Medical Research

'A job as a research scientist?'

Beyond becoming a doctor or a science teacher, what jobs can you do if you are interested in science?

Our speaker, a research group leader at the Edinburgh Cancer Research Centre (just around the corner) will briefly describe what he does, day-to-day and how he made the journey from school to scientist.

He will explain what 'bioinformatics' is, why analysis of big data is important in cancer research and how there are many diverse and exciting career paths in scientific research. Questions encouraged.

Speaker's Career Path:

How do you go from school to scientist?

As a pupil, I was always asking "why" and searching for answers. I realised science offers lots of different opportunities for jobs as diverse as naturalist to astronaut. Science involves observation, measurement and communication to collect evidence and to create answers.

While still at school, I was given work experience in the diagnostics labs of a local hospital - looking at patient samples and testing them. This gave me my first real insight into science. I took a degree in Biological Sciences, and by my third year, had become interested in microbiology. My final year project was growing antarctic bacteria in a giant freezer and learning how to extract the enzymes from them (used in washing powders etc).

I worked for the British Antarctic Society as a field scientist, and then moved into a more clinical area, working in a Cambridge hospital on routine testing, for example testing that prescribed antivirals were still working for patients. This gave me first-hand experience of how science affects people's lives.

I studied for a PHD in Biotechnology in Manchester and focused on growing proteins for the Biotech industry, and discovering more efficient ways of getting proteins out of cells. I become an expert on this, by conducting a focused study for his PHD.

I went on to spend 6 months in California working with a Biotech company, generating data and analysing it.

I changed direction to studying breast cancer and studied a post-doctorate. I was interested in the risk factors - examining the data of genetic backgrounds to learn more.

Medical Research

Roles in Research:

The cycle of research involves many people with different roles: clinicians, pathologists, computer scientists (informatics), and lab technicians.

Patient samples and data analysis allow you to learn from current practice and then introduce new drugs and models.

Computers in Research:

The cost of sequencing the human genome was 3 billion dollars and it took 13 years to complete. Now, due to the increase in the speed and memory ability of computers, it costs only 1000 dollars and takes only 20 hours.

Bioinformatics are the interface between Biology and Computing and are used to understand the raw data generated through experiments. Using principal component analysis, the similarities and the differences are studied.

With the use of data, you don't need prior knowledge to find answers.

Breast Cancer Research:

The gene, the different cell lines and clinical samples are compared to establish a patient's response to a drug. With each drug, there are patients for whom it works and those for whom it doesn't work - responders and non-responders.

I conducted a study into the diet of women with a genetic predisposition to breast cancer to see if there were changes at a cellular level. I used a control group who stayed with their normal eating regime. This study used data to establish that poor diet can be linked to an increase in the breast cancer risk for these women.

My approach is data exploration and the collation of information.

Data scientists are generating new data and now combining it with publically available data to test their hypothesis.

In a recent study, 60 - 80% of women responded to endocrine treatment. From this, I could identify the non-responders. Samples are taken before treatment, and previously there would have been a wait of 3 months to see if the tumours would shrink or grow. Now, I and my team have created a predictor which is 96% accurate and can measure the potential effectiveness of the drug on a patient at 2 weeks, thereby enabling a non-responder to be given other options earlier. IGMM shared this data with the Royal Marsden, who applied it to their samples and found a 91% accuracy rate.

It is now possible to escalate the treatment for those patients who need it.

Medical Research

Secondary Cancer:

Data sets of different studies show specific differences over time. We are combining data sets to understand the diversity of cancer. Using 17 studies, we have been able to isolate a new subtype of breast cancer which only applies to 3% of tumours.

Making Progress:

With greater life expectancy, more people are getting cancer, as age is a risk factor. However, the survival rate of living more than 10 years after diagnosis has doubled.

Funding:

My job entails writing and reviewing grants, writing papers and detailed research proposals. This is necessary to obtain funding for our projects.

I also give advice and feedback to others by:

- Writing/reviewing papers
- Presenting work (opportunities to travel)
- Writing reports and sending emails
- Discussing results

Positives and Negatives:

+

- Challenging
- Variable
- Interesting
- Flexible (I work 4 days so I can spend time with my children)
- Teamwork

-

- It can be frustrating
- You have to be self-motivated

If you want to be a scientist…

Go to the science festival, read books, do work experience, talk to people in the industry, be proactive, be passionate and enthusiastic.

Medical Research

Job Opportunities:

In data science, there is a massive shortage of people with the skills to analyse data. There will be an increasing demand for people with these skills, and for scientists to create the data.

Work Experience - IGMM rep:

Work experience: **Science Insight** - a week in Biomedical Science is available to S5 students in July. 150 researchers support it. You will shadow them in a lab and discuss ethics. **Nuffield placements** are available in summer 2019, (a Broughton pupil got a placement at the Roslin Institute this year).

29 Sept is the IGMM Open Day (as part of Open Doors) from 10 - 5pm.

September 2018