



Going back to school

The Biologist Editor Sue Nelson goes back to school for a 'Biology 101' and discovers that biology and physics have more in common than she thought

Aged 16, two weeks into my A levels, there was a tap on my shoulder during the bus journey to school. I turned and came face to face with a large eyeball sitting on a piece of muscle. My scream caused the driver to slam on the brakes as the eyeball rolled under the legs of other students, producing a Mexican wave of ear-piercing revulsion.

The eye belonged to a bull; acquired by a biology student from a butcher's for dissection. Fortunately, being of a squeamish nature, my local butcher had run out when I'd

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requested one myself. Unfortunately, I still had to do the lesson. It did not go well and was spent with my head out of a window, fighting off nausea.

Dissecting a frog produced a similar reaction and it became abundantly clear that I was not destined to become a biologist. I exchanged biology for chemistry, joining maths and physics. My biology education was over.

A spellbinding start

A few months ago these memories resurfaced on watching a biologist inject a female sea urchin with salt water. My stomach lurched. Thousands of tiny eggs descended into a small glass beaker filled with water as the urchin's spines swayed and rippled.

This time, I didn't head for the window. Despite not being able to wield the needle, I managed to pipette white globules of sperm from a male sea urchin into a solution – provided I didn't have to touch it, of course.

Using a microscope, I then observed – for the first time – sperm wriggling and racing towards the eggs and the appearance of a hazy halo signaling successful fertilisation. Within an hour, I was watching the beginnings of cellular life as the cell divided into two in front of my eyes. It was spellbinding, and an impressive start to a short, intensive course for science journalists to connect with biology and biologists.

"It's an opportunity to see how science is done and to see the rewards," said David Burgess, a professor of biology at Boston College and one of the course tutors. He was joined by associate professor Brad Shuster from New Mexico State University and by Brad's postdoc, Olivia George, a Native American whose love of biology had changed her life and career expectations from working on a reservation to a laboratory. They had nine days to give a bunch of unruly, independently-minded journalists a flavour of what it was like to do their job instead of report on it.

Sharing passion

The course is part of the Logan Science Journalism Fellowship at the Marine Biological Laboratory in Cape Cod, Massachusetts. Located by a pond filled with crabs, urchins and sea squirts on one side, and the Atlantic Ocean on the other, it is a living and working playground for the scientists. "People call us a Mecca for the biological sciences," said Andrea Early, who organises the fellowship and was once a fellow herself.

As Editor of *The Biologist*, whose degree is in physics, it was a chance for me to engage with a science that had always been off limits. When covering general science within a pool of correspondents, as I did at the BBC, we usually divvied up stories that played to our strengths. Even when editing this magazine, I leave the biology to the experts. I am a science journalist, not a scientist.

Journalists are often, by nature, butterfly brains. They are able to research, digest and absorb stories quickly, becoming an instant expert in a short period of time. Scientists can spend decades on one particular aspect of research and still enthuse about what remains to be learnt. It is obvious they love their work.

Tutors Brad, David and Olivia personified these traits, often working late into the night to ensure we could share their passion. "Isn't it beautiful?" Brad would say, joyously, on seeing the pleasure we gained from our images of cells.

Punishing schedule

Among the other fellows, everyone's level of biology differed: from courses at degree level to those, like me, who had finished their biological education early.

The first lecture was therefore a shock. Instead of the expected 'Biology 101', it felt as if I was being taught in a different language: biology in Croatian.

I'd brought along *Cell Biology for Dummies* but felt too dumb to use it.

Every other word needed explaining. When I last studied biology, the cell seemed to only consist of a nucleus, chromosomes, cytoplasm and a cell membrane. Now there are microtubules, actin, myosin and cadherin. I discovered that biology has its own complex vocabulary and finally understood why not everyone 'got' physics. To me it made perfect sense. Now I realise it's because I already speak the language.

The schedule was punishing. Lectures on genetics at 8:00am, lab classes all day and further lab sessions or talks in the evening. These ranged from yeast and cephalopods to arsenic and microbial oceanography.

We'd been warned by Brad that being a scientist – and science itself – was all about things not always working and this definitely proved to be the case.

Preparing samples, waiting for the microscope and then discovering that our sample was sub-standard, or that we'd used too much agar jelly, taught us about the patience and repetition required before any analysis was possible.

We learnt about immunofluorescence and tagging antibodies to different parts of the cell, watching with joy as the latest state-of-the-art Zeiss microscope revealed a multi-coloured piece of artwork with blue DNA or green microtubules or the red-orange lines of the protein actin showing cell walls.

When you're told about motor proteins called kinesin and dynein in a cell, you listen and digest, but it's difficult to imagine what is going on. As soon as Brad mentioned that kinesin moved towards a positive end, I mistakenly assumed this meant an electric charge was involved instead of simply the end that grows fastest.

Despite this misunderstanding, some of the vocabulary of biology was starting to filter through. It's not easy when discovering the definition of dynein is described as "found in

the flagella and crucial to cell motility" when you have to look up both the words flagella and motility.

Another universe

But the process of doing cell biology began to make sense – even if I still shied away from touching living organisms. I was simply enjoying what could be seen as the images and videos we made of cell division using the microscope helped clarify the lessons.

Then we watched an eight-minute animation by Harvard University called 'The Inner Life of the Cell'. The film is silent but Brad gave a live commentary of what we were seeing and the processes underway.

The cell revealed an astonishing complexity, both dynamic and thrilling. The sight of kinesin 'walking' along a microtubule was so unexpected it made me repeatedly exclaim, "No way!" It was genuinely exciting.

This unexpected world within a world was full of surprises. Familiar with exploring the wider world of astronomy, looking out from the Earth into the vast cosmos and beyond, here was another equally exciting universe at the cellular level. The experience was such a shock – and so beautifully moving – that I had to blink back tears. It was a definite 'wow' moment.

The reason for me doing this fellowship was to stand back from journalism to gain a better understanding of the science of biology and the process of the science itself. It did so much more than that. It opened my eyes.

OPPOSITE PAGE
Sue Nelson in the lab under the watchful eyes of Professor David Burgess.

BELOW
Biologists and tutors Brad Shuster and Olivia George collecting sea squirts from the lake at the Marine Biological Laboratory, Cape Cod.

