James Bancroft

James Bancroft is the Cellular Imaging Core Facility Manager at the Wellcome Centre for Human Genetics, University of Oxford, UK. James has a background in mitotic cell biology and advanced microscopy.

Tell us about your background. How did you first become interested in microscopy?

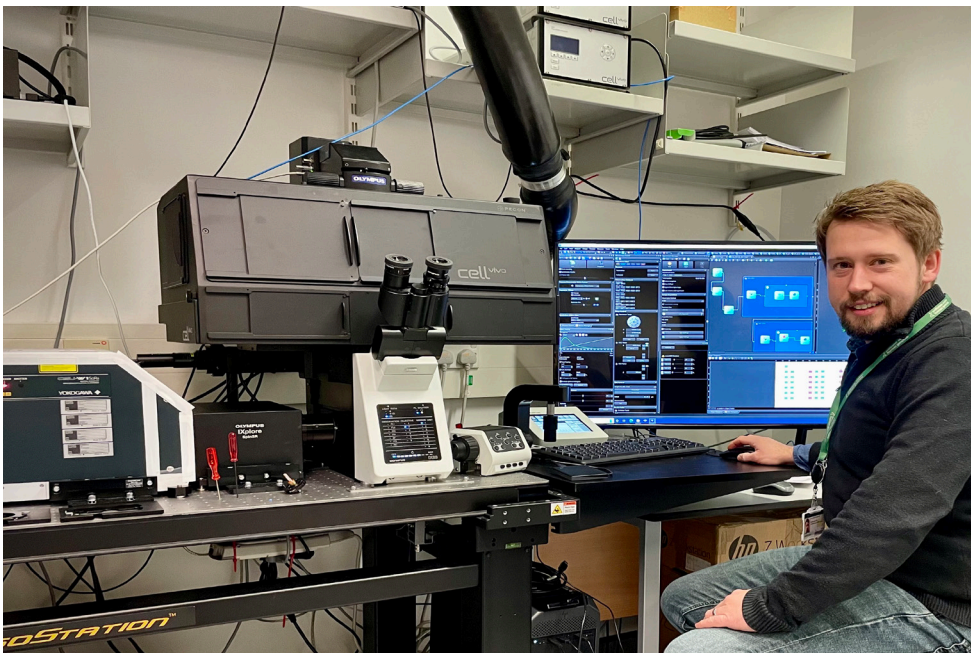
I first became interested in microscopy as a child. My Grandad bought me a microscope when I was 6 or 7 which was discounted by collecting coupons from cigarette packets (it was the early 90s!). It had a 100x oil objective and a battery powered brightfield illuminator. I looked at everything from pond water, plant leaves and blood smears taken from semi-willing family members.

At school I enjoyed science in general and went to study Biological Sciences at the University of Birmingham where some fantastic microscopy was taking place. I was fortunate enough to be awarded a Wellcome Trust funded summer studentship in the lab of Prof Franklin-Tong. This project and my dissertation in her lab focused on live cell fluorescent imaging in plant pollen tubes, from then on, I was hooked on fluorescent live cell imaging.

While working in the Franklin-Tong lab I met the team at Nikon Instruments and upon graduation I took a position with Nikon as an account manager in microscopy sales and support. Whilst with Nikon I gained a broad training in microscopy. After almost 3 years, I was drawn back into science and undertook a PhD at the University of Warwick in the lab of Prof McAinsh working on the mechanochemical processes that govern mitosis. This is an amazing field and is heavily dependent upon advanced microscopy and image analysis. After my PhD I took up a post-doctoral position in the same area at the University of Oxford in Ulrike Gruneberg's lab. In total I spent almost 9 years imaging mitosis and this is a field I still do some work in. I then briefly worked for Carl Zeiss Microscopy before taking up my current position as microscopy facility manager in early 2020.

What are you working on currently?

I am still very interested in cell division from a method development perspective. I am currently developing assays to automatically quantify key structures and events during the process of cell division. However, one of the fantastic things about my work is the variety of different projects I am involved in. Around a year ago I began a collaboration with Lahiru Handunnetthi using iPSC derived neurons to study cortical development. The beauty and the complexity of these structures have provided some really interesting imaging and analysis challenges. Most recently we took delivery of our first structured illumination microscope (SIM). This is particularly exciting as it will potentially allow us to achieve 60nm resolution in live cells. I am also currently working to adapt assays to take advantage of this modality.



Above: James preparing a high content imaging assay on a spinning disc confocal microscope.

What does a typical day look like for you?

One thing I enjoy is that while there are constants there isn't a typical day. I might be training someone at a microscope, checking system alignment, troubleshooting issues on a microscope, writing sections for a paper or a grant application, teaching in seminars or carrying method development work.

What do you most enjoy about your work?

The level of interest and variety I experience in my work is definitely one of the most enjoyable aspects of what I do. There is always something new to learn, it might be a new technology that becomes available, or a user with a new biological application. I enjoy maximising the results we get from the microscopy we do, for example, keeping a sample alive whilst simultaneously maximising resolution and speed.

What do you find most challenging?

The demands on my time are probably the biggest challenge, because there are so many different things that I am involved in. Discipline and proactive planning help, but people have unexpected problems so I have to approach my work with a degree of flexibility even with best laid plans. Another challenge is learning how to use and eventually master new systems when they come to the facility, however this is also great fun!

> "Whilst a classical academic career pathway is a major route I don't believe this is the only way to progress your career in science"

What are you hoping to work on in the future?

I would love to combine my interests and knowledge of mitosis with some of the work I have been part of in neuroscience. Perhaps to better understand the role of asymmetric cell division in human neuronal development. I have also started a collaborative project working on photo-degrons to control protein levels in living cells by dosing cells with tightly modulated blue light.

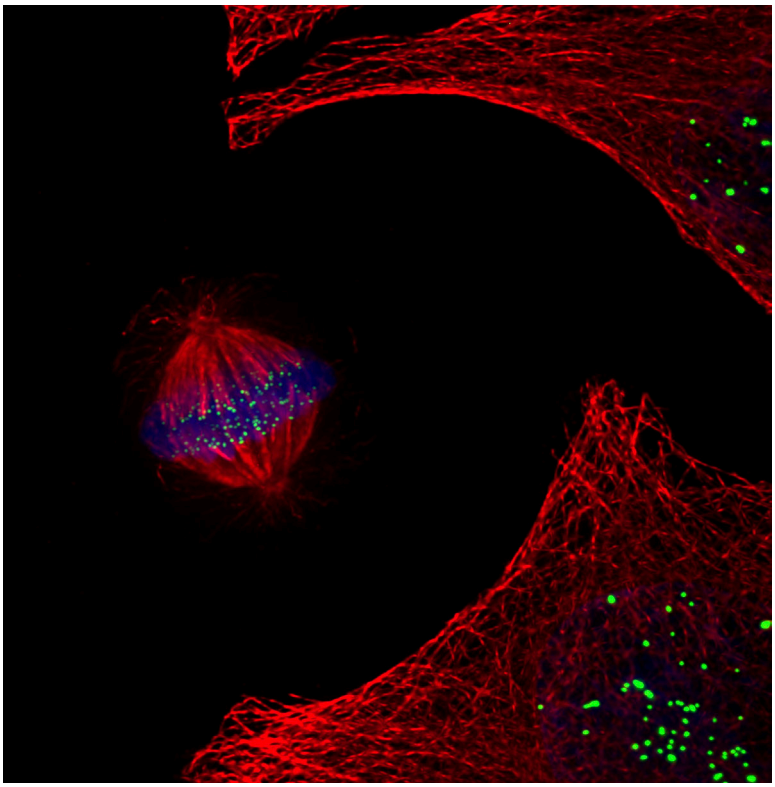
What advice would you give to aspiring scientists in this area?

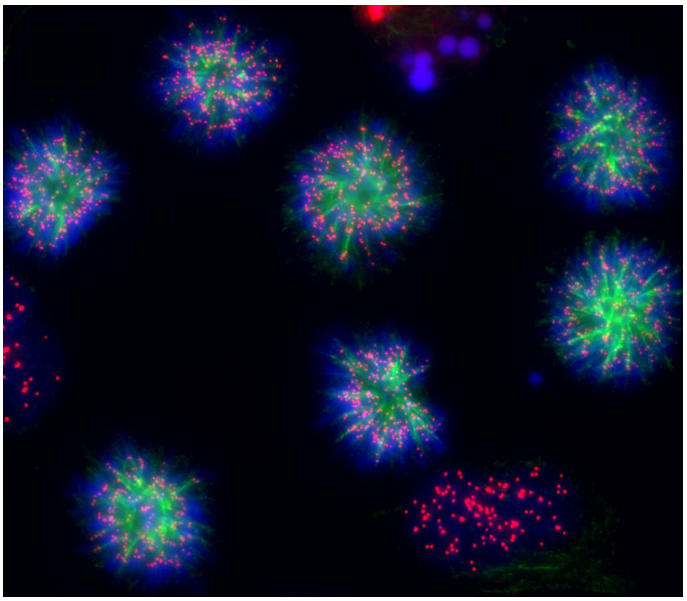
My career path has certainly not been typical and whilst a classical academic career pathway (i.e. PhD, postdoc, PI) is a major route I don't believe this is the only way to progress your career in science. I have gained many skills in industry which has a lot to offer, and people certainly shouldn't see a move to industry as a one-way street. Providing the experience is relevant, the door to academia is still open and experience gained in industry is often very beneficial for positions within research and core facilities.

Who are your scientific heroes?

One of my heroes is Osamu Shimomura who first isolated green fluorescent protein (GFP) from the bioluminescent jellyfish *Aequorea victoria*. He was awarded the 2008 Nobel prize for Chemistry along with Martin Chalfie and Roger Tsien for their work on GFP. This discovery has made so much of my work possible and has allowed scientists all over the world to observe important processes in living cells.

Eric Betzig is another scientist I really admire, as he was one of the key people who kick started the super resolution microscopy revolution. Eric developed Photoactivated localization microscopy (PALM) for which he won the Nobel Prize in 2015. Eric moved between industry and academia and did much of the development work for PALM with his friend and collaborator Harald Hess in Harald's living room. Prior to publishing their work on PALM in Science, the pair were both unemployed and had not published a paper in many years. I think this is a good example of how an innovative idea and a lot of hard work can make a big impact in science.





Left: SoRa super resolution image of a HeLa cell mitotic spindle at the moment of anaphase onset (Red - tubulin, Green - GFP-CENP-A/Centromes, Blue - DNA). *Right:* Widefield image of mitotic cells treated with a kinesin inhibitor which induces monopolar spindles (Green - tubulin, Red - CENP-A/Centromes, Blue - DNA).