

INSPIRING SCIENTISTS: DIVERSITY IN BRITISH SCIENCE FINAL REPORT



Interviewee Mah Hussain Gambles (left) with neighbour and brother (front) in Islamabad, dressed as Star Trek characters.

In May 2013 the Royal Society Diversity Programme began a new oral history project entitled ‘Inspiring Scientists: Diversity in British Science’, in partnership with National Life Stories at the British Library. ‘Inspiring Scientists’ has recorded the life stories of ten British scientists with minority ethnic heritage. Interviewees range from Professors to PhD students and the focus on science is wide, covering academia, big industry and individual entrepreneurship.

Contents

1 Summary	3
1.1 Work completed	3
1.2 Key findings and recommendations	4
2 Background	4
3 Table of audio interviews	6
4 Interviewee biographies	7
5 Discussion of content of interviews	10
5.1 Experience of scientific workplaces	10
5.2 Aspirations – becoming a BME scientist	12
5.3 Gender and parenting	13

1 Summary

1.1 Work Completed

- A substantial scoping study, authored by Dr Paul Merchant (National Life Stories) and Dr Sally Horrocks (NLS/University of Leicester) and previously submitted to the Royal Society, reviewed existing oral history collections and recent literature on the ethnic composition of the British scientific workforce in order to establish the criteria for selection of interviewees for this project.
- The Project Interviewer, Paul Merchant, completed ten extended audio life story interviews of between 6 and 10.5 hours with scientists of minority ethnic heritage at different stages of their careers. These were selected in conjunction with Royal Society colleagues to include a range of ethnic heritages, educational backgrounds and scientific disciplines, particularly those in which scientists with these backgrounds are under-represented.
- Additional video interviews were completed with each interviewee and edited to produce a short individual film plus three thematic films that draw on material from a number of interviewees to address specific aspects of their experiences in science.
- All of the audio and video interviews have been accessioned into the British Library's oral history collection and catalogued on the Sound and Moving Image catalogue (<http://sami.bl.uk>). With interviewee permission the full audio interviews will be made available via the BL's Sounds website (<http://sounds.bl.uk/oral-history>) and extracts will be made available via the *Voices of Science* website, which provides access to themed edited extracts from the *Oral History of British Science* programme (www.bl.uk/voices-of-science). The full video interviews can be accessed onsite at the British Library through the Listening and Viewing Service (www.bl.uk/listening).
- The project interviewer identified additional material on diversity from previous interviews carried out for the *Oral History of British Science* project and prepared selected extracts for inclusion on the Royal Society website.
- A blog post introducing the project and showcasing some of the material it collected was published on the Royal Society website in October 2013.

1.2 Key findings and recommendations arising from the interviews

- 1 On the basis of the interview sample the project finds no evidence of direct or indirect discrimination in British scientific workplaces.
- 2 Many interviewees did not regard science as an obvious, 'normal' or easy career choice for someone of their ethnic background. We may speculate that other BME young people may have been deterred from making this choice themselves.
- 3 In the case of female interviewees, it is difficult to separate the effects of ethnicity and gender in accounts of being in a minority in scientific workplaces.
- 4 Particular kinds of mentoring may encourage ethnic minority scientists to remain in and progress in scientific careers.

2 Background

National Life Stories [NLS] was briefed by the Royal Society Diversity Programme [RS] to scope an oral history project involving extended life story audio interviews and shorter video interviews with ten British scientists with ethnic minority heritage. The RS were concerned that the interviewees should include men and women, scientists at various stages of their careers, and that different kinds of scientific work and settings should be represented. In June 2013 NLS presented a detailed 'scoping study' which reviewed existing oral history collections and recent literature on the ethnic composition of the British scientific workforce. It argued, on the strength of this review, that interviewees should include scientists:

- with 'a variety of educational backgrounds [...] including 'unconventional' routes such as apprenticeship and part-time study'
- working in those disciplines in which 'ethnic minority scientists are currently poorly represented' – 'Earth and environmental sciences, space science, biological sciences, physics, chemistry, mathematics and certain kinds of medical sciences' (excluding medicine itself)
- from a range of ethnic backgrounds, especially those from backgrounds underrepresented in British science: Black Caribbean, Bangladeshi, Black African, Pakistani, Chinese.

A number of individuals were identified as potential interviewees in the scoping study. A shortlist was agreed in meetings between NLS and RS. The ten interviewees who accepted invitations to take part in the project are listed in the table below. Short biographies of each follow the table. The backgrounds, experiences, and careers of the ten scientists match the recommendations of the scoping study reasonably closely.

The audio interviews were conducted using the same methodology as other interviews for NLS's *An Oral History of British Science* [OHBS], by the OHBS interviewer Dr Paul Merchant. Interviewees were encouraged to talk at length about their whole lives from childhood onwards, including but ranging well beyond career, prompted by short, open questions. The shorter video interviews were filmed and edited to include a number of key moments in each life story and with the aim to engage especially an audience of older children and young adults.



Mark Richards at Imperial College, London

Harry Bhadeshia (second from right) with parents and sister in Kenya, 1960s



3 Table of audio interviews

Name	Discipline	Date of birth	Place of birth	Ethnic heritage	Length of audio int'w	British Library reference number
Dr Maggie Aderin-Pocock	Space science	1968	London, UK	Nigerian	8.5	C1379/101
Dr Charlotte Armah	Food science	1970	London, UK	Ghanaian	6.5	C1379/107
Professor Sanjeev Gupta	Geology	1965	India	Indian	9	C1379/110
Professor Harry Bhadeshia FRS	Metallurgy	1953	Kenya	Indian	9	C1379/100
Dr Mah Hussain-Gambles	Pharmacology	n/a	Pakistan	Afghan/ Pakistani	6.5	C1379/106
Professor Saiful Islam	Chemistry	1963	Bangladesh	Banglades hi	8	C1379/104
Ms Jassel Majevadia	Physics	1986	London, UK	Indian	10.5	C1379/105
Dr Jo Shien Ng	Electronic engineering	1978	Malaysia	Chinese	6	C1379/108
Dr Donald Palmer	Immunology/ veterinary science	1962	London, UK	Jamaican	10.5	C1379/102
Dr Mark Richards	Atmospheric physics	1970	Nottingham, UK	Jamaican	9.5	C1379/99

4 Interviewee biographies

Maggie Aderin-Pocock, born in 1968 in London, is a space scientist, television presenter and science communicator. Maggie's parents emigrated from Nigeria in the late 1950s. Following secondary and further education at a number of schools, she read physics at Imperial College, London, 1987-1990 and then completed a PhD (funded by Castrol Oils) on optical techniques for measuring thin layers of oil, in Imperial College's Department of Mechanical Engineering, 1990-1994. Following this PhD, Maggie worked as System Scientist at DERA Air Systems working on missile warning systems (1996-1997), Project Manager at DERA Land Systems working on land mine detection (1997-1999), Project and Engineering Manager at Mullard Space Science Laboratory developing an instrument for the Gemini South telescope (1999-2004), Senior Project Manager at Surrey Satellites Technology Ltd. working on instruments for the James Webb Space Telescope and European Space Agency satellites. In 2006 Maggie set up and led an optical space instrumentation group at Astrium Ltd., building instruments for ESA and NASA satellites and ground systems. From undergraduate studies onwards, Maggie has worked in science communication, often involving talks to groups of school children; since 2004 she has continued this work through her company Science Innovation Ltd., supported by a Science and Technology Facilities Council Fellowship at University College London.

Charlotte Armah, born in 1970 in London, is a Nutritional Biochemist at the Institute of Food Research [IFR], Norwich. Her research is concerned with the effect on human health of diet, most recently the effects on cardiovascular health of a particular variety of broccoli. Charlotte's parents and older siblings emigrated from Ghana in the 1950s. Following secondary and further education at an all-girls comprehensive school in London, Charlotte read Medicinal Chemistry at the University of Sussex, 1988-1991. She completed an MSc in Biochemical Pharmacology at the University of Southampton, 1994-1995, worked as a Research Technician in the School of Pharmacy and Pharmacology, University of Bath then completed a PhD (1996-2000) in 'Food Biophysics' at the Institute of Food Research [IFR], Norwich, with a focus on electrophysiological methods to determine effects on oat plant roots of particular chemical compounds. Following this PhD, from 2000, she has worked as a Nutritional Biochemist at IFR running 'human intervention' studies to explore relations between diet and health, including recent work on health effects of broccoli.

Harry Bhadeshia FRS, born in 1953 in Kenya, is Tata Steel Professor of Metallurgy in the Department of Materials Science and Metallurgy, University of Cambridge. His research is concerned with the understanding and development of particular crystalline structures in steels, with applications including rail steel (used in the Channel Tunnel) and 'super bainite' armour. He emigrated to the UK (London) with his parents in 1970. As a technician in the British Oxygen company, Edmonton, London he completed an Ordinary National Certificate in Sciences at East Ham College of Technology and a degree in Metallurgy at the City of London Polytechnic, 1973-1976. His PhD in the Department of Materials Science and Metallurgy [DMM], University of Cambridge [UOS] was completed in 1979 and followed by a Science Research Council Fellowship, 1979-1981. Since 1981 he has been an academic scientist in the DMM, UOS.

Sanjeev Gupta, born in India in 1965, is Professor of Earth Science at Imperial College, London. His research is concerned with the interpretation of geological and landscape features on Earth and on Mars; he is perhaps most well known for his work on the formation of the English Channel by ancient megafloods. Sanjeev emigrated from India aged five. Following education at primary schools in Kent and Berkshire, then Reading Grammar School, he read geology at the University of Oxford. After a year in China working on a geological map of southern China, he completed a PhD at the University of Oxford on relations between past tectonic activity and sedimentation in the southern French Alps. Following a number of postdoctoral positions in the US and the UK, Sanjeev joined Imperial College in 2003.

Mah Hussain-Gambles, born in Pakistan, is an entrepreneur, pharmacologist and social scientist. She emigrated to the UK (Hull) with her parents in the 1970s. Following secondary and further education at a comprehensive school in Hull, Mah read Pharmacology at the University of Sunderland. She worked as a scientist for a manufacturer of polyurethane foams, then as a formulation chemist in the pharmaceutical company Sanofi Winthrop, Newcastle, 1992-1995. Mah completed a Masters degree and PhD ('An exploration of the representation of South Asian people in clinical trials' – 2004) in the Centre for Research in Primary Care, School of Medicine, University of Leeds. In 2004 she founded the company Saaf Pure Skincare Ltd., applying pharmaceutical expertise in the development and marketing of natural cosmetics. Since 2012 she has worked as a project manager in a large pharmaceutical company in Hull.

Saiful Islam, born in 1963 in Bangladesh, is a Professor of Computational Materials Chemistry at the University of Bath. His research focuses on computer modelling of conduction in materials, with 'green' energy applications. Saiful's parents emigrated to the UK in the 1960s so that his father could work as an administrator in the Pakistan High Commission in London. Following secondary and further education in an all-boys comprehensive school, Saiful read Chemistry at University College London [UCL], 1981-1984. His PhD, also completed at UCL (in 1987), concerned the computer modelling of crystalline materials. Post-doctoral work at Eastman Kodak Labs in Rochester, New York, US was followed by appointments as Lecturer at the University of Surrey and, from 2006, as Professor at the University of Bath.

Jassel Majevalia, born in 1986 in London, is a science communicator and final year PhD student in Imperial College's Department of Physics, focusing on the 'multiscale modelling of precipitates in zircaloy cladding' involved in nuclear energy safety. Her grandmother emigrated from Uganda and her grandfather from Indian communities in Kenya in the 1960s. Following secondary and further education at a selective grant-maintained school in Essex, Jassel read physics at the University of St Andrews, Fife, Scotland. Winning a Bobby Jones Scholarship to Emory University, Atlanta, US, Jassel studied jazz music (and other subjects) for a year, then returned to the UK in to begin a PhD at Imperial College.

Jo Shien Ng, born in 1978 in Malaysia to Chinese parents, is a Senior Lecturer and Royal Society University Research Fellow in the Department of Electronic and Electrical Engineering, University of Sheffield. Her research is concerned with the development of highly sensitive photodiodes (called 'avalanche photodiodes') from wafers of material 'grown' using Molecular Beam Epitaxy. Following education at a Chinese Independent Secondary

School in Malaysia, she came to the University of Sheffield in 1993 to read Electronic and Electrical Engineering which she followed with a PhD, completed in 2003. Jo Shien then conducted post-doctoral work on material and device characterisation. The Royal Society Fellowship was awarded in 2007.

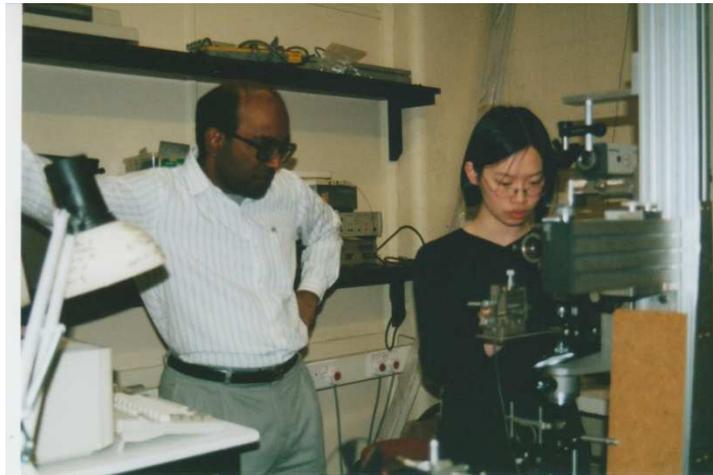
Donald Palmer, born in 1962 in London, is Senior Lecturer in Immunology in the Comparative Biomedical Sciences Department of the Royal Veterinary College, London. His research is concerned with the role of the thymus in the ageing of the immune system, and the identification of 'novel markers' on the surfaces of cells. Donald's parents emigrated from Jamaica in the early 1960s. Following secondary education in a comprehensive school in south London, Donald completed an Ordinary National Diploma in Medical Sciences at South London Technical College and then read Medical Sciences at the University of Bradford, 1980-1983. While working as a research technician in a tissue-typing laboratory in Hammersmith Hospital, Donald completed an MSc in Immunology at King's College, London, 1986-1989, and then a PhD investigating the genetic regulation of Beta-2-microglobulin in the Division of Transplantation Biology, Clinical Science Centre, Northwick Park Hospital, 1989-1992. In 1998, following post doctoral work at Cancer Research UK and Imperial College, London, Donald was appointed a Research Lecturer at Imperial College, with a Medical Research Council Career Development Award. In 2002, he moved from Imperial College to the Royal Veterinary College as a Lecturer in Immunology.

Mark Richards, born in 1970 in Nottingham, is a Senior Teaching Fellow in the Department of Physics, Imperial College, London. His research into wireless air sensing networks for real-time pollution mapping is linked to his role as co-founder and director of Duvas Technologies Ltd. Mark's parents emigrated from Jamaica in the 1960s. Following secondary and further education at a comprehensive school in Nottingham, Mark read chemistry at the University of Manchester, 1988-1991. He worked as Technical Sales Officer in spectroscopy for Perkin Elmer and then completed a PhD at Imperial College on 'High Resolution Spectroscopic Analysis of Trace Atmospheric Gases', 1994-1998. His next post in science in 2002 was as a post doctoral researcher in an Imperial College 'Technology Transfer Program', leading to the formation of Duvas Technologies in 2008. Mark is involved in a number of equal opportunities and schools 'outreach' activities and was involved in Tony Sewell's 'Generating Genius' programme. He also DJs and remixes as DJ Kemist, with his own independent label Xtremix Records.

5 Discussion of content of interviews

5.1 Experience of scientific workplaces – being a BME scientist

The ten life story interviews contain little evidence of direct or indirect racism in British scientific workplaces of various kinds. University departments, laboratories, research institutes and pharmaceutical factories are usually recalled as places where the ethnic background of individuals did not draw comment, and certainly did not affect progress. In contrast to the findings of an earlier oral history project with geriatricians trained overseas,¹ there is no sense that interviewees feel they have had to occupy or develop unpopular disciplines or parts of the scientific workforce.



Jo Shien Ng in the lab as an electronics engineering PhD student, University of Sheffield

Very occasionally, particular interviewees recall uncomfortable feelings connected to the experience of being a minority in the scientific workplace. For example Charlotte Armah described how some of those who volunteered to participate in her research were surprised to be greeted by a Black woman when they arrived at her place of work. Maggie Aderin-Pocock, during her interview, recalls a sense of being seen as different from her co-workers, but does not separate the effects of being Black and being female. Certain interviewees feel that they have benefitted from key, senior individuals, often referred to as mentors. Others feel that this mentoring was absent, but would have been valuable.

¹ British Library catalogue reference: C1356 'Overseas Trained South Asian Geriatricians interviews' and see Joanna Bornat, Leroi Henry and Parvati Raghuram (2011), "The making of careers, the making of a discipline: Luck and chance in migrant careers in geriatric medicine", *Journal of Vocational Behaviour*, 78, pp. 342-350.



Mah Hussain-Gambles developing medicines in pharmaceutical factory.

Interviewees do recount experiences of racism outside the spaces of British science, particularly during childhood and especially at school. Several recall experiences of actual or threatened physical violence directed towards them in public places.

Given the lack of racism or discrimination perceived to exist in British science by interviewees, it is perhaps not surprising that they are not aware of and do not feel the need for any activism concerning ethnicity and science, as is common in the US (for example in the activities of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers, the National Society of Black Physicists and the National Association of Black Geoscientists). However, a number of interviewees have longstanding experience of being chosen to take part in diversity campaigns, and of outreach work in schools and elsewhere, and of mentoring. Participation in such work is connected to a concern about the perception of science as White and male, addressed in the next section.



Maggie Aderin-Pocock

5.2 Aspirations - becoming a BME scientist

The ten interviews lend some support to the concern that young people from ethnic minority backgrounds may not view science as an obvious or attractive choice. None of the interviewees as young people were aware of BME scientists – they had no BME scientist role models. Many interviewees stress that their decision to apply to read certain sciences at university was unusual – that it went against the expectations of their ‘community’ and/or their family. A number of interviewees feel that it was necessary to achieve some distance from home and ‘community’ to become scientists. Others – especially Mark Richards – have been concerned to retain links to ‘community’ and to challenge assumptions that success in science must imply some kind of difference that has always been there.

There are clear links here to other work based on interviews claiming that BME young people may be funnelled towards particular kinds of work.² The present project has interviewed people who *did* study science at university – who overcame or enjoyed feelings of making an unusual career choice. It is reasonable to speculate that BME young people do not apply to study science because it is perceived, in whatever ways, as a White occupation. This could only be explored through interviews with BME children of secondary school age, or BME adults who (in contrast to the interviewees here) chose *not* to pursue science.

² See chapter ‘Work’ in Claire Alexander (1996), *The Art of Being Black*, Clarendon Press, Oxford, pp. 71-101.

5.3 Gender and parenting

Half of the ten interviewees are female. The scientific workplaces described in the interviews tend to be predominantly White, but also predominantly male. As noted in section 5.1, female interviewees do not necessarily separate gender and ethnicity in accounts of being a minority. Indeed, gender difference can come across more strongly than ethnic difference in accounts of interactions in scientific workplaces, positive and negative.

Eight of the ten interviewees are parents. Arrangements for childcare have made the most dramatic impression on the careers of Maggie Aderin-Pocock and Mah Hussain-Gambles (both set up their own businesses, allowing work to be shaped around childcare). Jo Shien Ng feels that she has been able to continue as an academic scientist because of the flexibility of her Royal Society University Research Fellowship, and because her husband is an academic in the same department. One male interviewee (whose full recording may be closed for a period of time) has felt, at times, unable to progress in a conventional way in academia because of his role as father and as husband to a busy doctor. In this way, Inspiring Scientists supports previous statements on the difficulties of continuing in science as a parent. These difficulties are considered, by the interviewees here, as more significant than any effects of ethnic difference.



Jo Shien Ng with husband and children

Paul Merchant May 2014

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