

Careers

Light the way

The range of opportunities for physicists at science companies is wider than one might expect, as **Alyssa Armstrong** discovered when she joined a laser research and manufacturing company

When I was an undergraduate, I assumed the only opportunities for physicists in science companies lay in research and development (R&D). In some ways, this misconception actually played a role in my decision to study for a Master's in engineering applications of lasers after I completed my undergraduate physics degree at the University of Liverpool in 2007. Basically, I saw the Master's programme as a way of delaying my entry into R&D – although, of course, I also had an interest in photonics and lasers.

Today, as a laser team manager at the UK's largest laser engineering firm, Laser Quantum, I can look back and see how wrong my early assumptions were. Since I joined the company in 2010, I've held a variety of roles, but never in R&D – although I've often worked closely with colleagues there, for example while transitioning new products out of the development phase and into production. I've also come to understand that research is just one small part of a successful business, and certainly not the only area where people with a physics background can contribute.

As a physics Master's graduate in a scientific company, I am part of a multidisciplinary team that includes graduates from across the science and engineering spectrum. This diversity of perspectives is vital because our lasers shape research in many different areas, including biomedical imaging, DNA sequencing, attosecond physics and microscopy. It is hugely rewarding to be part of such a successful and dynamic group, and I've also honed my physics skills and developed them further through interactions with colleagues.

Career development

Soon after I was hired as a laser engineer, I became part of a team that moved from



Laser Quantum

More than R&D Alyssa Armstrong found a variety of roles suitable for physicists at Laser Quantum.

manufacturing devices individually to manufacturing them in discrete steps, or stages, as on an assembly line. I played a key role in implementing new quality standards and testing methods, both of which significantly improved the efficiency and effectiveness of the manufacturing process. I also worked with the company's Continuous Improvement department on projects to refine and develop individual laser components or stages, making them more streamlined and boosting manufacturing quality. In one such project, I was part of a team that dramatically reduced the laser noise specifications for our largest bioscience customer to improve the performance of their application and give them an advantage in their marketplace.

After three years, I was promoted into a "product lead" position, which meant that I managed a small team of engineers working on a particular line of products. As Laser Quantum is a growing firm, there are always new projects to be part of and employees are encouraged to develop and add to their skills. On the technical side, I (along with many of my colleagues) have worked on lasers of many different wavelengths, all of which require their own design and build processes. Of course, understanding the safety aspects within the lab and of the lasers is imperative. I have also been on two management courses, which helped me move into my current post as laser team manager, where I'm responsible for a production team of 15–20 engineers and for manufacturing more than

1000 lasers per year.

The most important lesson I have learned while working at Laser Quantum is how to manage a team through good communication of objectives, careful planning and leadership by example. I have developed these skills through practice, great support from my own manager and other colleagues within the business, as well as external management training courses. Motivating the whole team to achieve their full potential and keeping on top of growing customer demand are achievements of which I am particularly proud. I'm still developing new skills, thanks to the community in which I work. I also represented the company at Buckingham Palace in 2012 when Laser Quantum won a major industry honour, the Queen's Award for Export, and in 2015 my colleagues voted me employee of the year.

Opportunities abound

Laser Quantum has more than 140 employees, a regular graduate intake and a comprehensive laser training programme. The company's four sites in south Manchester give employees opportunities to move between different technical areas within the business: laser engineering; supply chain management; technical support for customers; and product development and improvement, or R&D. A few of my colleagues have even moved from the technical side into sales and marketing roles – proving there are plenty of opportunities for trained scientists who can communicate ideas and build relationships with custom-

ers and colleagues. Laser Quantum also has three sites overseas (two in Germany and one in the US), and there are often opportunities for visits, secondments or intra-company moves.

If you are a physics graduate who wants to work with lasers or photonics, my tip would be to research companies in your area and find out more about what they offer, as you tend to only hear about the larger firms with graduate training programmes (Laser Quantum takes on placement and internship students during the summer months and regularly recruits new graduates who

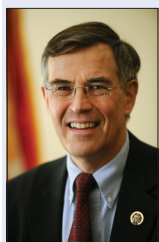
are interested in permanent roles). I would also advise that if you enjoy a particular subject and wish to work in that area, you should seriously think about doing a Master's degree. It is bound to be beneficial, especially since you may be competing against other graduates with Master's degrees when applying for jobs (see "The Master's route", October 2015 pp46–48).

Like many areas in physics, the photonics industry has traditionally been very male dominated, but this is changing and I see more and more women involved in various roles within the company. I'd encourage all

physics graduates to consider applying for roles at a scientific firm, especially those who like a challenge in a technology-led world. Science companies have a lot more to them than initially meets the eye and it is usually a case of applying yourself to the role and moving around the business to find your best path. Certainly, I've found that working at Laser Quantum has enabled me to be innovative and to develop as an employee, a manager and an individual.

Alyssa Armstrong is laser team manager at Laser Quantum, e-mail info@laserquantum.com

Once a physicist: Rush Holt Jr



Rush Holt Jr is the chief executive officer of the American Association for the Advancement of Science, and was a member of the US House of Representatives from 1999 to 2015, representing New Jersey's 12th Congressional District

What got you interested in physics?

I wasn't always the best student, but I was probably the most eager, and that was true about almost every subject. But somehow, science always seemed the most interesting. I remember having a hard time trying to decide what my major subject should be as an undergraduate, but I thought a lab science like physics would be hard to do on my own, whereas maybe I could do some history and literature and philosophy later.

How did you get into plasma physics?

As an undergraduate, I was doing too many things to be a good student – I was involved in student government, sports and theatre – so I didn't go to graduate school right away. Then, after a few years, I began taking some astronomy courses part time just to get going again. I was at New York University, and the only astronomy you can really do in New York City is to study the Sun as a star, so I began looking at the changes in the spectral lines of the Sun from day to day. Later, I tried some numerical and theoretical calculations for a thesis problem, and it just wasn't working out, so I fell back on my observations of spectral lines and turned that into my PhD thesis. But I never accomplished that much in solar physics, and after a couple of intermediate stops, I ended up at Princeton in the plasma-physics lab. Solar physics is a kind of plasma physics, so it was not a radical departure.

You also got involved in science policy.

I've always been interested in how the world works and how people get along, and I never saw any incompatibility between those two

things. An awful lot of scientists do, and for that matter so do an awful lot of politicians, but I didn't. Someone reminded me a few years ago that when I was in middle school, I had my own subscriptions to *Scientific American*, *Science News* and the *Washington Post*, which is the major newspaper of Washington, DC and national politics, so I was going down both paths even then. Later, when I was teaching at Swarthmore College in Pennsylvania, I began holding informal seminars for students to talk about the science-related policy issues of the day. That's probably when I started reading *Science* magazine and joined the American Association for the Advancement of Science (AAAS) – not knowing that 40 years later I would be the chief executive.

Why did you decide to run for office?

The short answer is that it was too important not to. Also, both of my parents had held elective office, and my father had been prominent in national politics. He died when I was still in elementary school, but for decades afterwards I would run into complete strangers who, after hearing my name (I'm named for my father), would say, "Oh, your father helped me in this way" or "Your father meant so much to my family". And I began to realize that, far from being demeaning, politics is actually uplifting. Plus, everybody said, "You can't possibly win in that district," and the more they said that, the more I wanted to prove them wrong.

What skills are required to succeed in politics?

It helps if you can think your way through complicated problems and express yourself well, in writing and orally, and those are skills that scientists should have too. Also, in politics, you have to like people, and part of that means you have to be willing to overlook some of their faults and frailties. Otherwise you would quickly become, not just discouraged, but really cynical. And you have to have stamina: serving in office was intellectually every bit as hard as science; it was psychologically much harder; and it was physically harder. You're on the go all the time,

with not a lot of rest, and you also have – well, in any business you have competitors, but in politics you have people who are trying to undo you. You need a pretty strong psyche to bear up under that.

Did your physics training help you in office?

In a general way, it came in handy all the time, because it helped to be able to analyse complicated problems and figure out the critical path in a process. But as far as actually solving a physics problem or putting my knowledge of a physical process to use in policy – no, not much.

What do you hope to achieve as CEO of the AAAS?

I think we need to do the things we have traditionally done, but do them as forcefully as modern problems require. Training scientists to communicate with the public is one example – there's a big need there and we've got to do that better. Another area we have to work on is in bringing diversity to the practice of science. Changing the "face of science" from old white men is something that must be done, not just if science is going to thrive, but if it is going to survive. Finally, there are important policy issues where what we have to say counts.

Such as?

Climate change. Public health. Transportation. Environment. We should be able to speak out with the authority of hundreds of thousands, and I think if we are more outspoken we will gain more members, because people will understand that we're a force for science.

Any advice for today's physics undergraduates?

Work on your communication. There's no such thing as being too good a communicator and most people don't come even close. Also, remember that, as a citizen and as a human being, you have a responsibility to apply your skills to the benefit of others. If you're studying science, you're probably somewhat privileged, so that gives you a slightly bigger obligation to do something with it.