

A quantum leap – communicating complex science with Jim Al-Khalili

Who are we? And where do we come from? As questions about life on Earth go, these are two of the biggest. **Professor Jim Al-Khalili** has dedicated his career to finding out the answers, keeping the rest of human life informed as he goes. Following his recent conversation with us at *Research Features*, he highlighted the importance of one key area needed to safeguard the future of nuclear physics and science more generally: communication.

Professor Al-Khalili is one of science's greatest communicators. From various TV documentaries, to an extensive radiography – including BBC's *The Life Scientific* – he has established himself as a prominent figure within science communication, acting as the middle-man between research, particularly his own area of theoretical physics, and the general public's appreciation of science.

Theoretical physics is widely acknowledged as one of science's most difficult disciplines to understand. Yet, through Professor Al-Khalili's influence, more and more people in the UK and across the world are interpreting it in a way that makes sense to them – and that can only be a good thing.

Whether it be improving understanding on how a black hole forms, or uncovering information on the fabric of reality, interest in physics is constantly growing, and that is something which needs to be nurtured. Fortunately, with Professor Al-Khalili as an award-winning advocator, its future is in good hands. He recently spoke to us at

Research Features to discuss his distinguished career and the importance of science communication in further detail.

Thank you for speaking to us, Jim. What first interested you in your own field of theoretical physics?

My first love of theoretical physics began when, as a young boy, I became fascinated with subjects such as quantum mechanics and Einstein's theories of relativity. But my research career began in earnest when I embarked on a PhD in theoretical nuclear physics. The atomic nucleus is the playground of quantum mechanics and I have spent 30 years trying to understand the quantum rules that govern how protons and neutrons arrange themselves within nuclei. Although I have broadened my interests in recent years, it is still the mathematical formalism and philosophical implications of quantum theory that I remain most passionate about.

This is an area which a lot of people would perhaps think of as one of the most difficult for a non-specialist to engage with. Would you agree? Has the experience of working ▶

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in such an area helped develop you as a communicator?

Indeed, it is. Quantum physics in particular is notoriously counter-intuitive and trying to get across the essence of what it tells us about the world has been challenging. But as with all good science communication, it is all about the language that is used. What is also important is the acknowledgement that the wider public is not 'less intelligent' than the me, nor that I need to 'dumb down' (a phrase I hate), but simply to use the appropriate images and words that can be understood without the benefit of years of study of the specialist jargon. This is of course not straightforward and I am always reminded of a quote by the famous physicist, Richard Feynman who, when asked to encapsulate his Nobel-prize-winning work on quantum electrodynamics in a few words, said 'if I could explain my research in a soundbite, it wouldn't have been worthy of the Nobel prize'.

What is your motivation for promoting science engagement so consistently throughout your career?

I would say it is simply this: if I discover something new about the Universe then why would I want to keep it to myself? I want to share with the whole world my love and fascination with the laws of nature. So I will shout it out to anyone who will listen.

Do you think the perception of 'science communication' has changed since you first started working in the area?

Without a doubt. When I first began my work in science communication twenty-five years ago, it was seen as something best left to those who were not practising researchers. It was not seen as an activity that a serious scientist should 'waste time on'. Since then, the whole area of public engagement in science has been transformed and I'd like to think I've played a role in this. I am among the first generation of practising academic researchers who have devoted time to bringing our research to a wider audience without losing credibility as serious scientists. This is certainly true in the UK, although other countries still have a way to go before science communication is established and respected.

The Life Scientific on Radio 4 is enjoyed by huge numbers of people, some of whom are scientists, many of whom are not. How do you prepare for these interviews?

I have a great team at the BBC. I work with producers (who themselves have PhDs in science) who do much of the preliminary research work and talk at length with the

guests beforehand. My producer will then send me extensive notes, research papers and articles, which I will read. Then I will spend a full day for each guest discussing their lives and work with my producer and writing the script. If only I could remember all the details of the science of all my guests, I would be a polymath. Unfortunately, my brain is finite in capacity and I cannot retain all the details once the programme is recorded.

Having worked across radio, television and print, what do you think the strengths of each medium are when it comes to communicating complex topics?

That's a difficult question. Television has the added benefit of imagery and story-telling in a way that many might say is richer than radio. But I have learnt over my years working on *The Life Scientific* that radio is also a fantastic medium if used intelligently. For me personally, I find the writing the most fulfilling and satisfying medium because here I am in complete control of the content and it allows me to unpack complex scientific concepts without the constraints of broadcasting. It is difficult to quantify the relative impact that each has. *The Life Scientific* has close to 2 million listeners each week, which is more than I get for my TV documentaries. But my books have been translated into 26 languages so it's impossible to know how far they reach.

And how about social media? What role do you see this playing in science communication over the next few years?

We are already seeing it growing in importance. I am a big fan of Twitter and, by following the organisations, institutions and individuals that I trust, I am able to use it as my main source of information. And with over 100k followers myself, I find it a powerful way of getting across my views on science.

Have you got a favourite example of how to take a complex scientific subject and make it not only understandable but also really engaging?

I am lucky in that the areas of science that I have expertise in also happen to be the ones that the wider public find so fascinating, such as the nature of space and time, the building blocks of the Universe and other fundamental questions about where we come from and the nature of reality. These are all profound topics, but they are also the ones the public is most fascinated by – everything from the nature of black holes or the possibility of time travel to how an atom can exist in two places at once.

From your own publication record, receiving an OBE, becoming the youngest ever recipient of the Royal Society Michael Faraday Prize for science communication to presenting multiple television shows, is there an aspect of your career that you are particularly proud of?

That's a tough one. I am very proud of some of the books I have written and particularly love to hear from people who come up to me and say they read one of my books when they were young and it then inspired them to go on and study science as a career. To think that I have played a part in shaping someone's life is incredibly humbling. I suppose if pushed, I'd say I am most proud of winning the inaugural Stephen Hawking medal for science communication, particularly as Hawking himself chose me.

What advice would you give scientists of any age who want to engage a wider range of people with their work?

Do it. However, I always say to young scientists wishing to do more to engage the public that they can either be science communicators (a very worthy and fulfilling career) or be 'scientists who communicate', which is the route I took. If the latter, then it is important to focus their energies first on establishing themselves as research scientists before devoting too much energy to communicating that science. Luckily, because science communication has gained respectability in recent years, many universities see it as an important part of an active scientist's career and encourage it.

• *Jim will be speaking at this year's New Scientist Live event, which takes place 28th September – 1st October 2017. For more information on the festival of ideas and discovery visit: www.newscientistlive.com/*



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