Interview

Painting for life

Scientist-turned-artist Lizzie Burns explores the world in a new way

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Lizzie Burns was in the midst of a typical postdoctoral stint at Oxford, researching how chromosomes are lost from cells during cancer, when she veered off to become a professional life sciences artist. Three years on, she's carved out a niche for herself, using art to help entice children into science. LabLit.com recently caught up with Lizzie to find out how her new career was going and what the future holds.

Burns with school children in India

"Both scientists and artists are interested in the world around them, but are investigating it in a very different way."

Would you say that, up until the moment you jumped ship, you were following a traditional academic career path?

Yes. But I had a lot of interest in other subjects too, and the arts were always my big passion. Even with biology, I tended to be interested in the more general aspects of it, not just the one topic I happened to be researching.

Was there a defining moment when you realized that the laboratory life was not for you? Or was it the culmination of a gradual awareness?

I was happily chugging along. But there was frustration, too; when experiments are slow and lab life lacks variety, then you look at other things. It was art that gave me the greatest rewards most consistently.

Were you bored with research, then?

No. I loved research, but I also felt I had to be true to myself and needed more variety. I wanted to grow and develop my passion for combining art and science as well as encouraging others....it was a very positive decision. I wanted to learn new things, stretch myself.

Have you always been an artist? Were you ever tempted to go into an art career straightaway?

I believe that everyone starts as an artist, but loses it as they grow up. I just kept it up. Science has also always been with me – my Dad is a biology teacher, and I've always had that passion.

How did it manifest as a kid?

Beetles and snails! Once when I was a toddler, my Dad found that I had blisters from handling a particular kind of toxic beetle. I used to pick up bees! And I kept giant African land snails as pets.

Figure 1. One of Burns's paintings adorns the cover of an issue of the scientific journal *EMBO*. © The European Molecular Biology Organization.

So art didn't tempt you at first, as a career?

No. I always figured that I enjoyed both and very deliberately didn't take art A-level at school; I wanted to develop in my own way in art. But science can't be kept up as a hobby – you need serious training.

What about the money?

Well, of course I did think about that too. Does anyone really realistically believe it's easy to make money as an artist? My great uncle was an artist – and a very good one – but to some extent, his experience was obviously very frustrating.

Do you find painting biology easy compared with other themes?

I started tackling biological paintings just over ten years ago between my degree and starting my D. Phil. At first I found it difficult because we are so used to being exposed to diagrams in textbooks, and the temptation is to be literal. It took me awhile to really *relax* into the subject.

Figure 2. *Hearing* © MRC Artist: Dr. Lizzie Burns. Inspired by the research of Professor David Moore, MRC Institute of Hearing Research, University of Nottingham UK. In hearing, the part of the ear we can see is only the tip of the iceberg. It funnels sound vibrations deep inside the ear where they hit the eardrum and move it. The body's smallest bones, the malleus, incus and stapes pass its movements on to a snail-like structure the cochlea – which converts sound vibrations into nerve impulses to create the sense of sound in the brain.

What happened next?

In the mid-nineties, I had my first exhibition in the biochemistry department at Oxford, and a few hundred people showed up. I was surprised at the turnout. I started doing covers next – scientific journals, books – at weekends (see Figure 1). My painting also happened to be a great way to explain to my friends what I was doing in the lab. People tend to be surprised by what the reality is. They'd ask me, is that *really* how our bodies are made? Is that how HIV *really* looks? It inspires that feeling of awe at what we are.

Do you prefer painting macroscopic or microscopic subjects?

I do all scales, but I prefer the small scale – it's a different world, harder to conceptualize. A bit more unfamiliar, a bit more relevant to disease. This really draws people in because it has relevance to their lives; they will know someone who is affected by a particular disease and will want to know more about it.

You work for the Medical Research Council now, and they were also responsible for your first professional science-art gig, "Medical Research Revealed". How did this job come about, and what did it entail?

There was no such job or position advertised for science artists, but I noticed that one of the MRC's mission statements was to engage the public with science. So I thought if they were really serious about this, they might be interested in

me. For "Medical Research Revealed", I went round talking to various scientists and painting pieces inspired by this dialogue. These were first exhibited at the Salford Museum and Art Gallery as part of the BA Festival of Science in 2003. Other places the paintings been shown since have included Oxford's University Museum and Newcastle's Life Science Centre. Most excitingly, the exhibition toured India at the invitation of the British Council, where people are especially interested in art and medicine.

We've heard that the MRC has sponsored you to work with kids. Tell us more!

It really came out of my own interest and enthusiasm. My original aim was to go straight into teaching after getting my university degree – I never intended to be a researcher. But at that point I was so fascinated by science that I kept going. Then one day a friend of a friend asked me to help out with their primary school for Science Week. These kids really loved the small-scale world, and they can use their imagination far better than adults. The feedback was fantastic, and I never forgot it. So when someone suggested I ought to be working with kids, I proposed the idea to the MRC, and they were delighted.

It's a documented fact worldwide that men are more successful than women in the sciences – at least as measured by Nobel Prizes and percentages of female professorships; recently Larry Summers, the Dean of Harvard, caused a huge stink by suggesting that women might be genetically deficient in the sciences. Have you seen any evidence that female school children manifest different scientific proficiencies than do boys?

Well, boys and girls *are* a bit different, about science. Boys seem to instantly love the gory and disgusting, whereas girls won't necessarily want to touch things at first. I'm not sure whether they're just fulfilling their roles or if it's innate. Boys like dinosaurs, facts, nerdy knowledge – the kids that are the most demonstrably passionate about science in my experience tend to be boys. Maybe there's just not the street cred there for the girls. Kids are extremely gender focussed at that age – they just want to conform. But I did have a great experience just last week: a girl came up to me and told me that she didn't like science before, but after meeting me, she really want to become a scientist!

Any other insights into what influences kids to want to choose a scientific profession?

This happens to be a key question I am personally interested in, and it was something I tried to find out from the various scientists I spoke to during the realization of "Medical Research Revealed." The vast majority of these people developed an interest at an early age (often during junior school) from being exposed to something different at school, say an eccentric teacher or encouraging parents. So it seems really important to catch them young – later on it's too late!

Figure 3. *DNA Chip – detecting a gene* © MRC Artist: Dr. Lizzie Burns. Inspired by the research of Sir Ed Southern's research in the University of Oxford's

You've had other projects too. Tell us about your science-related play that aired at the Edinburgh Festival.

It was called *Autodestruct*, written in 1992. The idea came about during my biology degree; I was having a go at growing cancer cells in culture at the time, and was fascinated that these cells that were so involved in death could be so beautiful, alive, immortal. I also had a friend who developed Hodgkin's disease, so she was on chemo. My friend's experience made her look at things in a fresh way and this I found striking. She'd say things like, "I never really appreciated before how

incredible an orange is" – all these things we take for granted.

What's the play about?

A scientist who develops colon cancer at an early age. He has an idea that, as he is fated to die, he'll take his own cells and freeze them so that in future they could be used to make a clone of himself – this was years before Dolly. It's about someone clutching on to this feeling that science will give some sort of immortality. I got a grant from COPUS for National Science Week; it also played at Oxford, and was used as part of ethics course. And then Edinburgh in 2001.

We understand that you are also a science consultant for Hollywood! How did this come about?

Through a friend, the mathematician Jonathan Farley at Harvard. He was always irritated seeing scientists misportrayed in movies, and then when the film *A Beautiful Mind* came out, he wasn't happy that it concentrated too much on the human story and not enough on the mathematics. So he founded a company called Hollywood Math and Science Film Consulting to provide a service to filmmakers to help them write realistically about science, and asked me to assist in the consulting.

Any big clients so far?

Well, it's only just getting off the ground. We need to find connections in the film world. We've had some TV projects recently…I would love the opportunity to work more with scriptwriters.

Figure 4. *HIV Vaccine* © MRC Artist: Dr. Lizzie Burns. Inspired by Professor Andrew McMichael's research team in the University of Oxford's Weatherall Institute of Molecular Medicine. The discovery of HIV resistance brought hope for a vaccine, and MRC scientists are testing a new kind of HIV vaccine based on DNA. The vaccine contains small sections of HIV genes designed to provoke a strong immune reaction as well as dead pox viruses to boost the immune response. **LEFT:** *HIV Vaccine: Immunisation.* Here, the vaccine of DNA-bearing gold particles (gold/purple) are fired through the cell surface by compressed helium, along with inactivated pox viruses (purple balls), to boost the immune response. **MIDDLE:**

Department of Biochemistry. DNA chip technology pioneered by Ed Southern in the 1980s is revolutionizing genetic analysis. These 'chips' allow genes to be identified and can detect subtle variations between genes which make us unique. Burns says she imagined the molecular scene across a DNA chip to resemble a tiny landscape. Thousands of tiny single DNA strands resemble a tiny microscopic cornfield. Each stalk can form a double helix with one of thousands of genes. Here the gene of interest (blue) has been decorated with fluorescent dyes (green).

HIV vaccine: Preparing for an infection. After vaccination, pox viruses and harmless HIV proteins (purple) are broken into fragments which are moved to the cell surface. Any white blood cells that recognize and bind to HIV proteins provoke a strong reaction. The white blood cell is given growth messages (pink) while the vaccinated cell is sentenced to death (black). **RIGHT:** *HIV vaccine: Protection from HIV*. Once vaccinated, the body's protective immune system is programmed to recognize and attack HIV. Here a white blood cell (top) is killing an infected cell (bottom) before the virus has time to spread further.

Do you feel more or less in touch with science now that you're no longer at the bench?

I feel very much more in touch, because I paint many different subjects, which provides a lot more of a general overview. Also, I've been privileged to be able to speak to a number of different leading scientists about various cutting-edge research projects that are set to make a big difference to health. And I think that they appreciate speaking to science artists who actually speak their language.

Do you think artists who aren't scientists might get it wrong?

Well, there's a tendency for some artists to go for the shock factor when it comes to science: for example, they'll depict genetic engineering using images like that mouse with an ear growing off its back – which of course had nothing to do with genetic engineering anyway. And it wasn't even a typical experiment, so it's a real shame it's used so often. I can see why it's done, as it's fashionable in art to shock, and in science you can find plenty of stuff that looks shocking. But if that's all you show, you continue to perpetuate a negative image of science. They're all fascinated by weird mutations. But the *beauty* of biology is rarely shown and that's what most of us are interested in.

Have you found that your artistic activities in the past three years have inspired you to think about biological processes differently?

Definitely. In order to produce a painting, I have to think about it very carefully. For example, I did one of the ear recently (Figure 2); this is a complicated structure and I really had to understand its mechanism. If you have to depict something with high accuracy, it forces you to think about the science behind it. You have to really question those diagrams they show in textbooks: are they actually correct? I try to use colors to represent what's going on, as accurately as possible; for instance, I was painting a DNA microarray chip and I tried to use the right colors for the wavelengths used in experiments (Fig. 3). In many ways you have to know more to *paint* an experiment than to actually perform one!

On a somewhat related note, while we see how art has always been crucial in helping scientists to visualize a three-dimensional molecule, do you think art can help people understand less tangible scientific processes or concepts?

Definitely. I can show things that no one can see, such as this novel HIV vaccine being developed here in Oxford. I explained it in a series, and as there were no pictures of this, I had to completely imagine it (Figure 4). It's made up but it's a very good way of explaining it.

A lot of biology entails motion. How do you depict this in paint – and have you ever considered trying out a moving medium such as video?

I'm definitely very conscious that microscope photos are still and look dead, stone-cold. Such images can be beautiful, but the real thing is full of life. I hint at motion with an impressionistic technique – it's hard to describe how it works. By applying paint in a dynamic way, brushstrokes

can give a feeling of movement. Color can give vibrancy. Sequences of paintings together can give the impression of motion. I suppose I could do animation, but I'd prefer to use the imagination. Animation is force-feeding it to you, leaving little to the imagination. You see this a lot in science museums now, with their films and interactive exhibits. I say you're better off going to look at real specimens, it's much more inspiring. Yes, moving things grab attention – but do they really make you think?

Such as books versus movies, perhaps!

Exactly.

As a scientist and artist, you are in a good position to think about the "divide" between the two disciplines first popularized by C.P. Snow. Do you think scientists are less creative than artists? More? Or *as*, but in a different way? Do they think in different ways?

Figure 5. *Male and Female* © MRC Artist: Dr. Lizzie Burns. Inspired by the research of Professor Bob Millar in the University of Edinburgh's MRC Human Reproductive Sciences Unit. Similarities between men and women can be seen in this painting. In both cases, development of our reproductive systems is triggered by the release of a single hormone (GnRH) from the base of our brains which in turn release further hormones (FSH and LH). These hormones act on the gonads (pale green) to stimulate secretion of sex hormone: testosterone from men's testes and estrogen from women's ovaries. These superimposed outlines of the two models (Burns and her partner) show how sex hormones influence male and female characteristics.

I reckon that scientists are just as creative; they have to be to do well. They need new ideas and have to use their imagination. Scientists do have to be more disciplined about their creativity; they can't stray too much, though maybe the best people do cross into new territory. This is true for artists as well. A lot of artists are following in previous people's footsteps and very few fundamentally change the way things are done, and these are the people who are remembered.

So more similarities than differences, then?

Both are interested in world around them, but are investigating it in a very different way. Ultimately scientists are valued more because what they are doing can potentially help people's health, and that's got the biggest impact for the same generation. But art is actually the longest-lasting legacy of a civilization.

We've heard that you asked your partner to dress as a male prostitute and pose in a graveyard for one of your pieces. Can we ask why?

Bless him, he's been my guinea pig. For one of my projects, this one in the social sciences, I was asked to depict inequality in society. The project was about rent boys in Glasgow, and the violence and poverty was moving and sad, and had a big impact on me. It wasn't ethical to show real rent boys, so I staged it. He had to wear a hooded top and stand around in a nearby graveyard where there are discarded condoms and needles left behind from drug users. I've used my partner some of my other works, including a painting about sexual reproduction (Figure 5).

Are there any well-known artists that you particularly admire in their ability to depict biology?

I really admire Van Gogh, that feeling of vibrancy and the energy of nature. Someone who inspired my passion as a teenager was Dalí. He was very interested in science; for example he did a painting just after the double helical structure of DNA was discovered. His molecular paintings weren't scientifically correct but they contained a lot of great ideas. Science was the future and Dalí obviously saw a sort of divineness in it. It was all a bit over the top, but I adored it, and still do.

Do you expect your collaboration with the MRC to continue?

Figure 6. *Microbe World*. Example of a school girl's painting inspired by science, executed during one of Burns's workshops at the Vasant Valley School in New Delhi. "Medical Research Revealed" toured India at the invitation of the British Council. She spoke to several thousand people as well as running workshops. Pupils aged 11-13 years donated their artwork to be shown in the UK. Pictured is a painting by one school girl of an imaginary pathogen called "Triplanian virus". According to the budding artist, the painting shows "two different viruses which destroy white and red blood cells. The virus has three eyes to aim at cells carefully."

I very much hope it will! They have been incredibly supportive and enthusiastic. The MRC is perfect for me, because medical research is the area I'm most interested in, and as the MRC is publicly funded, there are no ties to industry, so it lacks the economic dimension that would make me feel a bit awkward. I can feel completely behind it.

How might your job evolve?

I can see myself really focusing more and more on children. It's so worthwhile, and it's the best way to engage the public because at that age, it can make a long-term impression. Even if the kids don't become scientists, it teaches them a valuable way to think (Figure 6).

You can read more about Lizzie Burns's projects in other articles:

The MRC website: *Medical Research Revealed*

The *British Medical Journal*: *Powerful paintings: encouraging future doctors through art*

BBCi: *The art of the brain*

The *Guardian*: *But is it science?*

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