Chancellor Dharker,

> *"The enterprise of science, and how we do it, is far too broad to be neatly packaged, and it should not be considered as something hermetically sealed away, separated from other pursuits, such as history, art, politics or religion."*

So writes Jim Al-Khalili in the introduction to his recent book, *The Joy of Science*. As a physicist, academic, communicator and humanist, Jim's story is certainly not one of science "neatly packaged". Rather it is one of science reaching out – of barriers and borders crossed.

Jim grew up in Baghdad in the 1960s and '70s in a family environment that can only be described as diverse. His father a Shi'a Muslim Iraqi engineer and his mother British, Christian and more inclined to the arts. He was speaking English at home – where the BBC World Service was a constant presence – and using Arabic at school.

At school, Jim was bright, and probably a little competitive. Asked whether there was a point at which he decided to pursue physics, he did not describe being awestruck by an equation. Instead, he recalled a day when he outperformed everyone else in his class at a physics test. More seriously, his discovery was that science is not a vast body of facts but a disciplined way of solving problems: not something to know, but something you do. His view was that it's physics that addresses the big questions and young Jim knew that he could and would do physics.

For all the relaxed home life, Ba'athist Iraq in the late 1970s was becoming a hostile environment for a family like the Al-Khalilis. In 1979, just weeks before

Saddam Hussein assumed the presidency, they left their home and possessions to move to Portsmouth. England was familiar to Jim from holiday visits, but there was displacement to overcome. Needing to find his place among his peers, he put energy into less academic enthusiasms including finding love and – unfathomably – supporting Leeds United. Scholarship took a back seat for a while, but after re-taking A-levels, he entered the University of Surrey to do Physics.

Some students are inspired by the models, theories and observations that are the day-to-day subject matter of science. However, it is striking that Jim spent a year as an undergraduate "devouring" biographies of great 20th Century physicists. From this early point in Jim's career, appreciating science meant appreciating how scientific concepts come about, and that meant finding inspiration in the people who created them.

Jim completed his doctorate at Surrey and won a fellowship to work in nuclear reaction theory at University College London. Returning to Surrey, he developed an interest in *halo nuclei*, entities that are as exotic as they sound. Jim made significant contributions to understanding their fundamental properties, but the daily life of the theoretical physicist is less rarefied than you may think. As a professor of computing, I note that Jim owes much of his achievement in this area to doing a great deal of coding and – as he freely admits – a greater deal of debugging!

Since the late 1990s Jim's work has crossed boundaries between physics and other fields. He has, for example, pursued quantum biology, seeing it develop from a fringe subject to establishing the first doctoral training centre in the field, recognising that the area deserves new generations of researchers. In the same vein, he leads *The Quantum Arrow of Time,* a multidisciplinary project involving physicists, chemists, mathematicians, biologists, and philosophers in six universities in the US and UK.

Alongside research, Jim is a proud teacher. He has taught undergraduate physics every year in the last 30. Indeed, he is `fresh' from delivering his Semester 2 15-credit Stage 1 module unambitiously titled "The Universe"!

Jim is one of the world's foremost science communicators in print, on screen and in your headphones. He has written about 14 popular science and science history books, at least two of them nominated for the Royal Society Book prize. The range is extraordinary, including his first novel Sunfall, and the Ladybird Expert books of Gravity and Quantum Mechanics!

There is hardly a modern form that Jim not mastered, from TikTok to high-end TV. He has presented a host of documentaries, including *Atom* and the BAFTA-nominated *Chemistry: a volatile history*. One of his most significant achievements has been to shine a light on the glittering advances of Arabic Science in the 8^{th}-14^{th} centuries that laid foundations for the European Renaissance. His most regular gig, though, is the inspiring Radio 4 programme *The Life Scientific* that has been humanising science for over a decade and more than 250 episodes.

Jim has many formal distinctions. He was admitted as a Fellow of the Royal Society in 2018. He is an honorary fellow of the Institute of Physics and the Institution of Engineering and Technology, and a past president of the British Science Association. He was created OBE in 2008 and CBE in 2021 for Services to Science and Public Engagement. He holds a University of Surrey Distinguished Chair, a personal chair in physics and a university chair in the Public Engagement in Science. Holding so many chairs, he describes himself as a living three-piece suite!

And what is Jim himself like? Newcastle colleagues who have worked with him in the British Science Association and Festival, and elsewhere, tell me that he's full of enthusiasm and ideas, affable and accommodating. Perhaps

surprisingly, given his family background, Jim has been a humanist since his teenage years. President of Humanists UK from 2013 to 2016, he finds joy and wonder in a world that is extraordinary yet is rational and explicable.

Engagement in science has long been a worry. 150 years ago, when the creation of the College of Physical Science at Newcastle was announced in the pages of Nature, the editors commented "It can scarcely be known, … how much may have to be done in the way of *creating the demand* for scientific education in the locality". By 1885, the professor of physics was touring northern towns giving demonstrations on the brand new subjects - X-rays, radium, and wireless telegraphy.

The media have changed, but the stakes are at least as high today. When populist movements aim to shut down rational exploration through denial, the imperative is stronger than ever to engage people in doing science. For scientists who have felt hemmed in by their own subject or career, or for anyone who finds science remote and inaccessible, Jim Al-Khalili's work encourages us to step outside our "neatly packaged" disciplines, backgrounds, and mindsets. That capacity for amiable engagement is needed now more than ever. Chancellor Dharker, it is for this reason, that I invite you to admit Jim Al-Khalili to the degree of Doctor of Science *honoris causa.*

Citation by Professor J S Fitzgerald, Public Orator

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