

Chemistry



Laboratories



With a little help from our friends

Pursuing a scientific career with a disability presents a unique set of challenges. But as Mike Brown discovers, anything is possible with a little support

Coping with a disability while pursuing a career in an area you are passionate about can be a major challenge. With or without a disability, the need to have a fulfilling working life is of great importance and this is as true in the chemical sciences as in any other career.

With famous examples of disabled scientists such as Nobel laureate for chemistry Sir John Cornforth, who is deaf, and the acclaimed physicist and author Stephen Hawking, who suffers from motor neurone disease, it is clear that disabled people can and do have successful careers in science.

Rachel Holdforth, who is just starting out in her scientific career, has suffered from dyspraxia – an impairment of the ability to perform coordinated movements – from birth. ‘My coordination is poor and I have perceptual difficulties so I can’t judge speed and distance,’ she says. ‘I also have more fatigue than my peers – sitting and standing takes more effort – because I have to think about controlling my muscles,’ she adds.

Holdforth has just finished her PhD at the University of Cambridge, UK, on materials for nerve repair. ‘This involved making conductive gels filled with carbon nanotubes as scaffolds for nerve growth,’ she says. She tells *Chemistry World* that as a disabled student her undergraduate university experience was very different to her postgraduate experience.

Assessing risk

Holdforth declared her disability when deciding where she wanted to go to university in the UK. She was then assessed at an access centre

and a report was sent to her local education authority (LEA). By the time students arrive at university, the help they require should be in place, she explains. ‘In the chemistry laboratory, I was provided with someone to help me – they did things like pouring chemicals for me as I have less control over my muscles and can spill things easily,’ she says.

When seeking disability allowance for her postgraduate studies, Holdforth had to apply to the UK Engineering and Physical Sciences Research Council (EPSRC) for funding, and found this more restrictive, as she explains she was not awarded the full amount required to cover her assessed needs.

Another difference between postgraduate and undergraduate studies is the research aspect – there is more practical-based work and time is less formally structured. Assessing risks in the lab for Holdforth was different from her able-bodied peers, because her speed of response is slower and other precautions must be put in place in case of a chemical spill. ‘This is something that your laboratory colleagues need to know about and you have to be able to discuss the implications with your supervisor,’ she says.

She explains that time management for someone with a disability that involves quite a lot of fatigue also needs to be taken into account. Most of the time she was able to work out with her supervisor how to modify techniques so she could do an experiment on her own, but there were inevitably times when she needed help. ‘I had to do acid functionalisation of carbon nanotubes by heating them

In short

● **A disability should not put anyone off pursuing a scientific career**

● **Financial support and advice is available from governments and charities**

● **With a little planning, many lab situations can be adapted to suit requirements**

● **Technological aids, from robot arms on wheelchairs to low-tech apparatus modifications, can aid independence**

to reflux in concentrated acid. This is not something that is very sensible for me to do on the account of potentially spilling hot acid on myself,’ she points out. ‘Whenever I wanted to do this procedure, I would ask someone for help.’

‘With practical research there are obviously some things that you are just not going to be able to do – but most of the time you can get a lot of help from labmates,’ says Asli Ucyigit, who suffers from Stargardt’s disease, a genetically inherited juvenile macular degeneration that causes progressive vision loss. Ucyigit completed a PhD in inorganic chemistry at the University of Bristol, UK, in 2004, involving research into phosphine ligands for catalysis, but is now an oil and gas research analyst for international management consultancy McKinsey.

Organisation skills

Ucyigit explains that her research involved synthesising air sensitive compounds under an inert

Dyspraxia hasn’t stopped Rachel Holdforth’s career



RACHEL HOLDFORTH / JESSICA GWYNNE

atmosphere and many of the techniques she used involved work in a fume cupboard. 'Working in glove boxes or fume cupboards was sometimes a problem, because in order to see things properly I have to get up close. This is difficult in a glove box, and putting your head inside a fume cupboard is not a good idea,' she says.

Like Holdforth, good organisational skills were key for Ucyigit during her research project, as, for example, her condition means she cannot see presentation slides at external conferences or internal presentations. 'Overcoming this means organisation on my side and input from the presenter. I would plan ahead, write to the presenter and most of the time they would send the presentation to me in advance, for me to print out,' she tells *Chemistry World*. With some presentations, you can learn a lot from just listening, but with chemistry you need to be able to see equations on the screen,' she adds.

She explains that throughout her studies, there weren't really any specific gadgets or any special equipment to help deal with her condition in a laboratory environment, but help from other team members to read scales on equipment like thermometers was vital.

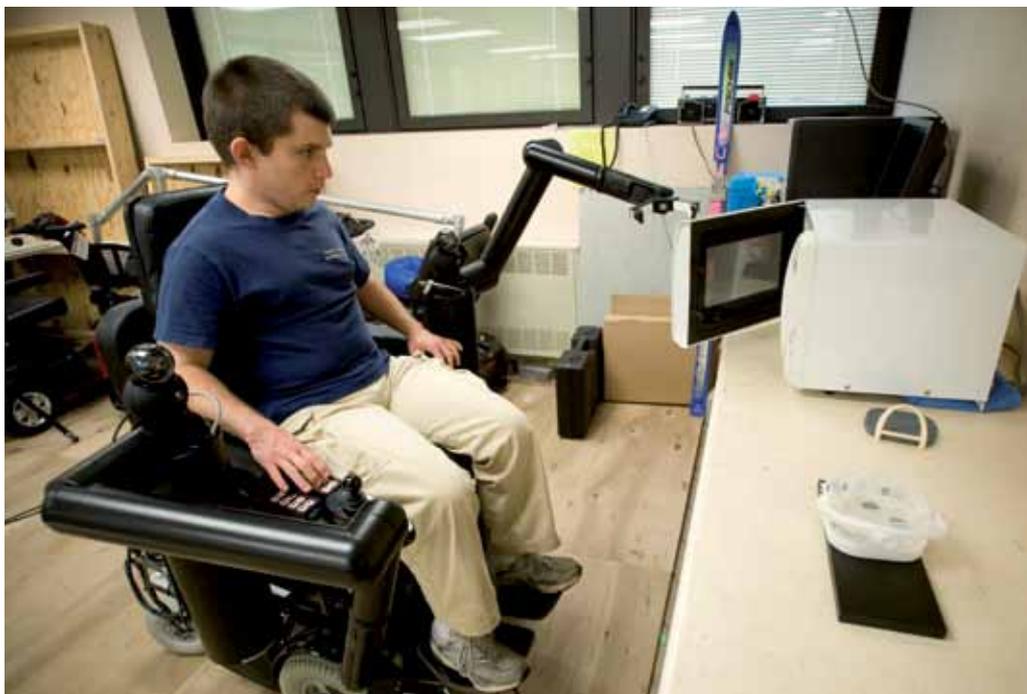
Helping people with disabilities is something that has inspired the research of Rory Cooper, director of the Human Engineering Research



laboratories at the University of Pittsburgh in the US. 'I am really interested in creating technology to help people with disabilities and this is a major focus of what I do. As I got my own degree and on my way to becoming a professor, I found there were very few scientists or engineers with disabilities, and so that started my interest into trying to open doors for other disabled people to study in these areas,' he says. Cooper works with the US National Institutes of Health (NIH), National Science Foundation (NSF) and Department of Veterans Affairs to create internships and postdoctoral positions so that after

Rory Cooper develops technological aids for disabled researchers

Cooper's robot arm-equipped wheelchair helps disabled scientists reach and manipulate lab equipment



their degrees, disabled students can get an introduction to the workplace and gain some experience.

Helping hands

In the US, the main law regarding disability is the Americans with Disabilities Act passed in 1990, which has recently been renewed. Cooper explains that a big part of this act focuses on the reasonable accommodation by employers of disabled workers and that universities and schools must be made more accessible so that 'they provide the least restrictive environment and people with disabilities get the same education as able-bodied people'.

Healthcare reform in the US, particularly the Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act, both of 2010, have a lot of implications for people with disabilities as well, says Cooper, because traditionally America's healthcare was employer based and a lot of disabled people did not qualify. Now in numerous healthcare provisions that will take effect over the next four years, employees with pre-existing conditions and disabilities should not be discriminated against and will benefit from subsidised insurance premiums. In addition, if someone becomes sick or disabled, insurers are prohibited from ending insurance policies.

In July 1980, as a soldier, Cooper was riding a bicycle in Germany, when a bus pulled out and forced him into oncoming traffic. He was hit by a truck going in the opposite direction. As a result he sustained spinal injuries and is now in a wheelchair. After rehabilitation he started college in 1981 and explains that his professors viewed his disability as 'an engineering challenge in order to make the classrooms and laboratories accessible'. Most of the modifications were pretty simple, he says, such as lowered benches where he could sit rather than stand, and a lower welding table and apron to cover his legs and feet. Later on in his studies he designed a mechanised elevating wheelchair that could place him in a standing position. Similar designs are now widely used to help other disabled people.

Cooper explains that he and his team are now working on a prototype personal mobility and manipulation appliance (PerMMA), a robotic arm incorporating a sensor system and simple controls that is able to perform tasks for the disabled researcher. Mounted on a wheelchair or table-

top the device has been tested by 15 people. 'We are now trying to get a commercial partner for the device and have received positive feedback from the people who have been able to use it, and the independence that it gains for them.'

Work ethic

Throughout his career, Cooper has wanted to help others with disabilities, because of the opportunities he has had. He is now a department chair, but remembers times when he felt obliged to prove himself because of his disability. 'In many cases I am the boss and so it has got much better,' he quips. 'Everyone has their own peers, so among my peers I still feel I have to prove myself. But as a whole there is less pressure, because I am more established in my career,' he adds.

Cooper highlights that there have been studies in the US, Japan, Germany and the UK that have shown disabled employees tend to take less time off than their able-bodied peers and that they change positions less frequently. This is a view shared by Vanessa Bird, a chemistry teacher, working in West Sussex in the UK. 'You have to work a lot harder as a disabled person than as an able-bodied person. You have to sell yourself constantly, rather than just being able to get on and do the job. Sometimes you have to be better than everyone else to prove it is possible to do,' says Bird.

After completing a chemistry degree at the University of Oxford in the UK, Bird became a teacher, a vocation she came to cherish, but after a car accident where she sustained serious spinal injuries, she was confined to a wheelchair with significant physical disabilities and found it hard to function as a chemist and hold onto a job that she loved.

Government support

Bird received a lot of help and guidance from Scope – a national charity that supports people with disabilities. She was provided with much needed equipment, such as a motorised wheelchair, by a UK government run scheme called Access to Work. The scheme sets out to assist employers with the costs of support and equipment for disabled employees. 'Over the years, as my condition has deteriorated, Access to Work has stepped in on a number of occasions and increased the level of support,' explains Bird.

'Access to Work is a very important scheme that helps disabled people to



Vanessa Bird uses a protective apron and face shield for practical work

realise their full potential in work and their career,' says Marije Davidson, public affairs manager at the Royal Association for Disability Rights (Radar) – a pan-disability organisation led by people experiencing ill health, injury or disability. Davidson explains that Access to Work needs to be better promoted and needs to provide a broader range of support, especially for people with mental health problems. She goes on to say: 'We welcome the UK coalition government's commitment to an "indicative support package" before employment – this means that disabled people will be told by Access to Work what support they're likely to receive if they get a job.' At present the scheme will only provide support once you have had a job offer. Davidson believes that an 'indicative support package' will give confidence to disabled people as well as prospective employers that support will be available. In addition, Radar believes the 2010 UK Equality Act is a very important tool in reducing the discrimination that is keeping

Low-tech modifications such as foam handles and straps can help



disabled people away from jobs, Davidson adds.

The Terminator

Bird is very pleased at the prospect of an 'indicative support package' and agrees with Davidson that this will improve the Access to Work scheme for disabled workers. She explains that when it came to teaching chemistry, Access to Work provided some dispensing pumps for individual chemicals so that she didn't have to lift and pour them, and a support worker who could demonstrate some of the experiments for her. The scheme was also able to suggest 'little low-tech solutions' so that Bird could demonstrate procedures such as titrations to her students. Bird finds it difficult to turn the tap on a burette, so a rough and ready adaptation was using the outer casing of a ball point pen for leverage on the burette tap when carrying out a titration. Other modifications included attaching foam handles and straps to test tube racks for easier and safer transport of chemicals.

When doing experiments, Bird has an apron that protects her in her chair and a face shield. 'I feel like I am some kind of robot in my outfit. In fact the kids call me the Terminator when I am wearing my bright green apron and the face shield,' she quips.

Bird explains that the children she teaches are the best part of her job. 'They are very adaptable and accepting of my disability and I find they have no concept that there is any kind of problem.'

Chemists can have fulfilling careers whilst coping with disabilities. There is help available from organisations such as Radar and it is clear that the UK and US governments are trying to restore the balance so that disabled employees have the same opportunities as able-bodied workers with equal opportunities legislation and schemes such as Access to Work. Even with physical limitations, it is possible to carry out practical research in a laboratory environment using low-tech gadgets and by obtaining help from colleagues.

'As a disabled person, it is possible to lead a very useful life, even though you may have to have some help to do it,' says Bird.

Further reading

Scope: www.scope.org.uk
Access to work: <http://bit.ly/accesstowork>
Radar: www.radar.org.uk
UK Government Equalities Office: www.equalities.gov.uk