WOMEN'S LAB

A recent report has exposed the Royal Society as a sexist institution. But these eight female scientists have fought prejudice to become leaders in their field. By Scott Athorne. Photographs: James Hunkin

Consider this. The Nobel prize has been running for 101 years, yet just 11 of the 478 science prizes have been awarded to women – six in medicine, three in chemistry and two in physics. It is a startling discrepancy for the most universally accepted endorsement of human excellence.

Women represent scarcely 1% of the UK's 300,000 registered engineers. Out of more than 35,000 members of the Institute of Physics, only 13% are women; and at the Institute of Mathematics, the figure is 17%.

"Stereotyping from an early age is the biggest reason," says Marie-Noelle Barton, the head of Wise (Women into Science and Engineering). "A lot of girls are interested in science, but they can be put off by their peers at school, who see science as uncool or unfeminine. And it's still common for parents to buy girls dolls instead of chemistry sets. In the school lab, girls are still asked to take notes while the boys get to do the experiments."

Perhaps this is why just a third of undergraduates in the physical sciences (maths, physics and chemistry) are female. Young women need smart, edgy role models, says Barton; the sort of role models who can make science and engineering seem like exciting alternatives to the run-of-the-mill arts, law and business courses. The sexual bias has been going on since the 16th century, when modern science was born, and the church was at war with witchcraft, a force of darkness that could not be understood by experiment, theory or observation. Women, it was assumed, were not equipped to do science but seemed to have access to this other form of knowledge, which was believed to have come from the devil. The religious terror led to the deaths of an estimated 3m women across Europe in 250 years. Moreover, the Royal Society in London, which institutionalised and codified science when it was established in 1645, has always been unarguably a men's club. A parliamentary investigation has found that it is still discriminating against women, with only 48 of its 1,233 fellows being women.

Marie Curie, one of the first women of science

Marie Curie was one of the first women to break through at the beginning of the 20th century. She discovered polonium and radium, paving the way for nuclear physics and cancer therapy. Born in Poland in 1867, Curie was the first woman in Europe to receive a doctorate in science, and to win a Nobel prize. In fact, she won two Nobel prizes – in physics (1903) and chemistry (1911).

Where are the modern-day Curies? They're out there, carving niches and creating breakthroughs. We met eight female scientists and engineers who are making a difference in the world of science ■

STEPHANIE ANKRAH age **25**

Sports materials engineer

Ankrah is a postgraduate researcher at Birmingham university. 'I love football,' she says. 'I'm developing materials that give better impact protection, which I hope may lead to improvements in shin guards. My work involves a mixture of sciences: physics for the mechanics, chemistry for the materials, and biology for the body. Adidas have an idea of what I'm doing, but they will know more when I present a paper at the fourth International Conference on the Engineering of Sport in Kyoto in September. I don't mind being one of the only women. I quite enjoy it, to be honest.'


30
DIADORA

Electrochemist

DR LESLEY YELLOWLEES | age 49

Yellowlees is a reader in chemistry at Edinburgh university, where she researches coloured transitional metal compounds. 'It's sometimes difficult to get the message across,' she says, 'but what I do, basically, is manipulate electrons to change a compound's property. In my case, I'm looking at colour. Transitional metal compounds such as platinum, gold, iron, zinc and cobalt all give off different colours, and you can use these colours as a key to identify all sorts of things. Our blood is red because we have iron in it. Crabs have blue blood because they have copper in theirs. But you can change a compound's colour by changing the number of electrons in it. I was doing this in Australia, in designing effective solar panels, which need to be highly coloured to absorb light efficiently from the sun.

'There are far more men working in science than women, and there's a multitude of reasons why. I have never felt marginalised. I've always had plenty of support. But it concerns me that there aren't more women in this field. We have five female members out of 40-odd staff in this department. It's not fantastic, is it? I get a great buzz out of doing experiments that push back the frontiers. When the photographer took my picture for this page, I asked him to take me laughing, because I think science is fun. At school I liked the fact that when I sat for an exam question, there was always a right answer.'

DR EMILY SHUCKBURGH | age 29

Atmospheric scientist

Shuckburgh is the newly appointed director of geophysical and environmental fluid dynamics at Cambridge university, and is a founding director of Weather Informatics, a company involved in long-range weather forecasting. She is also a research fellow at Darwin College, Cambridge. An expert panel on Eve magazine recently named her Britain's smartest woman.

'I research the atmosphere – specifically the processes that affect the distribution of chemicals, such as ozone. You might think that the chemical composition is the same everywhere, but that's not the case. The most striking example is the ozone hole. Ozone protects the planet from damaging ultraviolet radiation, and holes in the ozone increase the risk of skin cancer. CFCs (chlorofluorocarbons) are the main cause of ozone depletion, and even though they're being phased out, ozone levels are not predicted to recover until 2050. There has been a lot of debate in recent years about climate change. Last year, an international report summarised the current consensus among scientists, concluding that there is strong evidence that most of the warming over the past 50 years is attributable to human activity, and that global average temperatures could rise by between 1.4C and 5.8C over the next century. But a lot will depend on what measures we take between now and then. I'm looking at aircraft emissions and the effect they have on the chemical soup in the atmosphere. We are advising jet-engine manufacturers about the potential dangers future designs might have, especially if they fly at different altitudes.

'This work is intensely rewarding. It is currently dominated by men. But rather than being negative, I'd like to encourage and inspire women to take up such fascinating work.'

EMMA FOX | age **30** | **Horticulturist**

'PEOPLE WERE SURPRISED I GOT THE JOB, BEING ONLY 27 AND A WOMAN'

Fox, who's from Worcester, manages the palm and water-lily houses at Kew Gardens. 'I've always enjoyed gardening, ever since my grandfather introduced me to it as a girl. A lot of people were surprised when I got the job at Kew, because I was only 27 and a woman. Historically, horticulture is a male-dominated area of study. I look after the plants in the tropical glasshouses, and I explain the scientific work we're doing to the visiting public. Our tag line is 'All life depends on plants', which is a good way of summing up the importance of horticulture. Most of our work is geared around the cultivation of plants from all over the world and ensuring that the many endangered species aren't lost from their wild habitats. Helping this biodiversity is one of our biggest goals. For example, *Ramosmania rodriguesii*, a plant from the island of Rodrigues in Mauritius, is the only one of its kind left in the wild; we're propagating it at Kew and distributing the seedlings back to ensure its survival. The work is very rewarding and challenging. When I began gardening I didn't tell anybody what I did. But with all the gardening programmes on television, it has become sexy. Grandad would be proud.'

CATHY DAY — age 33

Senior engineer at Bentley Motors

'I think I was born to be an engineer,' says Day, who works in emissions and engine testing at Bentley Motors in Cheshire. 'I always preferred Meccano and Lego to girlie toys. I loved physics, maths and technology. When I decided to enter engineering, my careers adviser tried to persuade me to become an accountant and my friends thought I was mad. Fortunately, my parents fully supported me. When you have a burning desire to take apart something that moves, you know you were born to be an engineer.

'I studied mechanical and production engineering at Luton College of Higher Education and got a technical apprenticeship at Vauxhall – there was just myself and one other girl. I worked at the Millbrook Proving Ground, a test track for motor vehicles, and I was the only female engineer among 300 men. It's much the same at Bentley, though it has never hindered my career progression. I'm an engineering manager and I have other people working for me – all men. Engineering used to be portrayed as a macky, male-dominated industry. Nowadays, it's a highly technical field that is mainly computer-based. It's extremely rewarding, and a job I'm sure many younger women would enjoy.'

ANNETTE HOBHOUSE — age 42

Manufacturing engineer

Hobhouse works at Westland Helicopters in Yeovil, Somerset. She is head of aircraft assembly operations, and her work includes overseeing the production of the Apache helicopter, one of the military aircraft used by the British army. 'I certainly didn't envisage myself making the Apache when I was a little girl. I never saw myself being involved with aircraft at all. I wanted to build bridges and roads when I was 16, and after school I decided to study mechanical and systems engineering. I am fascinated with pure and applied mathematics, which provided me with a springboard into engineering. I can't talk about the product in any detail, because that is classified, but to know you played a part in building something as impressive as the Apache is extremely rewarding. It would be nice if there were more women in engineering generally, but I'm encouraged to see that more girls are applying for engineering degrees at university, and I'm hopeful the future will be better. I think women bring another dimension into the workplace – it leads to more harmony. There are equal opportunities in science for women, and I'm hoping that all these young budding females will come through, and take some of these British ideas and inventions on to become executable projects.'

DR CHARLOTTE PARKER — age 27

Food scientist

'At school I never really got to grips with science lessons,' says Parker, who works at the Institute of Food Research in Norwich. 'I was forever asking, "But how?" So I did a degree in medical biochemistry and ended up here. I'm working on changes in the texture of fruit and vegetables. Understanding food texture is important because nobody wants to buy soggy carrots or mealy apples. My lab discovered what makes the Chinese water chestnut stay crisp even when cooked; it's to do with their cell adhesion. I work with a group called ResNet, which is trying to address the issue of why women are dropping out, or not getting higher, in science. We have concluded that there needs to be a new way to judge how good a scientist is, rather than by the number of publications they have done. When women have a career break – to have children, for instance – it's hard to keep this number up. We need more role models like Professor Julia Goodfellow; she is married and has two children, and as the head of BBSRC (Biotechnology and Biological Sciences Research Council) she's one of the most influential scientists in Britain.'

Molecular biologist

LEANNE FELKIN

age 25

Felkin, from Newport in south Wales, is a research scientist at the National Heart and Lung Institute at Imperial College, London. 'As a child I loved going to the beach and poking around in rock pools collecting shells. When I was nine I was given a microscope for Christmas, and I can recall examining a dead bumblebee. I always enjoyed science lessons at school, and at university I studied genetics. It's a very exciting area to work in.

'Basically, I research heart failure. My work investigates the genetics behind heart disease, Britain's biggest killer, and examines the molecular effects of new drug programmes and surgical techniques. I'm working with a team on a new type of artificial heart, looking into the genetic events that are associated with it so that we can understand the cellular, molecular and physiological changes that are happening. It's a fascinating topic, and I hope my work will improve our understanding of heart disease. I work with quite a lot of female scientists and my department is 50-50.

'I think biological and life sciences tend to have more women than the physical sciences, such as maths and engineering. The hours at the university are pretty flexible, whereas in industry they're usually rigid. I've never found being a woman in science a problem, though I don't know how that will pan out as I get older and start a family. I would like to think that I can juggle both.'