Q&A

Mike Lockwood RAS President

Incoming RAS President Mike Lockwood talks to Sue Bowler about inspirational people and the pleasure of scientific discovery

You joined the RAS as a young scientist. What was the appeal, for you?

First of all, it gave me a forum to talk at. My first talk at an RAS meeting was absolutely awful. But as I watched other people, I realised why some of the speakers were good. And the people that I met through the RAS were fantastically helpful. I felt like I belonged. At that first meeting I went to, Alan Rodger came up to talk to me and find out what I did, and then he said "oh, I know just who you should talk to, I'll introduce you". The RAS makes those contacts possible.

Later on, I joined RAS Council. It wasn't the first committee job I had, but it was the first where I was really involved. Martin Rees was in the chair to start with, so I'd watch how he did things, then how Carol Jordan did things and then Jocelyn Bell Burnell and I learned from each one.

What do you hope to achieve as President?

The RAS was hugely important in helping my career. Over and over again, it inspires people to get into science and helps build careers. Somebody did that when I needed it, so I feel it's my turn to make sure it continues and not only continues but thrives. There is part of me that is sufficiently worried about the trajectory of this country that just maintaining the UK's capability and reputation in astronomy and in geophysics would be a good outcome. I know that doing no damage is a pretty low bar to aim for, but that's my starting point.

But one of the things I value most about the RAS is the library. I spent several weeks there, looking at old eclipse measurements of the size of the solar corona, because unlike in some sciences, in astronomy and geophysics the past does matter. That information never goes out of date and that's what our library offers. I'd like us to take some steps towards an integrated astronomy and geophysics information system – a library for the 21st century.

Tell me what got you started in science

It all started for me with Len Goldsmith, who was head of physics at Skinners School, Tunbridge Wells. He was a really interesting and charismatic man as well as a terrific teacher. And for some reason, I wanted to do well in physics. And he taught us more than physics; he used to talk about the scientists who had made the advances and the society that they lived in. He taught us about our rights and our responsibilities. From then on, I knew I was going to do physics. And as soon as I did some physics at university, I wanted to research physics.

And what did you do next? You did your undergraduate and postgraduate degrees at the University of Exeter.

I had to be very self-reliant for my PhD. I didn't really get much help, and I think that was a good thing. But I did learn that, if I wanted something done, I should do it myself. I went to New Zealand, to Auckland University for a year after my PhD and I loved it. When I came back I got a job at Rutherford Appleton Laboratory (RAL), which at that time, was just moving up from Ditton Park in Slough to the site in Oxfordshire where it is now. John Harries, who was head of remote sensing, lived in Surbiton, like I did. We shared lifts to work and got to know each other very well; I think we both began to look forward to traffic jams, because that gave us a chance to put the world to rights. John taught me a fantastic amount about physics, and the politics behind science. He saw something in me and I think he bent the ear of John Houghton, who was the director of RAL at the time, and I got an early promotion. People like Dave Willis, Richard Harrison, and Richard Holdaway made sure that I continued to get the chance to do some research.

You've mentioned inspirational colleagues, but who are your personal science heroes?

My heroes tend to be people who prevailed over the establishment or prejudice or poverty, or whose contribution is undervalued. Science is hard enough without these barriers, but sometimes people have a determination and a will which sees them through. So Rosalind Franklin, Marie Curie (particularly for her humanity as well as the incredible passion she had for her work), Eunice Foote, Srinivasa Ramanujan, George Fitzgerald, Ignaaz Semmelweiss, Jocelyn Bell Burnell. Richard Feynman was the most charismatic speaker I ever saw, and he was incredibly kind to me as a young man. Another difficult but brilliant man was Jim Dungey. I used to go to Imperial and everyone was so busy, but Jim just wanted to go to the pub. I'd go with him and we'd sit and he'd talk. I just listened and learned so much. I learn very quickly from people, once I realise how much they are worth listening to.

What motivates you in science?

I just love it. There have been some special moments when a penny drops. I remember times riding home after dark when I would ride with extra care because I had this daft feeling that if something happened to me, then something would be lost to the world, that it doesn't know and might not know for a long time. That feeling, that you're the only person in humanity to understand a small piece of the jigsaw, however small it is, that you're the first person that's really twigged – is a fantastic feeling. Magnificent and rather scary. Of course, when it's all published you find that there are people all around the world who had pretty close to the same idea.

And you enjoy publishing your work?

Oh, absolutely. The fun of it is contributing that piece of the jigsaw. And if something's wrong and that piece

doesn't fit as well as you thought, then the referees will tell you; it's fairly brutal. But peer review is incredibly important. I get very angry with people who think that peer review is dead, because they never suggest an alternative way for science to correct itself. Yes, peer review is inefficient, and it does make mistakes. But over the long term, those mistakes are always corrected.

But some incorrect ideas have a life of their own, often on social media, as you have found.

Yes, I did some work on how solar variability influences climate change that shouldn't have been necessary, because the science of vibrations in greenhouse gas molecules and of radiative transfer in our atmosphere is so sound. And when you really understand it, it's impossible that they did not cause our temperature to rise by the amount that observations show. But there was, still is, this common misconception: people think that, because the Sun powers our climate, then changes in the Sun must be causing changes in our climate. And it's just not right, first of all because there are reasons why changes in solar output are so small or because mechanisms for which there is no evidence are invoked. One of the things I did was some work to show that global temperatures should have peaked soon after 1985 if solar activity was a big factor – the rise in solar activity has turned to a fall since then but global average temperature has kept on rising. I have also put limits on how much solar variability could have contributed to long-term climate change. And there is interesting science there; on a regional basis, there are planetary wave effects that propagate down from the stratosphere, which is much more influenced by solar changes than the troposphere. They can cause some regional and seasonal variations to jet streams: that's really interesting to long-range weather forecasting, but in terms of the basics of centennial climate change, it's a non-starter. I'm quite proud of that work but I'm also proud that I stuck to my guns when it got nasty – and it got very nasty. My family and I did receive death threats to stop me talking about it. That is so bizarre: even if I did stop, it wouldn't change the reality one iota.

Those people must be absolutely convinced that I'm only talking about this science for some sort of personal gain. Of course, one falls in love with one's own ideas and when you test them against data and it doesn't work, your immediate reaction is that the data must be wrong. But if other data doesn't work either, you have to think, okay, the common denominator is now my idea: that's the bit that doesn't work and that's what I have to change. And that is what the conspiracy theories get so wrong. The idea that a real scientist would deliberately pursue something that is wrong just for their own benefit... well, I guess it may have happened but it is incredibly rare and is always, and usually quite quickly, shown for what it is in the proper peer-reviewed literature.

Tell us more about how science works for you

Talking about people who have influenced me, Stan Cowley has this amazing, incredible, holistic view of everything, and he's outstandingly knowledgeable. That could make writing a paper with him a pain because he would say, something's wrong, it's just not right. And I would say, yes, I know, let's just take that bit out and rewrite it. But he wouldn't do that; he'd need to rewrite the whole paper. After working with him, I started to think a bit like him, and that's a huge asset. He and I have made some great progress. I guess the most important was a new paradigm of how the solar wind flow drives flow in our ionosphere. We provided the mechanism that works at a faster timescale. And as Stan says, you look for one thing, you find another. I was trying to understand the temperatures in the ionosphere because they tell you something about the magnitude of the flows there, and it was all wrong. So I went back to the raw spectra, and looked at the data. And I immediately recognised the form that said the plasma had gone into a non-thermal state. We had discovered echoes from non-thermal plasma in the upper atmosphere, which was was great. What's amazing was how little we had to go on, but we thought we had great data. We were using much higher resolution data than people had had before. You look back and think it's absolutely amazing that we deduced anything at all from it.

What do you enjoy outside work?

Music. I really love to listen to and play music. I play guitar – I'm not very good – and I admire good musicians, in any genre, enormously. I'd like to say that I read a lot, but it's not true: I do so much reading as part of being a scientist that it simply isn't a relaxation for me. I'm also a slow reader and tend to analyse every word. So I find that I read poetry a lot – I admire poets who can say a lot in a few words. At school, I wasn't diagnosed as dyslexic only because the concept and the word were not yet defined. I was saved by learning Latin. It's such a nuts-and-bolts language (I think of it as the equivalent of assembler code in computer programming) that you have to work out the purpose of every word. I was able to transfer that to my own writing and speaking, but like the guitar: it doesn't come naturally to me.

I do love sport; again I admire sporting prowess because I never had it myself. I'm a lifelong soccer supporter; it gives me a sense of belonging and a reason to check the scores. I get very emotional when watching any athletic or sporting achievement in a way I just cannot explain.

I love swimming, especially in cold water. That is something I learned when visiting the Arctic where I swam in Finnish lakes, the sea off Sweden, Norwegian fjords and even off ice floes in Svalbard. The sense of well-being as you warm up again is wonderful.

Lastly, I love being with my three young grand-daughters. They are so funny and so talented, each in their own individual way. They will know much more than I ever have. I understand very well the value of enthusiasm and so I see my role as nurturing that. I have fears for the future that we are bequeathing them, but they are so bright, aware, kind and inventive that I genuinely believe they and their generation will find solutions. ●

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AUTHOR

Prof Mike Lockwood FRS, is part of the Space and Atmospheric Electricity Group on the department of Meteorology at the University of Reading, also at RAL Space and a visiting honorary professor at Imperial College , London. He becomes president of the RAS at the AGM in May, and stays in office for two years. Read more about Mike's life and work in an earlier interview from *A&G*: tinyurl.com/yc5e7ha4

Sue Bowler is editor of *A&G* and a big fan of the RAS Library, as it is now and as it could be...