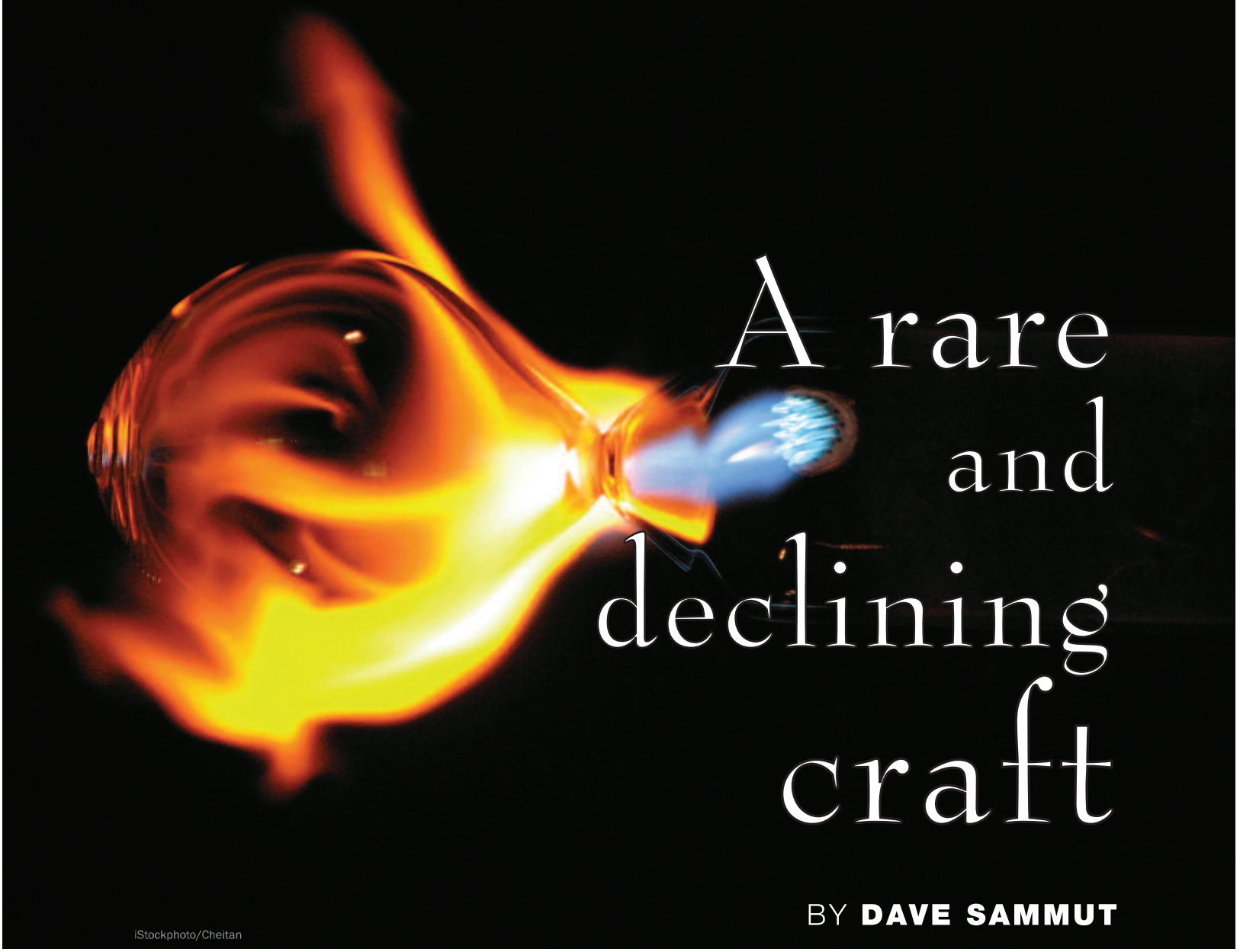


A rare and declining craft

BY **DAVE SAMMUT**

iStockphoto/Cheitan

'A bench all down one wall contained a selection of glassware apparently created by a drunken glassblower with hiccups, and inside its byzantine coils coloured liquids seethed and bubbled.' Terry Pratchett, *Eric*

The art of professional glassblowing pre-dates the Enlightenment. And the ground-breaking scientists who first attempted an orderly understanding of the world (July 2014 issue, p. 22) performed many of their experiments in glassware custom-made for this work.

According to the American Scientific Glassblowing Society, glass first appeared in Egypt as far back as about 1500 BCE, used to glaze tiles. But it was a luxury item, and took almost another two millennia to spread to common items, both socially and geographically. It was only less than a thousand years ago that we first invented a reliable way of keeping the rain out of our homes, while still admitting the light (see box).

Glass remains an ideal material for modern scientific experimentation. Inert to most substances and transparent, glass can be fashioned into a near-infinite variety of vessels and implements. It is so ubiquitous in application that it forms the fundamental trope representing the archetypal chemical laboratory.

Yet the artisanal glassblower, like the cooper or the farrier before him (or her), today practises a craft that is in decline. Although still essential for bespoke and advanced glasswork, the role of the professional glassblower is threatened. In the 1970s and 80s, wet chemical glassware represented the majority of work for professional glassblowers. This has been largely displaced by cheap imports of lower-quality catalogue glassware. And this,

A solubility cell. Brandon Scientific Glassblowing

in turn, is leading to chronic underinvestment in the next generation in the craft.

Today, there are fewer than 30 members of the Scientific Glassblowers Society of Australia and New Zealand (SGSANZ). A generation ago, almost every major scientific institution in Australia had a dedicated glass workshop. With the recent closure of ANU's new facility (after only a few years of operation), the association could now only point to Queensland University of Technology and the University of Melbourne remaining.

Part of the challenge is that there isn't enough work in Australia to support the full-time creation of bespoke pieces. The scientific glassblower needs a core of routine work to survive. Mike Brandon of

A window into history

The humble window offers a great view into the evolution of glass making techniques.

European windows were small, draughty and covered in oiled parchment (knock carefully!) or cloth. But Venetian glassblowers first worked out a method to make flat glass: blow a closed cylinder, cut the ends off, then cut the cylinder lengthwise – the cut glass could then be heated to sag to flat sheets. Over time, the glass cylinders could be made up to 2.4 metres long and around 30 centimetres in diameter, and this came to be the dominant window glass production technology in the 19th century.

New World glassblowers later worked out a second method: they spun molten glass on the end of a pipe, using centripetal force. The 'crown glass' discs could be as large as 1.5 metres, but were commonly much smaller, and could be cut into relatively small squares when cool. At the centre was a distinctive 'bull's eye' piece that are now collectors' items.

The Pilkington process, invented in the UK in the 1950s, produces continuous sheets of flat glass that are made by floating molten glass on a pool of molten metal, typically tin. Via simple gravity, the molten metal naturally forms a completely even, horizontal surface for the production of consistent glass sheet of even thickness. Common furnaces are 9 metres wide and 45 metres long, and can contain more than 1200 tonnes of glass at 1200°C. And modern understanding of annealing and layering processes means that we can imbue strength and resilience to the glass, so that its less likely to break, and less likely to cause injury if it occurs. It's all really quite clever.

Ammonia neutralisation apparatus.
Brandon Scientific Glassblowing

The modern scientific glass workshop is much more sophisticated than just furnaces and tongs ...

Brandon Scientific Glassblowing, Vice President of the SGSANZ, creates high vacuum stopcocks for his bread-and-butter work, primarily for export markets. Other glassblowers mix their time between scientific and artistic glassblowing, or run their shops as a hobby.

Brandon was generous with his time in talking about the state of the craft. Starting as a trainee in New Zealand in 1981, Brandon worked for the DSIR (the equivalent to our own CSIRO). Coming from a chemistry background, this knowledge has served him throughout his career to provide a context and understanding for the pieces he produces. Brandon was trained by a member of the British Society of Scientific Glassblowers, but was introduced to both American and German influences in his craft.

He moved to Australia to take up a job at the University of Tasmania in 1989, and in 2008 set up his own company. His enthusiasm for his craft is evident. 'I love what I do. I enjoy the variety of work, having to do research work and work for industry, agriculture, aquaculture and the arts. I've done all sorts of weird and interesting work over the years. It is a great craft to be lucky enough to be in.'

But there are few students taking up the craft. Apprenticeships are long – at least five years. Brandon says that they're expensive for the master, and challenging for the apprentice. It is very difficult, he says, when it is likely that every single piece that the apprentice produces in the first year will be discarded. That's costly in labour, the master's time and materials, and requires a great deal of fortitude as the apprentice learns the craft.

The British Society of Scientific Glassblowers is the primary certifying authority for Australian and New Zealand glassblowers, with a certificate of competence taking a minimum of three years to attain (probably much longer) across a variety of work. And this requirement for varied experience poses another challenge to apprentices as the work dries up.

The modern scientific glass workshop is much more sophisticated than just furnaces and tongs (what Brandon refers to as 'pot workers'). Brandon says 'We're mainly ''lamp workers'', working at a bench with a lamp [a flame], fabricating scientific glass instruments from tubing and rod. And we use instruments like

glassblowing lathes designed to work the materials, with specialised burners – not like a normal engineering lathe'.

'You could be working something very fine and intricate to something large. I've worked with oxygen probes down to microns in size, up to reaction vessels up to 100 litres. In my workshop I can work a very wide range.'

But a workshop requires a substantive investment, and with no apprentice to take over from Brandon in the later years of his career, he is concerned that one day his workshop will need to be broken up, and his specialist equipment separated and sold for a fraction of its value.

The key for preserving the craft, according to Brandon, is to think locally as a scientific community. 'At Australian universities, a student can buy whatever they like off the internet. There is no control, no loyalty to Australian suppliers. If the universities and the research labs gave their local industry a second thought, it might be enough to give support to warrant investing in the future. Any scientific community still requires our skill set.'

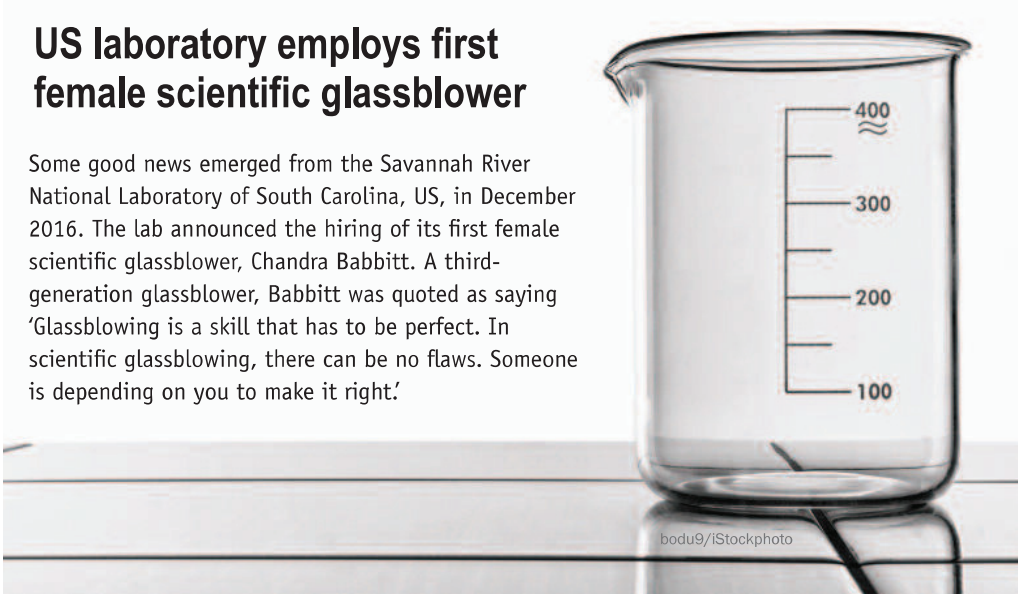
Brandon says: 'The craft is in its senior years, no doubt. But there's always going to be a demand there. Science changes all the time, so therefore the demands on your glassware will change. But without some sort of acknowledgement that the craft needs to continue by the people who make the decisions … it's up to Australia to support its local industry or there won't be a glassblower out there to do one-off jobs.'

Dave Sammut FRACI CChem is principal of DCS Technical, a boutique scientific consultancy, providing services to the Australian and international minerals, waste recycling and general scientific industries.

A jacketed sparging vessel. Brandon Scientific Glassblowing

US laboratory employs first female scientific glassblower

Some good news emerged from the Savannah River National Laboratory of South Carolina, US, in December 2016. The lab announced the hiring of its first female scientific glassblower, Chandra Babbitt. A third-generation glassblower, Babbitt was quoted as saying 'Glassblowing is a skill that has to be perfect. In scientific glassblowing, there can be no flaws. Someone is depending on you to make it right.'



bodu9/iStockphoto