TURNING POINT A switch from chemistry to biology led to research success **p.257**

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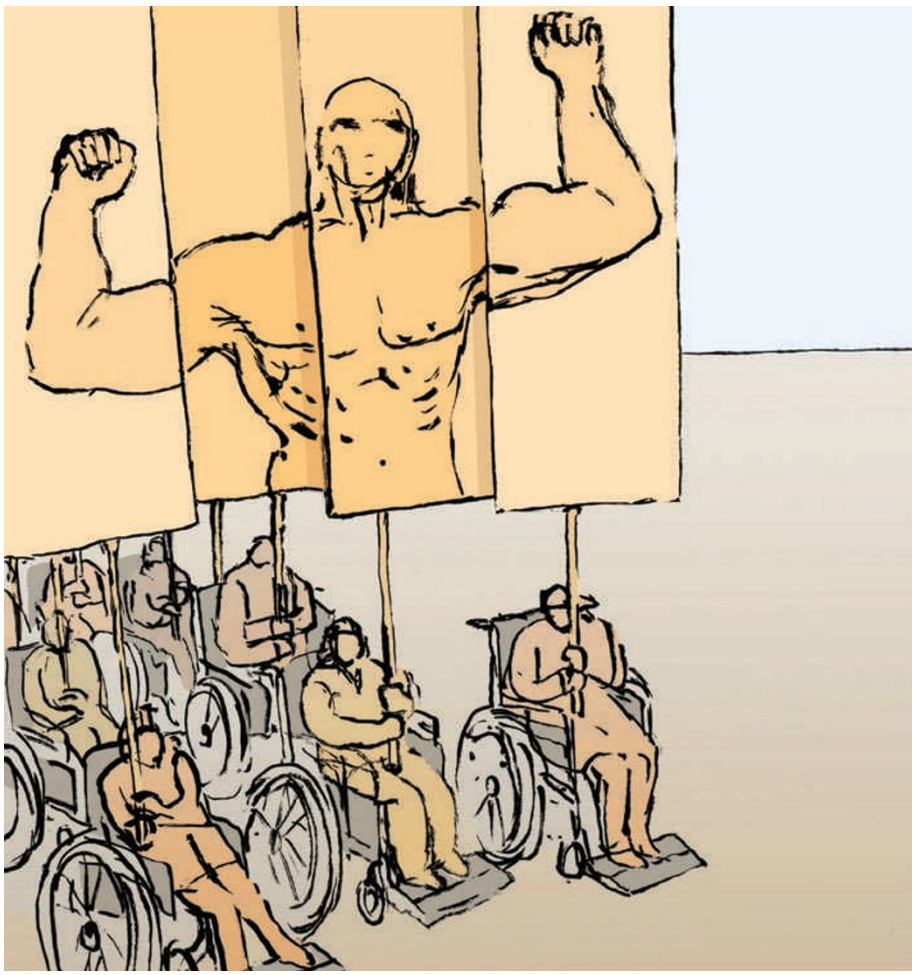

EQUALITY

The fight for access

Scientists with disabilities seek ways to level the playing field.

BY VIRGINIA GEWIN

Jesse Leaman is, in some ways, typical of the many young, promising scientists struggling to excel in a tough funding environment. After receiving a PhD in astrophysics from the University of California, Berkeley, and completing a postdoc last summer at NASA Ames Research Center in Moffett Field, California, he is now looking for work. Not so typical, however, are the obstacles that Leaman faces on a daily basis — he is paralysed from the neck down as a result of an accident at the age of 18.

Leaman chalks up most of his employment travails to being in a highly competitive field during an economic downturn. "I'm struggling along with everyone else," he says. But he is concerned that his disability will compound an already challenging job search. Travelling, for example, requires him to arrange for nursing care, so it isn't easy to spend, say, a week in Europe to interview for positions. And Leaman can't earn extra cash through the typical routes while he looks for work. "I can't work as a waiter while I wait for grant proposals to go through," he says.

Although Leaman and others with disabilities face complex challenges, the job landscape in the United States has largely improved since the 1990 signing of the Americans with Disabilities Act, which prevents discrimination on the basis of disability. And in the United Kingdom, the Equality Act, which took effect last October, provides that country's most comprehensive anti-discrimination measures ever, including provisions against indirect discrimination — for example, any employment condition that particularly disadvantages disabled people. In the United States and parts of Europe, shifting societal attitudes, advances in technologies to control laboratory equipment remotely and funding schemes aimed at boosting training opportunities for people with disabilities make scientific careers more accessible than ever before. But advocates for the disabled say that the ability to honestly assess and communicate abilities as well as disabilities will be most helpful to the careers of Leaman and others in similar situations.

SHIFTING ATTITUDES

Disabilities have a real impact on a person's capacity to get a job. People with disabilities — physical, mental or emotional conditions that impair activity — consistently have a higher unemployment rate than the general population. For November 2010, the US Bureau of Labor Statistics reported an unemployment rate of 14.5% among civilians aged 16 and older who had a disability, compared with 9.1% among those who did not have a disability. Data on employment rates for disabled people are scarce in Europe, but labour-force surveys and some data from the *European Union Statistics on Income and Living Conditions* database for 2008 suggest that well below 75% of people with disabilities are in employment, says the Academic Network of Disability Experts, which aids the European Commission in developing disability policy. The best employment rate for people with disabilities hovers at a meagre 50–55% in countries such as Sweden and Germany, whereas Romania, ▶

Hungary and Poland have a dismal rate of 30%. Low rates of employment may be linked to any number of factors, including a lack of training, opportunities or confidence.

Simply getting into graduate school is the first hurdle. According to the US National Science Foundation (NSF), 10% of undergraduates entering science, technology, engineering or maths (STEM) fields have disabilities. Yet typically only 1% of people who receive STEM doctorates have disabilities — roughly 355 people in 2008. In 2004, the number hit a low of 284, part of a three-year decline that spurred NSF efforts to foster more opportunities, says Mark Leddy, director of the NSF's programme for research in disabilities education based in Arlington, Virginia.

Increases in the number of people with disabilities applying for STEM degrees and medical school may also reflect the fact that the term 'disability' has come to comprise a broader range of disorders than it once did. The traditional definition referred to someone who used a wheelchair or was visually or hearing impaired, but now it often also includes people with learning disabilities, attention-deficit disorders and psychiatric conditions. In Britain, for example, people with dyslexia and Asperger's syndrome submit among the largest number of preliminary enquiries for the government's Disabled Student Allowance (DSA), which was established in 1993 to help universities provide assistance such as sign-language interpreters, note-takers or assistive computer software.

BEYOND FUNDING CHALLENGES

In the United States, a growing number of federal programmes offers supplemental funding or specific schemes to help students secure employment at research institutions. For example, the National Institutes of Health (NIH) in Bethesda, Maryland, offers grant supplements to promote diversity, and provides PhD and MD fellowship awards for students with disabilities. The NSF offers facilitation awards for scientists and engineers with disabilities, to cover the costs of special accommodation or equipment needed to do research. It also funds ten university-based alliances, usually across multiple campuses throughout the country, that offer career support including mentoring and internships for people with disabilities who aspire to a scientific career. Other NSF-funded programmes, such as DO-IT (Disabilities, Opportunities, Internetworking and Technology), based at the University of Washington in Seattle, offer online mentoring and support to identify adaptive technologies, software, and online resources that can improve access to academic programmes.

In Britain, the outlook for postgraduate students with disabilities is less positive. One reason is that the DSA available to postgraduates is roughly half of that available to undergraduates. As a result, supplemental schemes are in high demand among postgraduates, says Paul Alexander, chief executive of the Snowdon Awards Scheme, a private funding body based in Southwater that was created in 1981 to facilitate disabled students' pursuit of higher education. The scheme's maximum award is only £2,500 (US$3,900), but Alexander says that people with disabilities seeking postgraduate education make up at least 50% of the Snowdon scheme's roughly 100 awards each year. "Supplemental funding is really uncommon throughout Europe, which can lead to all sorts of problems," says Mark Priestley, professor of disability policy at the University of Leeds, UK. For example, he says, students with disabilities who take longer than expected to complete their PhDs as a result of chronic health conditions may find that their grants don't adequately fund the extra time needed. "We've had a few issues with students needing extensions, yet the funders were not flexible," he says. In those cases, the funding simply runs out.

F. DE RIBAUCOURT

Mark Priestley of the University of Leeds, UK, pictured here with a colleague, critiques European policy on disability.

Other opportunities, such as the Erasmus scheme — designed to facilitate the movement of student researchers across Europe — go largely untapped among the disabled, although they are eligible for supplemental awards to cover travel- or care-related costs. Just 213 students with special needs — out of a total of 198,523 Erasmus students Europe-wide — received extra funding during 2008–09. In Britain, only 9 out of 11,724 Erasmus students applied for the supplemental awards in 2010, according to the British Council, which oversees the scheme in the United Kingdom. As Leaman notes, travel is difficult for some with physical disabilities, but Priestley says that the apparent lack of take-up of mobility schemes may also reflect how the inconsistent patchwork of legislation covering support services and employment in European countries can make such a move daunting to people with disabilities.

There are some hurdles that targeted schemes can't help with. "Getting started as a young investigator is the hardest part for scientists with physical disabilities, given attitudinal as well as physical barriers that must be overcome," says Brad Duerstock, a biomedical researcher at Purdue University in West Lafayette, Indiana, who uses a wheelchair. Duerstock says that he was lucky to do his PhD at the Center for Paralysis Research at Purdue with Richard Borgens, a neuroscientist. "He knew my limitations and was very open about working with me to find out what kind of research I could do," says Duerstock. Still, he says, he struggled to hit training milestones as quickly as people without disabilities.

Duerstock plans to open an Institute for Accessible Science at Purdue this year — launched with a US$2-million NIH 'Pathfinder' award that he received last October. The awards aim to increase the diversity of the scientific workforce. Duerstock's reconfigurable lab space will allow him to help at least six young disabled scientists work out how best to modify laboratory equipment so that they can conduct science autonomously. "Our main mission is to help these students be as independent as possible — that's what they need," he says.

But technology alone won't prepare disabled scientists for the job market. Internships are key: they offer access to a potential employer while letting employers assess abilities without making long-term commitments. To be frank, says Sheryl Burgstahler, director of DO-IT, some employers may be nervous about hiring someone with a disability because, if things don't work out, anti-discrimination laws can make termination difficult. Internships, she says, are a way for both the employer and intern to have a positive experience — and have led several participants to permanent positions at Microsoft, for example.

The Entry Point! programme, funded by the

American Association for the Advancement of Science in Washington DC, facilitates internships to NASA research centres, national research laboratories and corporations such as IBM. "We're not only preparing them for the internship, we're building a support network to encourage them to go on to graduate school," says Laureen Summers, who helps to place Entry Point! interns at NASA facilities. Similarly, the Career Opportunities for Students with Disabilities (COSD) programme, based at the University of Tennessee in Knoxville but covering more than 600 universities, facilitates internships at companies such as Dow Chemical, Microsoft and CISCO. "At Dow, we're always looking for innovative people. Persons with disabilities have certainly dealt with obstacles that require creative approaches," says Shawn Loachridge, the sourcing and global university relations manager at Dow's company workforce planning office in Midland, Michigan. Students with disabilities represent an untapped market for employers increasingly eager to boost workplace diversity, says Alan Muir, director of COSD.

"The essence of science is being able to think creatively, and sometimes the most creative insights come from people who think about the world differently."

Although these programmes help students with disabilities to gain employment opportunities, successful job bids require frank self-assessment. "It takes a realistic view of one's own strengths and weaknesses for a person to become an effective self-advocate," says Carla Romney, chair of the undergraduate science and engineering programme at Boston University in Massachusetts, who has spent the past decade creating programmes to help students with disabilities to engage in STEM. Romney cautions students against overestimating their physical abilities. At the same time, they should be frank about what they need to succeed, and ask for it. She says that although attitudes are changing, many students are still reluctant to disclose their disabilities on application forms for fear that they won't be admitted — which, she says, is a disservice to themselves. Burgstahler and Romney say that it is imperative that students learn the communication skills necessary not only to become their own advocates, but also to become good scientists. "The essence of science," says Romney, "is being able to think creatively, and sometimes the most creative insights come from people who think about the world differently." ■

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TURNING POINT
William Ja

William Ja, assistant professor of metabolism and ageing at the Scripps Research Institute in Jupiter, Florida, is getting noticed — and funded — for his cross-disciplinary research in protein chemistry and fruitfly genetics.

J. MCENTEE/SCRIPPS

Did you intentionally leap from a PhD in chemistry into a postdoc in biology?
Yes and no. I majored in chemistry at the University of California, Berkeley, as an undergraduate, but always knew I wanted to do something biological. I just didn't know what. While getting my chemistry PhD at the California Institute of Technology in Pasadena, I wanted to bridge the gap between chemistry and biology, so I switched to a postdoc in pure biology. Then I got the chance to work with Seymour Benzer, a pioneer in molecular biology known for unravelling the ties between genes, behaviour and longevity. I loved it, but realized how difficult it is to stay at the forefront of two disciplines.

How did you come to work with Benzer?
My PhD focused on developing techniques to help peptides bind to protein targets. Benzer's work on the long-lived fruitfly mutant dubbed Methuselah was well known on campus. I wondered whether I could use my technique to develop peptides that could bind to Methuselah, to see whether they could affect ageing in flies. At the time, the Glenn Foundation for Medical Research in Carpinteria, California, had a scholarship programme that aimed to give PhD students a sabbatical-like experience. I applied, hoping to join Benzer's lab to do work on ageing *in vivo*. After that, Benzer invited me back as a postdoc.

What did you learn from that experience?
We found that certain peptides, when overexpressed, act as longevity drugs that can extend the lifespan of the fly. I found that I loved working on the organismal level. As a chemist, I had never worked with things that walk. I got interested in fly behaviour, courtship, memory and learning. And, because I had no biology experience, I asked naive questions — for example, I examined flies' eating and drinking habits.

Do you have a career strategy?
I enjoy working on questions that are fun and interesting and that no one else is exploring. One example is measuring how much flies eat, which is difficult in such a small organism. Another is whether fruitflies get thirsty, which questions a 100-year tradition of rearing them in the lab without free water. We found that diet and thirst can affect a variety of fruitfly phenotypes. My papers are often the result of ideas thrown out at lunch or over drinks — I've had a 10–20% success rate following up on questions conceived in a bar. That is how two of my best papers — the questions I mention above — began.

How were the diet and thirst findings received?
Some people doing fruitfly research get upset when I present my results, because my findings might cast doubt on their own work. In those instances, I've encouraged authors to test whether thirst makes a difference and publish their results — that is the only way that we'll know if this is a significant problem. Debates are part of science, but I would say that the politics of science has been the biggest surprise to me as I've moved into a more independent stage of my career. I didn't realize, as a postgraduate student, how shielded I was from politics. I've learned that being a good scientist doesn't mean you are always right.

As a new assistant professor in a bleak economy, where are you looking for money?
There is a lot of stress in this economy about getting grant money, but I do science best when I'm working on diverse projects. The Glenn Foundation surprised me with an unsolicited US$60,000 award last November to continue my research into ageing. And in October, I received funding to explore non-surgical sterilization methods for dogs and cats from the Found Animals Foundation in Los Angeles, California, a non-profit organization dedicated to minimizing euthanasia at animal shelters. It had a prize for creating a single-dose sterilant for cats and dogs, and I wondered about using a cytotoxin to attack cells important for reproduction. I wrote a proposal capitalizing on my protein-chemistry and molecular-biology experience and asked for $200,000. They agreed. ■

INTERVIEW BY VIRGINIA GEWIN