

VIDEO INTERVIEW TRANSCRIPT

## Norris, Keith: transcript of a video interview (15-Dec-2015)

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**Related resources:** items 2017025 - 2017029, History of Modern Biomedicine Interviews (Digital Collection)

**Note:** Video interviews are conducted following standard oral history methodology, and have received ethical approval (reference QMREC 0642). Video interview transcripts are edited only for clarity and factual accuracy. Related material has been deposited in the Wellcome Library.

## Norris, Keith: transcript of a video interview (15-Dec-2015)\*

**Biography:** Dr Keith Norris BSc PhD (b. 1928) trained as a biophysicist at King's College London under M F H Wilkins (later FRS and Nobel Prize winner for his contributions to the study of the structure of DNA), where he developed reflecting microscopes for the study of DNA with ultraviolet and infrared radiation. He joined the Microbiological Research Department, Porton, to apply physical methods, including infrared spectroscopy for the detection and identification of bacteria in the atmosphere, becoming Head of Aerobiology and Field Trials, before moving to the Chemical Defence Establishment (CDE), Porton, as Deputy Director responsible for the development of chemical defensive equipment, and then to the Ministry of Defence in Whitehall as Director for Chemical and Biological Research and Director for Internal Security Research, at the time when the United Kingdom was taking the lead in establishing the 1972 Biological Weapons Convention. He then spent two years as Scientific Adviser to the General Officer Commanding, Northern Ireland. Retiring in 1983, he became a Consultant to the Director of the CDE and a part-time Regional Scientific Adviser to the Home Office, and served on the Home Office Home Defence Scientific Advisory Council until 1993, when Civil Defence was abandoned by the Government.

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### [1]. EARLY YEARS AT KING'S COLLEGE; MAURICE WILKINS

I was very fortunate, I mean, in 1948 I had completed my examinations and I had a further year to do at King's College, and I was given the option of doing a year's research under Maurice Wilkins, who was working on the ultraviolet spectroscopy and ultraviolet microscopy of living cells. And this was the subject that I was given. I was asked to develop reflecting microscopes so that we could use them at higher magnification and higher resolution to study the role of DNA in living cells. This work progressed through the years and eventually led to Maurice getting involved in the use of X-rays for examining nucleic acid, which he had extracted from cells and of which he had some highly purified specimens. With the aid of polarising microscopes he'd developed techniques for drawing this into very fine fibres of nucleic acid, which in fact crystallised quite well, and with the help of Raymond Gosling, who was his assistant at that time, they had taken X-ray pictures of nucleic acid using an old machine in the Chemistry Department. And by the end of 1951, they had developed quite good pictures of the structure of nucleic acid. And it was about that time that Rosalind Franklin came to King's.

### [2]. MEETING ROSALIND FRANKLIN; VISITORS TO THE LAB (CRICK AND WATSON)

I first met Rosalind Franklin, it must have been early in 1951 because, well she joined in 1951, joined King's College in 1951, but she spent the first three to six months of that time writing up her work in Paris. Initially it was thought that she was going to work on the X-ray structure of collagen. But at Maurice's suggestion she was transferred to work on nucleic acid. And as a result Raymond Gosling was passed to her to become her assistant to work on the subject. So when she came to King's in 1951, the pictures they'd got were such, that Alexander Stokes decided that the X-ray diffraction pictures were those of a helical structure. And so the dice were set, and they were working towards getting better pictures, and so Rosalind was given the job of taking that work on, because as an X-ray crystallographer, she was expected to bring her expertise to bear

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\* Interview conducted by Professor Tilli Tansey and Professor Bob Maynard, for the History of Modern Biomedicine Research Group, 15 December 2015, in Salisbury, Wiltshire. Transcribed by Mrs Debra Gee, and edited by Professor Tilli Tansey and Professor Bob Maynard.

on the subject. But for some reason or other Rosalind thought that she was given the whole job of DNA structure, and she wanted to work solely as an individual, and there was - it became a difficulty between her and Maurice. And Maurice was fobbed off with some DNA, which she - and she was left with the best specimen of DNA that was available at that time. And it was that which she subsequently developed into what is now known as Film 51.

Now at that stage in the proceedings Maurice had frequent visitors. Maurice had known Crick I think from before the war and certainly after the war and Crick was a regular visitor to the laboratory. And later on he and, Crick and Watson, were also regular visitors. There was, when I left King's, 1951, there was no suggestion that there was a competition between them for the structure of DNA at all. They would sit and talk in the laboratory together with X-ray pictures on the desk - some crude models, not the elegant ones that Watson and Crick eventually developed. But at that stage, I had to spend one afternoon a week making carbon atoms to fit these models, so the suggestion that Watson makes - that King's had no knowledge of models at all - is absolutely wrong. We didn't have a lot of knowledge because we adopted the Cambridge pattern and, in fact, we made them to exactly the same scale and pattern; in fact, I think, we used some of their moulds for the bases. And that's the way it went. And, in fact, I know that on several occasions Watson left King's with quite a large number of carbon atoms or model bases in his suitcase that had been made in the King's workshops. So, competition, there was no thought of it at all. And so, I think, Watson had one meeting with Rosalind where he was more or less shown the door, and I can understand why. But she did, unfortunately she felt that she didn't want to work with anybody at King's, and so she and Raymond Gosling got on and carried on the work, but Raymond, because he'd worked previously with Maurice, was constantly keeping us informed of what was going on elsewhere. It was an open laboratory, it was a team effort. As far as I was concerned, when I left King's it was a team effort. Everybody was putting their bit in towards the ultimate goal.

**[3]. DESIGNING THE X-RAY CAMERA; SEEKING ADVICE FROM ROSALIND FRANKLIN**

I was working on the design of a low angle X-ray camera for looking at collagen where the spacings might be in the hundreds of Angstroms, a very low angle one, and I sought her advice. And I sought her in a laboratory and I found that very attractive, dark hair, dark eyes, but she was, it was like interviewing the head mistress. She sat there and, aloof, a little bit arrogant. She tried to be helpful in answering my questions, but I think she found it a little distasteful talking to a mere post-graduate worker, and so, but anyway, I got advice from her on the design of the camera. I subsequently met her on other occasions. At tea in the common room she usually resorted to reading a journal rather than taking part in discussions. I tried to talk to her about hockey, which she enjoyed in her youth, and I still practiced regularly, but I failed to establish contact with her. And I gather that she was primarily a lone worker and did not wish to contribute in a team, to a team at all. In the many colloquia in the College concerning our work, I have no recollection in her being particularly active in joining in any of the discussion. In fact I can hardly remember joining in at all, although on one occasion, she gave the main discussion, she gave the main talk and she did answer questions quite openly, and quite well. And when she was describing her own work, she sounded thoroughly professional and competent, and although I suspect she didn't suffer fools gladly.

**[4]. NATURE, AND THE RACE TO PUBLISH**

I went back to King's regularly after leaving. On one occasion, I think, I went back to collect my Amici microscope and take it back to Porton and do some work there with it. And on one of those occasions, Maurice told me that he was busy writing a paper to get it in; he had a deadline to get it into *Nature*, because Watson and Crick had written a paper which they'd submitted, and that he had learnt this from the Editor of *Nature*, who was a friend of Maurice, and they met reasonably regularly for dinner together. So the story that Maddox says that this was arranged between the Heads of Department of King's and Cambridge doesn't really fit with my story, but probably Professor Randall did intervene at a later stage of the proceedings to ensure that the papers were published simultaneously. But that's my personal view, from my contact with Maurice. But during my working life there, over a period of four years, I suspect I had no daily contact with Maurice - but probably every other day at least - and so we were on the most friendly of terms. We talked

about any matter that came to our head, usually about family matters, but more often than not about the work.

#### [5]. WORKING ON AIR POLLUTION; WORKING WITH DRIVERS

About 1958, I started working on air pollution when it became apparent that I needed a larger team to do air sampling in the open air and to examine samples that we'd collected. And I made a list of the technical staff I thought I needed, and was told that that would be an impossibility, but I could have four drivers. Well, I was a bit dismayed at this, but after a time I took them on and I allocated them around the rest of my technical staff and we each took one of them under our wing, and I was amazed at how quickly they became adept at experimental work, and how conscientious and how careful they were. I also discovered how good they were at recording what they had done. They would keep a good log of their activities and, as a result, these chaps came in as very low paid drivers, or very low paid laboratory workers, and they got promoted. And within a very short space of time, all four of the drivers that I'd taken on became the top grade of scientific assistants in the Department, and they displayed enormous talent, which had not been realised in their previous occupation. And I found them the most conscientious, useful workers. And I, one of them was very competent at using high powered microscope oil immersion doing regular counts, which were checked and verified occasionally. But he was capable of being, given a task, sent off and work entirely on his own and bring back, I will say better results than professional people who had been dragged out of their laboratories. For example, senior experimental officers, reasonably high grade technical people, taken out of the laboratory and asked to take a sample at grid reference ABCXYZ, I found that I had to teach them map reading and everything. In fact I had to teach them more than I had to teach the drivers. I was astounded. I was astounded at how difficult it was to take people from the laboratory into the field, whereas taking drivers into the laboratory seemed a much easier process.

And I'm absolutely amazed at their skills that they were able to bring, and all done with a different sort of sense of service that it was. I mean, I can remember we were setting up the mobile lab one day, and it had been raining, and we'd ploughed up the ground, and we had a bit of hard standing, and it was muddy and knee deep in mud, and I got a shovel out and started shovelling it off the concrete so we didn't carry it. And this, came behind me, 'Doc, you are not allowed to do that! Give me that shovel now, that's my job.' You know, and I said, 'It's anybody's job who is prepared to do it, Ken.' But 'No, no, no, no, no, you're not...' I said, 'What are you doing?' 'Oh,' he said, 'I'm skiving.' So he said, so I said, 'Well, here's a shovel then, you do it if you're skiving. If you're not doing something more important. If you're doing something important, fair enough.' But they mucked in whereas you took a professional away, they expected to get royal treatment. I had one, I had one PSO [Principal Scientific Officer] came with us. When we developed the radioisotope work we had to develop, we developed another laboratory, and I, we went away for 10 days normally to do two trials, and we did one trial early in the week, and he - because his radioactive work he could assess it quite quickly - he produced the results very rapidly indeed whereas we were working with petri dishes at the place. They'd got to be incubated and it took us time to produce those results before we could think about doing another experiment. So he said, 'Right, I'm off now. I've done my job. I'm going now.' I said, 'Oh no you're not. You're down here, we're doing two trials.' 'I can't wait around here waiting to do things.' I said, 'I'm waiting around to do it, why shouldn't you?' Anyway he said, he refused. So I said, 'Right, get in the car.' This was Porton. So I drove him back here and I said, 'Now, explain to the Director why you're not prepared to work another day.' Within five minutes he was back in the car and going to Porton, tail between his... He was not a happy man. But he was professional, he went on to get a Chair.

[END OF TRANSCRIPT]

#### Further related resources:

1. Jones E M, Overy C, Tansey E M (eds) (2016) *Air Pollution Research in Britain c.1955-c.2000*. Wellcome Witnesses to Contemporary Medicine, vol. 58. London: Queen Mary, University of London.

2. Tansey E M, Maynard R (intvrs); Tansey E M, Maynard R (eds) (2017) *Norris, Keith: transcript of an audio interview (15-Dec-2015)*. History of Modern Biomedicine Interviews (Digital Collection), item e2017023. London: Queen Mary University of London.