



**STS Careers Podcast – Malcolm Chalmers speaks to Victoria Goldsack, teacher, and recent MSc History and Philosophy of Science student.**

*Victoria completed her MSc in History and Philosophy of Science in September 2018 – two days after this interview was recorded. She works as a Physics teacher in South-East London, and from 2018 will also be teaching History of Science to pupils.*

MC Hello and welcome to another STS podcast. We're discussing the careers and the work done by people in our department, and I'm here with one of our... I think it's safe to say current student Victoria Goldsack?

VG Yep, deadline is Friday, I'm still current!

MC So still a current student for the next few days. You're currently employed as a teacher, and you're currently doing the HPS, History and Philosophy of Science course?

VG Yes, I studied the History and Philosophy of Science course in October last year

MC So, I'd like to talk a little bit about what led you towards doing that degree. Can you maybe talk me through from GCSE level, up to the end of A Levels?

VG So from GCSEs I then studied History, Chemistry, Physics and Maths at AS level, and then dropped my History and just did Physics, Chemistry and Maths at A-Level and then went on to University at Bristol to do Chemical Physics undergrad.

MC So Chemical Physics, it's a fairly niche subject I think you'd agree. There are a lot of people who do Chemistry, a lot of people who do Physics - but Chemical Physics was an interesting path to take.

VG Yeah, there were about seven universities at the time that did the course, just pure Chemical Physics!

MC And how did you find that, doing a fairly unusual degree, shall we say?

VG I loved it. It kind of catered to my interest in Chemistry and Physics very well. It was very prescribed though, because it was two huge courses they had to combine into one. There were eight on my course, I was the only girl in my year group, so it was rather niche. But we were doing courses with students from Chemistry and Physics, so I had plenty of people I made friends with outside of my course.

MC Did you then go straight from that degree into a masters? Or did you have a few years working in the meantime?

VG No - so I took a couple of years out. I graduated right in the middle of the recession, and couldn't work out what I wanted to do, so I went and worked as a graduate assistant at a secondary school, and then decided I wanted to do my PGCE, so I went into teaching and then came to the Masters after about 5 years of teaching.

MC So there's definitely not been [a process of] A Levels, then undergraduate, then Masters. You've gone away, you've worked, you've taught, and then thought "this would be a degree for me". Now what interests me is that you dropped History at AS level, but then came to do History and Philosophy of Science for the degree. Did you miss having done that History side at A level, or was it to try to get a different viewpoint on the science work that you'd done?

VG I think it was more that when I was teaching, you realise that things like the electron were only discovered at the end of the 19<sup>th</sup> century, and you were suddenly standing in a classroom going "This was only in the last 100 years", and thinking "Wait, how did we get from not knowing about the atom 100 years ago to now having all the technology and everything?". The photoelectric effect is now a mainstay of the A level course, yet the paper was written in 1905. How? How do these all fit? How does the history fit, was it this-then-this-then-this, or was it something else? And then a friend of mine was intercalating her medical degree to do History of Science, and I thought "That sounds awesome, that's what I want to do!".

MC Do you think that not having a masters was a disadvantage to you in terms of your work?

VG No, but for me, I have a 2:2 in my undergrad, and therefore I felt that that was holding me... not holding me back, especially not in physics, but personally I felt that it didn't reflect my ability and I wanted to do something else, and I wanted to go back into academia. I wanted to do more studying and I wanted to learn more about the subject I was actually teaching. So yeah, that's why I came to do the history of science.

MC So you explain a little bit about what interested you in the course, and why you chose it. Were there any differences between what you expected to find and what the course actually ended up entailing? Were you surprised by any of it?

VG I kind of came in going "I want to learn as much as I possibly can, I want to have as broad a range as I can", and all of this kind of stuff. I think some of the things that did surprise me was just the breadth of what UCL offers in their history of science courses. I did do some STS courses as well, so I did a unit in security and war which really interested me, and I was able to do that although I'm a history and philosophy Masters student. I structured my course decisions to give myself as broad a range of history as I could, so I went from ancient Greeks, early modern, all the way through to nineteenth-century science, and just what I learnt amazed me, and all the knowledge and all the links and all the networks and all the patterns - it's amazing, I loved it. I absolutely loved it.

MC That's fantastic. Are there any specific modules that you can pinpoint where you can say "I wouldn't have expected to have done that but I'm glad that I did"?

VG I wouldn't have expected to have been able to do any of the science, technology and society modules, because they're on a separate stream. Yet the way the course worked I was able - as long as I didn't go over a certain percentage - I was able to pick whatever [I wanted]. So yeah, some other friends of mine did quite a few, I think I only did one, I think I just did the security and war [module] that counted as STS rather than HPS, but the fact that I got to do that was amazing. I absolutely loved it.

MC I think that's one of the things that the department do, we do divide the masters courses into "these are history and philosophy of science modules, these are science, technology and society modules" but whichever degree you choose, you're not prevented from taking any module.

VG Well, we got presented with them in one booklet, and said "Right, choose your modules"! If you're HPS you'd naturally gravitate towards the more historical ones, and if you're doing STS, vice versa. Then there are some that counted as either stream. As far as I know, I don't think anyone in either stream had issues subscribing on the other side, as it were. I think we all, all of us have a mix in some way. A couple of the STS students decided they wanted to improve their philosophy so quite a few did a philosophy course in the second term, and did 19th century science because that fed in really nicely into their understanding of the networks and things in the 20th century, on the more STS side. It was great, the free range of choice.

MC Fantastic. Obviously, we've talked a little about the modules you can choose. Following term one and term two comes the dissertation. So can you talk a little bit about what you decided to do for your dissertation?

VG So, my dissertation is about using Uranus as a commodity in 18th century England, and how it was used. How a major scientific discovery such as a new planet, which was the first of its kind, was then used by society, and how it was kind of amalgamated into society thinking. So I've been looking at how it was used... sorry, how it was cultivated by society for politeness. Alice Walters wrote a paper about politeness in 18th century science, and how astronomy was one of the main things in polite society. I've also looked at 18th century caricature, because the planet was named originally after the King, George III - Georgium Sidus. It then became a reference, or got used as a reference to the king in various ways, and the way it was used changed depending on the public opinion of the King.

MC Interesting. As soon as you say that I start thinking about modern political cartoons...

VG They're all based in the 18<sup>th</sup> Century! 18<sup>th</sup> Century caricature and visual satire tradition is what has shaped our current political cartoons, and England is slightly unique in its... Hogarth and Gilray are unique to us. It's been really interesting, and now I know a lot about 18<sup>th</sup> century politics!

MC Which I'm guessing you didn't expect to know before...

VG No, I had no idea I'd actually end up knowing a lot about the politics during the end of George III's reign! That's not something I ever, ever expected.

MC It's not something one would naturally think of in terms of a "Science" degree.

VG So, in terms of unexpected things, during my time I did an essay on the Hampton Court Clock, the astronomical clock at Hampton Court – so I now know huge amounts about the history of Hampton Court, and astronomical clocks from about the 14th century onwards, because although the

clock was built in... 1543, I think it is? You can't just fix on that, you have to look at the tradition it comes from and all this stuff, and not just in England but around the world. You learn things, like, about Henry VIII's palace Nonsuch, which I didn't really know about. I got to look at 15th century maps, because they have references to Hampton Court. I looked at some of the light travel guides - I can't remember what they're called, the travel guide type book sort of thing. I got to look at some of Elizabeth I's accounts, to see who got paid to do what to the clock. There are very few references.

MC Primary sources!

VG Absolutely. I absolutely love archives now. I've about 6 library cards, if not more! At the same time though, I've been looking at 15<sup>th</sup> and 16<sup>th</sup> century primary sources, but on the STS side I've been into the National Archives to look at documents that have only just been opened from Margaret Thatcher's government, to do with the Chevaline project, which was Britain's nuclear deterrent before Trident. So I've looked at a lot of stuff surrounding that, but some of it... I wrote my essay for that module, it was due at the end of April, and the archive was opened at the end of February this year. So I was one of the first to see some of those papers, which was awesome!

MC OK. Picture this for a second. Imagine that you are a teacher listening to this podcast, trying to decide whether or not to do a masters in this department. What are the things that you think teachers more widely could take from a degree here, whether it's the STS or the HPS side?

VG One of the things I know I will take back into my teaching is being able to situate certain discoveries and also... I'll be able to put them into context more. So, say the discovery of the electron - what was happening around time? Why is it predominantly only men that are mentioned in the history of science? Why did they seem to be the ones that were doing the discoveries? Just reminding them, you know, like all these experiments - why do we do them? Why do we get the kids to do multiple experiments? Yes, it's to build their skills, but it's also because of this tradition of witnessing, which comes from the start of the Royal Society. You couldn't say something happened unless you'd seen it happen and therefore you then became part of that fact. That's kind of carried through. We see it now in teaching, or in the classroom - we get them to do a current experiment to show the graph does actually look like a big S, or whatever, and they're going to go "Why, why?". Well, sometimes you're going to go "Because you're improving your skills", and yes it is, but it's also because it's got that historical element. I think it gives more context to what you're teaching.

To be honest, going back into education yourself as a teacher is a phenomenally enlightening experience, as my poor supervisor has found out, as have lots of my markers. You realise, yes, you're told comments are really really important, and you give loads of comments. When you're getting your own work marked and you get a comment like "this is good", and you think "what does it mean by good? Where on the scale?". Then you realise that you have to quantify it more. It's not ok to put "this is a good piece of work", I either have to make sure the students understand what I mean by... where my reference for "good" is, or I have to be more explanatory, and explain what I mean by "good" and so that has... well, it *will* improve my teaching practice hugely. I've just massively enjoyed it. All these things that you know the ins-and-outs of, like, you know how Copernicus came up with the whole heliocentric system, and all of that stuff, but you don't realise that back in ancient greece they had multiple versions! One of them has a massive fire at the centre that they call the hearth, and then the Earth rotates around that, but between the hearth and the Earth there's another thing that's also orbiting this fire, that's blocking it out. That's a really weird concept, but that's also really neat! How did they come up with these ideas? I think it, possibly, has also helped me understand more how children come up with some of their ideas. It's worth unpacking it more. We are also confined by the curriculum, so we can't go and... like, I wouldn't have been able to go and do actual research on, say, comparative anatomy, for example in the 19th century, and how they looked at likenesses and similar bones. This must be the hip, so that must also be the hip, even though the bone is the wrong length, or whatever. I will never be able to go and discover that, and things like the Crystal Palace dinosaurs. I would never have had time to look that up, necessarily, yet having done this...

MC For those who might not know about it, can you say a little bit about the Crystal Palace dinosaurs?

VG The Crystal Palace dinosaurs are these giant concrete dinosaurs that are in Crystal Palace park, and they were made around the time of the Great exhibition, mid-Victorian times. They are what they thought dinosaurs looked like, in terms of their skin patterns and all this sort of stuff, and it's really interesting, looking at them and seeing what they took as... what they supposed them to look like and how they walked and all that sort of stuff, from their Anatomy they've made, and then looking at what now scientists think they look like, and just seeing the differences. So it shows you, like scientists... it can be a prime example of how theories change with different things that come up, and they weren't necessarily wrong. They had elements that are correct, or what we now feel is correct, but it has changed and there is a reason for the change, and there's a reason why they came up with that, and I think that's what I'm going to put into my teaching.

In order to understand the theory they came up with, you have to understand the thinking in the background for it. Like Newton for example - one of the things you have to understand with Principia and all his major chunk of work, a lot of it was to prove or to evidence God's providence in the world. I didn't understand, I didn't know about until having done this course, and now I can go "Oh, ok!" and then when you read it all, that's a major section of Newton's life that is missed out, or that we don't talk about in Physics education. It was all "Here are Newton's three laws, go and look at the motion, do the force and motion graph".

Part of me now feels I've been really disingenuous to Newton, but at the same time he wasn't necessarily coming at it from a scientific background. He was coming at it from a totally different viewpoint, but we hold him up as a big scientific figure, he's major. I think that's taught me that, looking at these people, they're not all trying to prove 'whatever'. I think it's quite refreshing, that's something I definitely want to take into my classes. To say to students "you might be an artist, or you might consider yourself currently as an artist, but have you thought about looking at your stuff through a microscope?". There aren't clear boundaries, and I think this course has just reaffirmed that for me that these boundaries are massively blurred.

Yes I could have done a teaching Masters and looked at education theory, but I feel that for me, I've enjoyed this so much and I think it will impact more on what I teach - not **how** I teach but **what** I teach, and the emphasis that I put on things, and hopefully kind of scoop up those that are sitting around going 'I want to go back to English, I want to go back to history, I don't want to be in physics, I hate physics'. That's one of the things that I feel I majorly got out of this course, that I'll be able to possibly engage them more in my subject.

MC So because you've gained different insights into, or different ways of looking at the science, hopefully you can then find different ways of teaching science to people who perhaps have different interests?

VG Yes.

MC Fantastic. Well, I wish you the best of luck with that and we may well have to get you back in a couple of years for another interview to see how it's been subsequently with that teaching. That's wonderful, for now, thank you very much for coming in Victoria. This has been another podcast from the Department of Science and Technology Studies at UCL.