxford between 1971 and 1975. In 1975, he became Professor of Geology at Lamont-Doherty Geological Observatory. He accepted the post of Royal Society Research Professor in at the University of Cambridge in 1979. In 1995, he moved to Oxford where he became Professor of the Physics and Chemistry of Minerals as well as Head of the Department of Earth Sciences. He has served on numerous committees and in many professional associations and has been rewarded with many honors. He became for example a Fellow of the American Geophysical Union in 1979, when he also received the J.B. Macelwane Award. He became a Fellow of the Royal Society in 1983. In 1995, he was awarded the Arthur Holmes Medal by the European Union of Geosciences and the Lyell Medal by the Geological Society of London. He has been a member of the UK Natural Environment Research Council since 1981 and of the UK Council for Science and Technology since 1998. He has authored or co-authored close to 200 publications. O'Nions is a Director of the Geochemical Society (*see the interview beginning on p.10*).

Angelina W. M. G. Souren  
Vrije Universiteit, Amsterdam



## A Portrait of Professor Sir Keith O'Nions

The following article is the result of conversations between Keith O'Nions and Angelina Souren (representing *The Geochemical News*), that took place at various locations in Oxford on September 8, 1999.

### Introduction

It will be instantly evident to anyone who meets Keith O'Nions: here's a guy who really enjoys what he does. A pragmatist with a good sense of humor and plenty of energy. He sprints up and down the staircase at the Department of Earth Science, dashes into the truly remarkable Museum of Natural History next-door to show off the location of the poster session for the Goldschmidt 2000 Conference, and jokes easily with his co-workers. His office is simple and functional. Well-organized, with little clutter. A photograph here, some papers there. Behind his desk, two rows of books - an occasional geology text but mainly physics and chemistry publications - are within easy reach and span the width of the room. Above the books, less easy to reach, is a third row with folders and binders. Stacks of *GCA* and *EPSL* occupy low shelves elsewhere in the room. Cabinets with slide archives and other items also indicate that things are kept pretty much under control in this office.

O'Nions was born in Birmingham on September 26, 1944. His father was a printer and while neither of his parents had a university education - nor did anyone else in the family - they all saw the merit of education and encouraged him. In those days in post-war Britain, getting good grades and passing exams for Grammar School at age 11 was very important. O'Nions is married to Rita whom he met in Grammar School. The couple has three daughters. The eldest daughter is director of an Art Council dance centre. Lindsay, the middle one, graduated in modern languages (French and Italian) and has just returned from Japan where she spent a year teaching after she finished her studies. The youngest daughter is doing research in molecular biology.

O'Nions's professional career was significantly influenced and shaped by several people: Geoff Brown who was his science teacher in Birmingham, Roger Morton who taught him everything about field geology, Halfdan "Bud" Baadsgaard who was one of his Ph.D. advisors, Knut Heier and David Vincent,

Wally Broecker, and Ron Oxburgh. His long-term research interests have been in isotope geochemistry, particularly to use isotopes in the study of oceanic and continental crust to investigate the origins of continents and the times of their formation. Among his present interests is the 30-40 Ma record of changes in palaeo-ocean circulation that is recoverable from ferromanganese sediments in the oceans. One of his greatest pleasures is seeing former students and post-docs succeed in geochemistry. Examples of people who put a smile on his face in this context, are Jo Hamilton who is currently Deputy Chief of CSIRO Petroleum in Australia, Steve Goldstein who's at Lamont-Doherty Earth Observatory, John Stone who teaches Cosmogenic Isotope Geochemistry at the University of Washington, Don Porcelli who's an associate scientist at CalTech and David Hilton, currently an assistant professor at Scripps Institution of Oceanography.

O'Nions first learned of the knighthood through a letter informing him that he was going to be proposed to the Queen, as a suitable candidate for a knighthood. The knighthood was made official a few weeks later, on June 12. On July 6, the UK's Defence Secretary announced the appointment of O'Nions as Chief Scientific Adviser to the British Ministry of Defence.

### About the knighthood

*AS:* *What happens at the knighthood ceremony? When is it taking place? What is its significance for geochemistry?*

*RKO:* Well, this is all still hearsay of course, but apparently, as a male getting a knighthood, you still kneel before the Queen. And she then places the sword on the shoulder. Apparently, women don't get knighthoods; they can become dames and they don't have to kneel. I think it will happen in late November.

But you don't get a little brown envelope with 50-dollar bills in it. There is something on a ribbon, I believe, a medal. It is only a personal honour, has no wider significance. The main thing I've noticed so far is that a lot of people have started calling me Sir Keith, instead of just Keith. But the undergrads don't care about that at all and still just call me Keith, which I think, is great.

### About his career

*AS:* *How did you end up in earth science?*

*RKO:* I was always very attracted to physics and chemistry, but when I was at school - I think I was fourteen years old - I found Arthur Holmes's *Principles of Geology* in the school library and read it and was captivated by it. Really the most beautifully written treatises on physical geology. So I got very interested in the subject, collected fossils and minerals and so on. By the time I was leaving high school, I really wanted to do geology. It was a relatively easy step after that to go into geochemistry or geophysics, because I was fairly well inclined in those directions anyway. The obvious thing was to do something like geochemistry or mass spectrometry, which combines a fair amount of physics and chemistry with the earth.

I never met Arthur Holmes, by the way. Which is a pity, because it was really the quality of his writing and presentation that attracted me into the subject. There are a good many other books that one comes across in the earth sciences, which are the biggest turn-off you can imagine. It is interesting how one is so influenced by one's very first encounters.

**AS:** *You did fieldwork in Norway several times, for instance together with Jacques Touret at whose department I did my Master's. You also worked in Norway for a while. What's your connection to Norway?*

**RKO:** When I was an undergraduate at Nottingham, I did some fieldwork in South Norway with Roger Morton. I graduated in geology, having done geology and physics and then went to Canada to do a Ph.D., on a sheer whim. I was always interested in going to North America. I was just writing my finals when I saw an advertisement from the University of Alberta and I just thought, "I'll do it!" So I wrote to them, asked if they could offer me a scholarship and so on. I emigrated to Canada, to the University of Alberta in Edmonton. I did my Ph.D. and stayed for a one-year post-doc.

The thesis work was in geochronology, on a field area in South Norway. Geochronology was important in the 1960's, but it rapidly became fairly boring. However, at that time it was rather important for studies of metamorphic cooling and so on. I worked on a field area that I'd had an acquaintance with, as an undergrad at Nottingham, through Roger Morton, who was doing field geology there and then moved to Canada, to a professorship at the University of Alberta. Most of my real knowledge of field geology - which is not bad for a geochemist! - came from Roger Morton.

Jacques Touret, who's a fluid inclusion specialist in Amsterdam these days and with whom I've spent time in the field, was also very helpful to me. I met him when I was an undergraduate doing my field mapping. I was absolutely awe-struck by Jacques Touret and his beautiful French accent. He had a little Citroën deux-chevaux, with a jeep-type body on it, and he drove this thing from France through Sweden to Norway. But I was so impressed, because he knew the names of rocks and could recognise them, describe them and also appeared to understand them.

The way I actually got to work in Norway as a post-doc was via Knut Heier, who had just returned from the ANU in Canberra and became the director of the Mineralogical Museum in Oslo. He was my external examiner on my Ph.D. and he offered me a post-doc in Oslo. It was a very nice post-doc; it was called Unger Vetlesen Postdoctoral Fellowship, which was only available for Americans and Canadians. It was paid in US Dollars and I qualified because I was a Canadian Immigrant.

The interesting thing is that just before I left Canada in 1970, I had a letter from David Vincent who was the professor of geology in Oxford. I'd had some correspondence with Oxford because I was hoping to get a post-doc there. He wrote me a letter and offered me a junior teaching position; it was called 'demonstrator'. That now is 'called assistant lecturer'. Anyway, he offered me this teaching position, completely out of the blue. This was only a couple of days after I'd accepted to go to Oslo. Obviously, a job in Oxford is clearly better than a post-doc in Norway, but back then I thought, "Well, I can't be unethical about this. I've accepted this position in Oslo and that's it." So I wrote back to Oxford, "Very nice of you to offer but I've accepted a position in Oslo so I must refuse." I got a letter back from Oxford that said, "Well, that's fine, we understand, but on your way to Oslo, why don't you just visit the department here in Oxford to say hello?" I did that and it was clear that they knew Knut Heier very

well in Oxford, because he'd been a post-doc there in the 1950's, with Ross Taylor and all these people. So Rita and I went to Norway and after a few days, Knut Heier called me in his office and said, "Listen, you got a two-year post-doc here but I've been talking to David Vincent; we're very good friends. We think it would be much better for your career if you stay here six months and then take that job in Oxford." During those six months our first daughter was born and we carted our baby off to England. Things were like that in those days. It is very nice to have people concerned about your career, in a very unselfish manner. I have this enormous gratitude both to Knut Heier and David Vincent (who's now 80 years old). That's the extent of the Norwegian connection.

From 1975 to 1979 I went to Lamont. With three small children, the youngest one of which was only three months old. We had loads of luggage and we went to New York on the Queen Elizabeth II, because we could take the baby in the pram and the luggage. In 1975 it still cost about the same to go by ship as it cost to go by plane. So we arrived in New York and Wally Broecker came to meet us in the Geochemistry Panel (van), as they called it - it was basically an old wreck. I think we arrived on July the 5<sup>th</sup>, because I remember we spent July the 4<sup>th</sup> on the boat. Wally is an exceptionally generous man and comes down to the dock in New York to meet us. I can see Wally Broecker at the docks, while we're standing with the three kids and a great big heap of luggage. There are signs everywhere saying, "The porters are free. Do not tip the porters." It's the porters' job to get your luggage, then to take you to passport check and off the boat. I see Broecker down there... and this red-capped porter comes along and says, "How much are you gonna give me to move your luggage?" I thought, "Uh-Oh. Here we are. New York. It says that they are free and not to tip them, but it's probably a bit corrupt here." So I thought, "I will have to offer quite a lot of money". Remember, this was 1975. So I say, "I'll give you twenty dollars". He looks at me and says, "Forget it!" And walks away. And eventually, it costs me sixty dollars to get my luggage from one end of the quay to the other!

#### **About janitors, carpenters and life in general**

**AS:** *Who was Louis? I've heard that whenever you went back to Lamont, Louis would be the first person you went to see and sometimes the only person you would see.*

**RKO:** Louis was a janitor, a Puerto Rican, I think. He became the janitor of Geochemistry. He was one of these naturally able people but in a formal sense was not highly educated. He was a natural leader and he immediately took control of Geochemistry. Working at 5 o'clock in the afternoon, cleaning until midnight, he controlled everything. Very funny guy. He really adopted all the young people and everybody went to Louis for help - even Wally. He became a part of the greater Geochemistry family. Geochemistry at Lamont always had an independent air, tended to take a different and unconventional view compared to the rest of Lamont. Mostly because Wally Broecker is rather different. Having a janitor who was almost a godfather was really completely in concert with the way Broecker ran Geochemistry in those days. Louis was so well-loved by everybody. When I left Lamont, one of the

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great disappointments was to leave Louis behind. Just after I left, they got contract janitors in at Lamont and Wally promptly appointed Louis as a member of the scientific staff. Louis retired about four years ago and they all organised a surprise retirement party for him. People flew back from all over the world, from as far away as Australia to go to the retirement party of the janitor at Geochemistry. He was marvellous. He'd always find a beer in the cupboard or in a drawer. He was an absolutely wonderful guy.

Another extremely interesting person I met while I was there was a guy called Rusty Williams. Rusty Williams had got a B.A. in History. I think his father had been a carpenter and he therefore also had carpentry skills. So I hired him at Lamont as a carpenter to build my labs and he eventually became a member of the Lamont Buildings and Grounds staff. This guy had the most outrageous sense of humour. He was absolutely hilarious. He was in control if you like of the comedy side of the Geochemistry as Louis was in control of the other. So Geochemistry, during the years I was there, had two major figures who between them created a rare cultural environment. One was the janitor and the other was the carpenter, a *véry* intelligent man. Sadly, Rusty Williams died of cancer just a few weeks ago. But this guy was also a part-time cop and one day... - he had a bizarre sense of humour, absolutely bizarre - I walked into his office and he produced a gun! He pulled a gun out on me, like this, and he pulled the trigger... Anyway, it clicked. And he said, "It's okay, you were quite safe. Look, the bullet was in the next one." That was his sense of humour. He was the only person I knew in the 1970's, in America, who thought Monty Python's Flying Circus was the funniest thing in the world. That humour was a bit too early for most Americans. He was absolutely hilarious. It's very sad that he just died but at least Louis is still around. Louis lives down in New Jersey and does a bit of venture capital work, so to speak.

I really had a charmed career. I mean, I've been in good places, had a good time, but I think probably, of all the places I've been, Lamont was the most exciting. This was simply because it was the first complete Lab I built by myself. I was there with a bunch of other people, such as Jo Hamilton who is now in Australia and Norm Evensen who is up in Toronto and we just had this fantastic time with really bizarre characters like Louis and Rusty plus this rather anarchic Geochemistry group run by Wally. It was a very warm and welcoming environment. It had very few rules, compared to most University structures. It was successful, socially, scientifically, and was probably the most special time of my career. You know, I left there in '79 and went to Cambridge, but I've always felt a great deal of warmth for Lamont. One of those places that I've always enjoyed going back to.

#### About fieldwork and adventures in Africa

*AS: Do you like fieldwork? Do you still get into the field?*

*RKO:* I do. I adore it. Because I have had this interest in geology from an early age, I knew lots of names of minerals, rocks and fossils and that sort of stuff. But if I have a reputation at all in science, it is really as a geochemist in mass spectrometry and it sometimes comes as a shock to people when I go in the field and identify things. I was actually very well trained as a field geologist. I still do go out into the field but in a different capacity, not

in terms of doing proper field geology, of course. For example, I'm going to Iceland next week and I've been in China in the summers of 1998 and 1999, collecting loess. I did teach the first-year geological field trip here in Oxford a couple of years ago. In the 1980's, I was working in Northwest Scotland with Mike O'Hara, a well-known petrologist. It was actually wonderful to be in the field with a really first rate field geologist. That's a great great experience. Mike's a superb observer.

*AS: I am sure you have a few stories about fieldwork adventures, like most earth scientists. What are yours?*

*RKO:* When I was at Lamont, we had a research grant from the National Science Foundation to do some chronology on the Modipe gabbro in Botswana. It was at the time thought to be the oldest gabbro showing a remnant magnetisation from which the earth's field strength about 2.5 Ga ago could be estimated. Jo Hamilton was a graduate student in Oxford and came to Lamont as a post-doc and now works for CSIRO in Australia. We went off to South Africa together and we rented a VW minibus, a combi as it's called in South Africa. As a matter of interest, it did not have a seat belt in sight. We headed off into Botswana and managed to collect big samples of gabbro so we had huge twenty-kilo pieces of gabbro all over the floor of the minibus. We completed the fieldwork and then decided that we would drive on to Rhodesia (now Zimbabwe). I had worked in Rhodesia when I was in Oxford. We left, and there we went along this dirt road and Jo Hamilton was driving. The rear end of the Volkswagen started to move and then it rolled over and over and over and over. These great big lumps of gabbro just went flying out through the windows and everywhere. By some miraculous method, I ended up going out of the back window of the Volkswagen although I was sitting in the front seat. I ended up outside, unscathed, a bit bruised, and these big lumps of gabbro were strewn down the highway. Rather a dirt road on the edge of the Kalahari Desert! Petrol was pouring out of the van and Jo Hamilton was sitting white-knuckled in the van, upside down but otherwise still in good shape. I've got a picture of that somewhere. Our suitcases had burst open, clothes were all over the place, but of course my first preoccupation was to go and pick up these rocks. So I was going up and down the road, building up a pile of rocks. By this time, a whole group of Africans had collected around us and were rather mystified. Here was a vehicle upside down with Jo Hamilton shaking and I was collecting a pile of rocks. Anyway, quite a big group of Africans had collected around us and one of them came forward and spoke pretty good English and said, "How are you?" I was a bit surprised because they were pretty basic people. And he said, "Would you like to come back to my house for some tea?" We said yes, because we got to get police help and that sort of thing. I don't think we had tried to contact the police by that stage. You could only contact them by getting somebody else that happened to drive past. So we went off to one of these rondavels - round mud huts with a thatch roof - standard African style. We went back with him and he said, "My wife will make some tea." But his English was quite good. We went into the rondavel and he produced an English china tea set. And Twinings tea. In an African rondavel in Botswana! And he confessed he'd actually been in, I think it was Imperial College, at some stage. So we were sipping Twinings tea in a mud hut at the edge of the Kalahari.

Anyway, the police arrived and they were furious with us, really gave us a big dressing down but did agree to put our rocks in their pick-up - we had a ton of rocks - and they took us and our rocks to a place called Palapye. Which is one of the railway junctions where the train comes from Rhodesia through Botswana to South Africa. And there were we were in Palapye, with a pile of rocks at the side of the road and we were thinking, "Shall we get the train to Rhodesia or shall we go back to Johannesburg?" We went to the local store, which was run by a white South African and he was sympathetic to our plight. He said, "I'll get your rocks back for you". He produced some big sugar sacks. We packaged these things up in big sugar sacks and labelled them all up to Lamont-Doherty Geological Observatory. He said, "Don't worry about the rocks. You guys look after yourselves, get yourselves sorted out. I'll get your rocks back." How about some money? No, no, I'll get your rocks back. This was a store in the middle of nowhere and we thought, "Nice bloke, but we're never going to see these rocks again." But they did show up at Lamont and we think the guy in Palapye must have paid for their transport. Isn't that amazing?

By the way, we hired this minibus from Budget Rent-a-Car in Johannesburg and we had to call them and say, "Eh, the car is in Botswana." Jo Hamilton would not pass a Budget Rent-a-Car place, for years after that. He would always cross to the other side of the road.

Actually this was quite a troubled trip, because when we left Johannesburg, we got on a 747 to fly back to London and we were just off the runway when there was a flash of light outside the window and the engine blew up and dropped off. We had to dump our fuel and land on foam on the runway. And then we had two days in Johannesburg. Yes, that was a quite an eventful trip.

#### **About moving back to Europe, about putting things back into society and his new appointment**

*AS: Why did you leave Lamont?*

*RKO:* The Royal Society in Britain gives a small number of professorships; they're called Royal Society Research Professorships. These were given on criteria that I certainly did not understand at the time. The first I knew about it at all is when I got a letter, which more or less said, "We'd like to offer you a Royal Society Research Professorship. Would you be prepared to accept this if suitable arrangements could be made?" I knew it was really the chance of a lifetime so I went to Cambridge. Those professorships now have a maximum of ten years but were jobs for life in those days. They had to be renewed every five years but you could hold them until retirement, if you wished. I held mine for sixteen years and came to Oxford four years ago. I basically felt that 16 years was long enough. It was time for a change and perhaps to put a bit back in the system and be head of a department some time. Payback time.

Over the last ten years I've done a number of other things. I've been involved in research council committees and have been chairman of a few of them. I was very involved in the European Union science committees. I barely know Brussels at all but I've been to Brussels more than most people would ever want. The last number of years I've been a member of the Council for Science and Technology. None of this has been to the point of hav-

ing a particularly deleterious effect on the rest of my life. Although I must say that being head of the department is not the best way of doing research. It is not a hard job here in Oxford, but it is a job that never really goes away.

Having been involved in these things, perhaps it is not surprising that the government job has come along. I had three weeks of sheer hell deciding whether to take that job. Of course, most people who take on jobs of this sort don't get back to Labs. They may stay in science in one way or the other, without actually getting back into the lab. So, one has to take such a position with the expectation that one might not come back to it. To the lab, I mean. However, it's a three-year leave-of-absence, formally, and the University will keep my job open for me. Anyway, now that I've made the decision, I am looking very much forward to it. It's a very challenging opportunity.

*AS: So what made you decide?*

*RKO:* (Laughs) It just looks like a hell of a lot of fun!

It involves an enormously broad range of science. Many of the things I have been involved with for the government and the research councils have made me aware of a broad range of science, ranging from astronomy through materials science through into the biomedical sciences. I've been much involved in aspects of research council work across that whole range for the last ten years actually and this has been tremendously exciting. I'm ignorant across the whole spectrum, but at least I know that there is a spectrum. But one's real expertise is very narrow.

I think it's is going to be interesting, having spent all of my adult life in universities and in the academic world, to spend a small amount of time in the real world. Some might say, "Defence, the real world? You must be joking!"

If this had not come along, though, I would have been perfectly happy to stay here. I would have completed my term as head of the department in September 2000 and I would probably have taken a sabbatical then. I would have been perfectly happy pottering along for another decade, doing what I've been doing, would this new opportunity not have arisen.

Coming back to Europe from the States was an eye opener, because in the late 1970's, if you got to know other European earth scientists, it was usually by meeting them in America. There was very little integration in science here in Europe. With the separate funding structures in the various countries, there was very little unified activity at all. Twenty years later, Europe is a very different place. One of the things I really enjoyed was competing with Al Hoffman and Claude Allègre. We were always in a fairly tough scientific competition. But we actually collaborate very closely on geochemistry and earth science in Europe and encourage our post-docs to work in each other's labs.

Unlike Claude's, who's minister of education, science and technology in France, my appointment in the UK is not a political one. Claude would probably call me a typical British pragmatist. I don't have strong political views; I am pragmatic. I like what I like and support what makes sense. I don't have any political party affiliations.

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*AS: Have there been any events or periods that were particularly difficult, because you had to solve certain problems, or because of things that turned out entirely differently than you expected?*

*RKO:* In science, my view has always been that if you go into a problem or subject, you should have very good, well thought-out reasons to do so. But, at the same time, you must expect to learn something completely different than what you had in mind originally, which has been really true of my career. Who would have envisaged the application of Nd-isotopes to sediment systems, the evolution of the continental crust and as ocean water mass tracers in the mid 1970's when a number of us started investigating them with regard to meteorite chronology and sources of plume and ridge basalts. And in the 1980's, jointly with Ron Oxburgh we started investigating He-isotope distributions in relationship to heat-flow following the lead of Russian workers such as Igor Tolstikhin. A few years later, together with Chris Ballantine we evolved our work to study the relationship between ground water flow and hydrocarbon accumulation. I think that you have to be ready to understand and discover anything and not just the things you anticipated when you went into it. But I still think that as an intellectual discipline it is extremely important that you have very clear reasons to go into something. That's been a repeated aspect of science, for me.

In personal terms, I have had a very simple straightforward life. I just grew up, got educated, got married, had some kids, moved around the world a bit and here I am. Without too many trials and tribulations on the way. I am one of those unusually fortunate people. I met Rita when we were in Grammar School, at age 11. We were in the same class in school but she was much cleverer than me. She worked as a radiographer until we had children. Now she's teaching disadvantaged children, either visually impaired or with learning difficulties or other special-needs teaching. She was the best mathematician and the best in everything at grammar school. I was relieved when she did not go into earth sciences. (Chuckles) It might have destroyed a wonderful relationship! In effect, she put her career into the children. She didn't work outside the house for about ten years. Yes, in personal terms, my life has been very straightforward. It's rather unusual, but I have very little interesting to report. With all the travelling and all the places we've lived, I think Rita and I were probably both trying to build a good background for the children too. Looking forward and enjoying the things that are good about a place and not getting too hung up on things that are less than great.

*AS: Where do you expect major developments in geochemistry, earth sciences and other sciences, in which subjects? If you would determine where the funding goes, where would it go?*

*RKO:* I've always been much more impressed with supporting smart individuals in science - give them as much freedom as they can to be creative - than the support of hairy-fairy notions and specific missions. This recognises the fact that the best people usually find the best things to do. It is often a bit presumptuous to have a committee decide what are the best things to do and then find the people to do it. You got to have a balance, however. There

is a great danger in all western societies that we lose sight of the fact that the best people properly supported are probably going to give you the best outcomes. And these outcomes in science usually have the biggest economic impact or have the biggest effect on the quality of life issues, but are very difficult to guess in advance. They arrive often through serendipity. So I think it is best to strike a balance between directed research, foresight programs directed towards premeditated targets, and the proper support of bright individuals. Because that is where the real creativeness is.

*AS: Do you think that the earth sciences need to change? In the sense of justifying their existence to the public? Claude Allègre said a few years ago that the other sciences were not convinced, that what we are doing is worthwhile and therefore also needs to get adequate funding. He said we had to change the way we do things.*

*RKO:* Well, regarding present-day science, the advances that are being made in many areas of biological and biomedical research are really quite incredible. The potential in biological and life sciences is truly enormous. And if one looks at that, and looks at the sorts of proposals that are made in quite a broad part of the earth sciences, one can say that they often look less exciting and less relevant in the societal sense, compared to some of these other areas. It should not surprise us, nor should we protest, that the priority goes to other areas.

Having said that - I mean that was just injecting a sense of reality - I think there are enormous opportunities in earth sciences. The opportunities in the integration of the biological sciences and geological sciences are just immense. There is a big surge and a great deal of potential in cosmochemistry and the planetary sciences, with new missions and new technologies. Progress - if it is going to be made - is usually where conventional parts of the subject overlap with other disciplines. For example, to progress in biogeochemistry, we have got to involve people that really understand biological chemistry. A standard geological or earth sciences education is not going to be sufficient. Difficulties arise where there is a reluctance to move away from traditional parts of the subject and the sort of arguments that are rehearsed in this country is that intellectually some part of the subject is still rich, and that is absolutely true. I mean, you and I could go and find an outcrop somewhere outside Oxford, pick up a rock nobody gives a damn about and we could spend a very intellectual afternoon, describing it, thinking about it, reasoning about it. It is just not enough for things to be intellectually challenging and to have intellectual vitality or even have intellectually able people involved. It's really got to be more than that. There are so many things we could do in earth sciences, but there is no chance of it all being funded.

What earth sciences has to do, is to progress and embrace these new opportunities. Also, to do a better job of communicating its talents, abilities and skills more widely to policy makers than has been the case in the past. I don't think we are good at that, as a subject. If you compare the ability of the astronomy community to communicate its successes to the wider community: that is really quite enormous. I think earth sciences departments are going to have to look at where the boundaries of those subjects are, to make sure that they're not building Chinese walls, but rather seeking new opportunities.

My view is that with regard to the major issues that confront us about our ability to inhabit the planet - the planet we're actively modifying - what earth science has to offer is the physical-chemical basis for understanding the processes that control the environment. That is wonderful, because we're the only ones who can do that. Earth science is populated with people with strong physics and strong chemistry backgrounds and good applied mathematicians. In terms of measurement techniques, the geochemists are probably the best chemical analysts in the world. So there is a contribution that we can make, in some of the basic physical science of the processes controlling the environment.

Boundaries between subjects are often established for convenience of teaching, funding and administration. These often become too firmly established and great progress often flows when they are breached. It has happened before, of course, this breaking down of walls. Look for instance at molecular biology. A major part of the subject started in the Cavendish Physics Labs in Cambridge, which was part of the crystallography group there. Crystallographers, physicists, started doing structures of organic materials and look where we are, almost fifty years later. What actually happened had an influence across of the whole range of biology.

Earth sciences has also had these sort of revolutions, both intellectual and technical, but I think we are probably failing as a subject, to really get over our own relevance, to policy makers.

A key is to get students to university and encourage them to take courses in the subject. At this university, which is far from standard in terms of the world of university - it's a very unusual place by any standards - we actually have to work very hard to introduce the subject really down to school level. We have open days for schoolteachers, special meetings at Easter time where schoolteachers come. These are schoolteachers of physics and chemistry and we hope they can tell their kids that there other things you can do with your physics, chemistry and math. We work very hard, very hard, to get students into the subject at this university. Whether we are working harder than other universities, I don't know. There are some universities - far too many - that are taking students into earth sciences without a good mathematics and physical sciences training and these people are not going to be able to push the subject where it needs to go. But the better places everywhere are well aware of this.

*AS: I know you have official links to other European earth science departments. Can you tell me something about those co-operations?*

*RKO: We have a European Union Network, which links a number of labs in Europe. The Free University in Amsterdam, the Max Planck Institute in Mainz which is Al Hofmann's, Claude Allègre's lab in Paris, and Aix-en-Provence in France and Oxford. This Network has been tremendously beneficial. We meet every few months with a number of post-docs who are part of this Network. This is very good because the thing with that European network is, that if you're in Holland you can't appoint Dutch people and if you're in England you can't appoint Brits. Twenty years ago, when I came back to Europe, none of this existed. I did not meet Claude Allègre in Europe; I met him at the AGU. In twenty*

years, a huge change has occurred and this is actually very good. Geochemistry and certainly isotope geochemistry has often had the reputation that it was occupied by a bunch of warring tribes, that it is an area where the rivalries are high and where the levels of aggression and competition also have been high. All those things are true, actually. I think it has been a fairly aggressive area. But one of the great successes in Europe is that three of these aggressive people - Claude, Al and myself - have been able to work really closely together, to do things for the common good of European geochemistry and more broadly, for earth sciences as well. This has required that we place scientific arguments to one side and do these things in a harmonious manner but still maintain a sort of vigour and cut and thrust needed in the research. I think that is actually quite an achievement!

I've also worked with Igor Tolstikhin for eight or nine years. He is funny guy as well and the most outstanding geochemist in Russia. He's the guy who discovered  $^3\text{He}$  in Kamchatka volcanics. And most of my research career, I've collaborated with Karl Grönvold, who's Icelandic.

#### **About the person**

*AS: How do you manage your activities? How do you juggle your parcels of time? I notice that you do not seem the slightest bit stressed and I know quite a few scientists who are.*

*RKO: Well, I do work a large number of hours. I work most evenings and I'm not very good at working at home; I tend to come back and work at the office. I go home for dinner, and most often come back to the laboratory in the evenings and work to 10:00 or 11:00 pm. Saturday is my best day for peaceful work. But if you enjoy what you're doing, it's not really work. To me, doing research never feels like work. It is somewhere between a hobby and just having fun. The wonderful thing about sitting down in your office and reading an article is that you can feel quite stimulated. You can feel you've achieved something when you've understood something and got away with some new knowledge. You can go into the lab and make some measurements on something and the euphoria can last for a few days. However, being head of a department is actually work. Stress has never been one of my problems. I can put a lot of effort into something, work very hard at it, if I think I can make a difference. But I never end up beating my head against the wall. There's no point.*

But yes, I know that many people feel a strain because we now have three, four, five jobs, where we used to have two jobs, teaching and research, thirty years ago. The accountability is higher. I view juggling my time as a new sort of challenge. I've been very lucky. I almost never ever fail to get a research proposal funded. If you run into trouble with funding, that's a very-high-stress situation.

*AS: Do you have any other favorite books, besides Principles of Geology?*

*RKO: To tell you the truth, I don't actually read a lot of books. Teaching here and in Cambridge, I made very little or no use of textbooks at all in teaching. My view is that there is a great deal*

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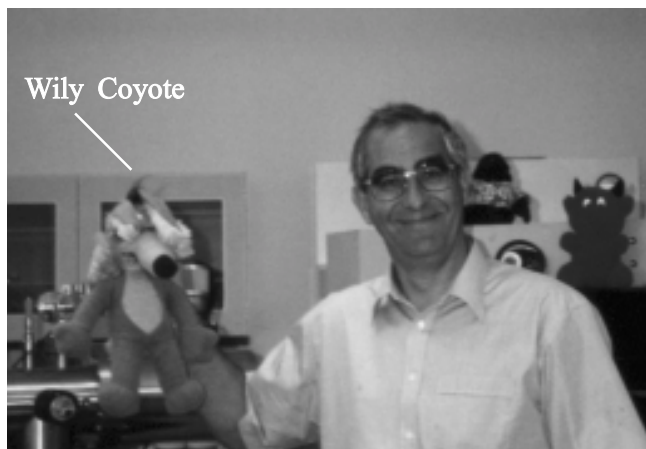
of merit in presenting the subject and encouraging people into the literature at an early stage. I was always discouraged by seeing a course with a particular course text, with the aim of the course that you become familiar with the text. That is probably okay in physical chemistry, where you go through equilibrium thermodynamics, through kinetics and so on but in earth sciences I think it's much less appropriate because the subject moves so fast in so many areas. I make very little use of textbooks and don't recommend geochemistry or geology course texts. But, like everybody else, I do use books as reference books, of course.

Outside of science I read less and less as time goes by. I made a choice. Like many others, I don't have time to read many novels anymore. Reading novels has become a bit of a Christmas occasion. The last novel I read was Steinbeck's *Cannery Row*. This was just because I happened to be in Monterey. In terms of regular reading I read *The Economist* magazine and that is the only newspaper I subscribe to.

There are lots of books that I've enjoyed. I've been reading Bob Williams, for instance. Bob Williams is a professor emeritus in chemistry here in Oxford and he has written two books, one with a co-author called Da Silva. One is called '*Natural selection of the elements*' and the other is called '*An Introduction to Biological Chemistry*'. These are absolutely fascinating. They deal with how inorganic chemistry interfaces with biological chemistry. The roles of redox elements such as iron and copper in cells, the role of calcium, what the control mechanisms are in passing these elements from an enzyme to a protein and so on. Reading that to me has been just pure relaxation. But it's not on the best-seller list.

AS: *What about hobbies? You used to play rugby as a graduate student in Canada. Do you still play rugby? Or do you play golf now?*

RKO: No! None of that sort of thing. I like walking and I like music, all sorts of music. I listen mostly to classical music. I have no real favourites, but I never tire of Beethoven, Mozart, Vivaldi and Bach. And being English, I have to devote some time to the garden. My biggest hobby, however, is my work and things like theatre and concerts often lose out to it. I do not distinguish between hobby and work, though. As I said, my work really does not feel like work.



*I now get official advice from the Ministry of Defence, and they tell you to sit like this.*



*This is how, I'm told, one must approach The Queen*



*Massif Central, France, 1984*

*Krafla, Iceland, 1982*