

# What is life?

## Catching up with Paul Nurse from the Francis Crick Institute

- Sir Paul Nurse, cell biologist, geneticist, and Nobel laureate became the first Director and Chief Executive Officer of the [Francis Crick Institute](#), UK, upon its inception in 2010.
- The institute has become one of the largest and most exciting biomedical research centres in the world.
- Research is led by the scientists themselves, which Nurse believes leads to greater creativity and more impactful investigations.

**S**ir Paul Nurse is a geneticist and cell biologist whose research is recognised worldwide. In 1999, Nurse was knighted for his contributions to cell biology and cancer research, and his work with Leland H Hartwell and Tim Hunt on the key regulators of the cell cycle earned him a Nobel Prize a couple of years later, in 2001.

Since 2010, Nurse has been Director of the Francis Crick Institute in London, UK. In this insightful interview with *Research Features*, Nurse discusses the institute's creative 'bottom up' approach to research, his presidency of the Royal Society, science communication, and how he stays grounded despite a staggeringly successful career.

### What projects do you work on at the Francis Crick Institute?

The Francis Crick Institute is a little unusual compared to the majority of research institutes. First, it's very large. In total, there are around 1,500 scientists here in the middle of London who focus on discovery research, particularly biological and biomedical research. We're an independent research facility; the institute itself is funded by major biomedical research funders, rather than a university, for example.

Most institutes follow 'big themes' in science, but what I've noticed throughout my career is that these themes are often unimaginative or unadventurous. A more creative approach – which is what we do here – is to have open academic recruitment searches and an extensive network, focusing on hiring interesting people who will pursue novel things as invested, high-quality researchers.

In other words, we form our range of funded research projects more bottom up, rather than top down. Our research topics are not set by the leadership of the institute, but by our researchers. Many of them are in the early stages of their career, as we tend to focus on working with younger, upcoming researchers. Our research is strongly influenced by the next generation of research leaders, and I think that this is a really effective way of producing the highest-quality research. This sort of thinking, however, can often be overlooked by those who administrate research funding, because they are often more programmatically focused.

### Did you encounter any challenges when founding the institute?

During the institute's formation, there was a lot of opposition to it – partly because the institute was founded by merging multiple institutes together. Initially, two of the institutes were completely against it, and one was half against it. People, including scientists, can be opposed to change. There was also a lot of opposition from other institutions and universities who seemed envious of our new, unique approach to research; to form the Francis Crick Institute, we simply took money from old institutes and put it together, which has been a great success. There was little new money, which is often not realised.

### Do you think removing certain obligations for researchers, such as teaching, can enable scientists to conduct more effective research?

At the institute we do have reduced obligations with teaching, but we have other very important obligations, which I



Sir Paul Nurse, Director of the Francis Crick Institute.

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believe are integral for conducting effective research. For example, by placing a focus on supporting early-career group leaders, our senior group leaders have to be deeply involved in nurturing the growth of upcoming researchers at the institute. We pay huge



The Francis Crick Institute is located in London, UK and facilitates international, top-quality research.

## The senior group leaders at the institute have to be deeply involved in nurturing the growth of upcoming researchers.

attention to recruitment. For example, we get between 400 and 500 applicants for a group leader position, and we get 1,500 graduate applications for 30 slots. It takes a lot of work to get through the recruitment process, and we have many thorough processes in place.

The other thing about being a researcher here is that you're under constant, albeit positive 'surveillance'. As a rule, we tend to review people every five to seven years, and this is very thorough. If a researcher at the institute fails to pass our review, we

ask many people to move on, while also putting money aside to help them secure a new position. Our early-career group leaders come here for a fixed term of 12 years in total, and then we help them move elsewhere. That's almost unheard of! Most institutions hang on to their best people, but our idea is that we train and nurture them before they continue their career elsewhere, helping research in the rest of the country and establishing networks across the world. All these things make us different from conventional institutions of science.

### You have previously used the term 'guilt' to refer to independent scientific discovery. Could you elaborate on this?

When I was young, just finishing my PhD, I thought that to be a good researcher I had to do something that was likely to be useful to humankind. However, I also felt that if I was an excellent researcher, then I should have the freedom to pursue my interests and intuition, on the grounds that one could make important fundamental discoveries. This resulted in two things; first, I had to hold myself to a high standard and remember that I'm not entitled to support; that has to be earned. Secondly, I found out that I was quite good at running things, so I decided I could spend some of my time running things alongside my research, which I view as doing something useful to society. I find that some researchers feel entitled to support; it's a privilege to be supported.



The institute works across academia, medicine, and industry, supporting researchers from a range of disciplines.



Facilitating continuity and support between senior and early stage researchers is an important aspect of the Francis Crick Institute.

*In 2001, at the time of winning the Nobel Prize, you were optimistic that biology was on 'the edge of a new paradigm of discovery'. How has your field changed over your lifetime?*

I was referring to two things. The first is the increasing appreciation of how cells and organisms work and the second that biology was focused on the chemistry of life. I felt, 20 years ago, that in addition to chemistry, it was clear that biology was an information science. You can only understand life when you understand how information is managed in the chemical and physical machines that are cells. Earlier in my career, I thought a lot about the logic of how different components are connected, and we are beginning to combine AI and machine learning with chemistry and physics to generate a better understanding of how life itself works.

Cells are very important: we're all made up of billions of these. The cell is the simplest

entity that we can, without reservation, say is 'living'. I also felt, all those years ago, that by understanding a cell and how it works, we obtain profound insight about life.

*What was it like being the president of the Royal Society?*

Being president of the Royal Society, which is one of the greatest science academies of the world, was a huge privilege. During my presidency, I tried to make it more open to the public and to participate in public debate. The problem with a venerable body like the Royal Society is that the leadership is nervous about making a mistake that would damage the reputation of the institution, and this makes it very difficult to bring about change.

What I felt, however, is that to be relevant in the real world, you must engage with the world and accept that sometimes you won't get things completely right. At the time,

the climate change debate was raging, and there was a very well-funded anti-climate change movement, attempting to undermine the worrying results that climate science of the time was pointing towards. I felt we should take them on publicly for this, which I did, and in response they attempted to undermine the Royal Society and me as president. That was stressful, and indeed a risk, but I'm glad I did it.

*You are an adaptive communicator, which you have suggested is in part due to your upbringing. Could you tell us a bit about this?*

I come from a working-class background: my mother was a secretary, my grandmother was a cleaner, and my grandfather worked in the Heinz baked bean production line. I went to a grammar school, but I was always at home talking to, you could say, 'normal people'. This has influenced my ability to communicate with people; I've always been

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grounded in that way, and my own family are always grounding me as well, which I am grateful for.

In my book *What is Life?* I combined technical scientific explanations and historical and philosophical accounts of the development of biology, with stories of my own scientific life. I wanted this book to be about biology that would still be largely 'correct' 50 years from now, meaning it has a long 'shelf-life' as a useful introduction to biology, as well as glimpses of my own personal life and inspiration as a scientist.

Popular science books can sometimes fall short due to a tendency to look over the horizon to the next big discoveries, or indeed 'hype-up' current fashionable or topical areas, rather than focus on a general, important theme; the main topic of my book is to explore what it is – biologically, historically, and philosophically – to be 'alive'. By tackling this and related themes in the book, I hope that every reader can glimpse the wonders of biology in accessible and relatable terms.

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