Beyond astronomy...

Dr Annabel Cartwright
Cardiff University,
School of Physics and Astronomy

Where will you be in ten years ?

- Look at statistics, how many of you will end up working in astronomy/academia.
- Consider what you are looking for in a career.
- What options are out there? Some case studies.
- What you should be getting out of your PhD

STFC / RAS figures

- In 2011 RAS polled all Universities to find out how many permanent academic staff and students were working in the UK, in astronomy, solar system science, and geophysics. *(The demographics and research interests of the Astronomy and Geophysics Communities 2010, RAS)*

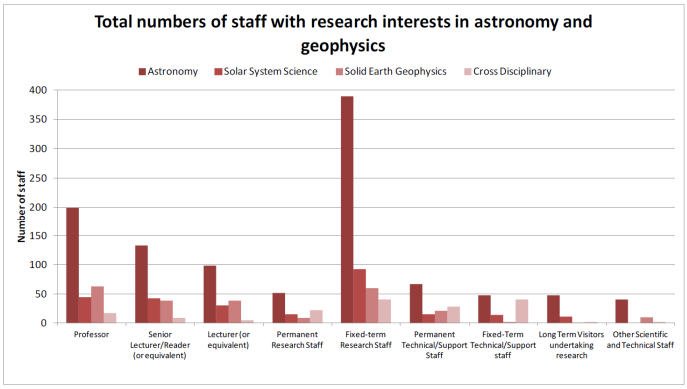


Figure 1: Total number of staff in post with research interests in Astronomy, Solar System Science and/or Solid Earth Geophysics

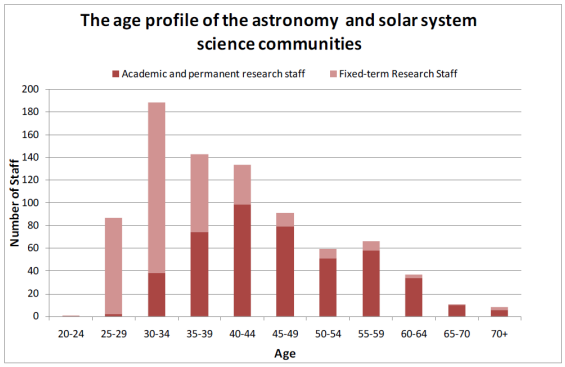


Figure 4: The age profiles of fixed-term and permanent staff in astronomy and solar system science

Table 7: Research students and permanent academic staff in universities in Astronomy, Solar System Science and/or Solid Earth Geophysics

Research area	Number of research students	Number of academic staff	Ratio of research students to academic staff
Astronomy	851	431	2.0
Solar System Science	149	117.2	1.3
Solid Earth Geophysics	167	140	1.2
Cross Disciplinary	37	30.8	1.2
Total	**1208**	**628**	**1.9**

Current figures from STFC : 435 astronomy PhD and 360 PDRA .

- Each member of staff will have many PhD students over their lifetimes.
- But will only retire once.
- A PhD is a necessary but NOT a sufficient condition to obtain a job in academia.

SO what are you looking for in a career?

- What are your top 3 considerations?
- Please discuss with your immediate neighbours.

Some case studies, real former students/staff from Cardiff…

Professions…

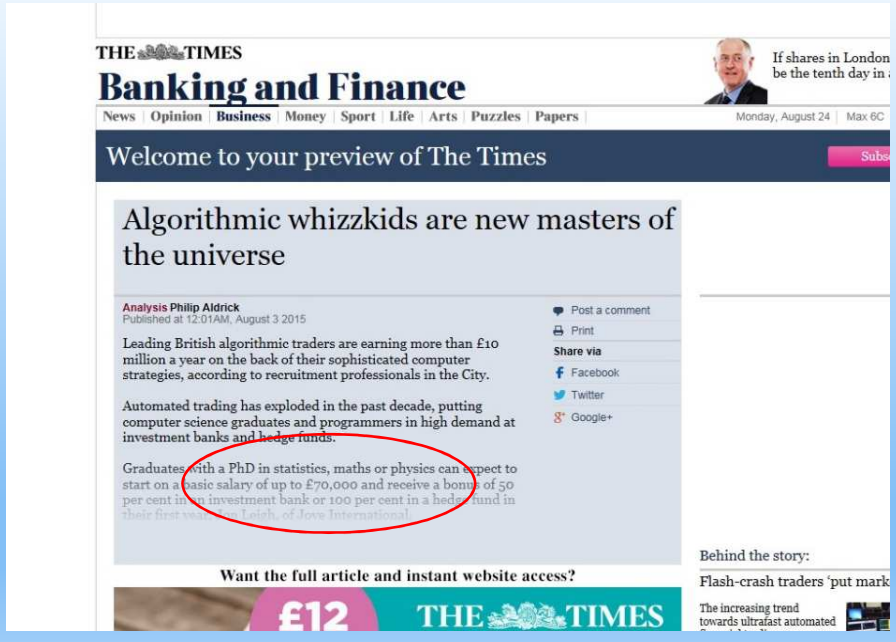
Dr Owen Davies,Deutsche Bank

- For the last three years I have lived in London, and I currently work for an investment bank. My PhD background has certainly helped me: attention to detail, problem solving, and an analytical approach are invaluable in my job. In my current role I am an Assistant Vice-President, running a team of 15 people. We provide banking services to hedge funds that are large investors in the financial markets. Our clients can be very demanding and we have to adapt quickly and find solutions to fit their needs. I enjoy the fast-paced nature of my work, and the challenges change daily. In the future I plan to widen my knowledge of financial products, and explore other areas of finance

Mark on your sheet

- Banks
- Hedge Funds,
- Actuaries,
- Accountancy companies
- Stockbrokers
  - What do they want?
    - NUMERACY, IT, FAMILIARITY WITH COMPLEXITY, BIG DATA EXPERIENCE
- http://www.thetimes.co.uk/tto/business/industries/banking/article4515374.ece

Deepak Baskaran,
Quantitative Analyst, Credit Suisse



THE TIMES

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Monday, August 24 | Max 6C

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Subs

Algorithmic whizzkids are new masters of the universe

Analysis Philip Aldrick
Published at 12:01AM, August 3 2015

Leading British algorithmic traders are earning more than £10 million a year on the back of their sophisticated computer strategies, according to recruitment professionals in the City.

Automated trading has exploded in the past decade, putting computer science graduates and programmers in high demand at investment banks and hedge funds.

Graduates with a PhD in statistics, maths or physics can expect to start on a basic salary of up to £70,000 and receive a bonus of 50 per cent in an investment bank or 100 per cent in a hedge fund in their first year, Ian Leigh, of Jove International

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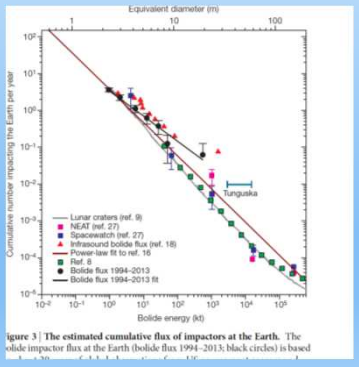
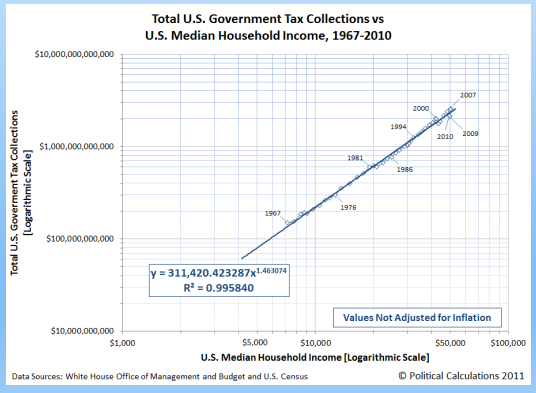
Plus-

- Many economics/ banking phenomena can be modelled using physical analogs
- Eg power laws.





Patent Attorney

- Dr Berengere Parise, Patent Examiner, European Patent Office, Munich.
- Had a job in Cardiff but family was split between two countries.

- "As a patent examiner, I am evaluating patent applications in the field of optics and measurement of light characteristics (spectroscopy, wavefront sensing, interferometry, etc., are typical topics I deal with on a daily basis). In evaluating a patent application, one has to search for the most relevant prior art (using patent databases, search engines, google, etc.), and evaluate if the invention is new and inventive in view of this prior art, and therefore entitled to delivery of a patent.

  So the most important skills I use is my Physics basic knowledge (for understanding the physics behind the inventions and be able to assess the inventivity), some of my experience with astronomy instruments, as well as the "investigative" skills that one develops during research. Because I work at the European Patent Office, I also use language skills that I developed in the course of my academics career: we are required to speak English, German and French.

  A related (but different) job is that of patent attorney, who drafts with his client the patent applications that I am reviewing. As an examiner, I get to interact with attorneys. I believe that becoming a patent attorney is also another very relevant job perspective for astronomers, as it requires a deep understanding of physics (for drafting the patent application and defending it in front of the patent office).

- About the pros and cons of my job compared to astronomy:

  - It is a job a 8:00-17:00 job (with some flexibility), almost exclusively behind a computer, dealing with applications and dossiers. So it is not a project-based job with adrenaline and overhours peaks, but a work on dossiers. This can be seen either as a pro or a con: on the plus side, one gets a dossier done within a few days, and then it's really done/gone. For people not interested in projects spanning over years and years, this is quite nice. On the minus side, it has no hands-on aspect, and can of course become boring. But I haven't reached that point yet, because I am very much interested by the technical aspects of the inventions, and I still learn a lot. I appreciate very much the broad range of inventions I get to review, in comparison to the very specialized and narrow field that a researcher deals with in practice.

  - Compared to astronomy, it does not involve regular traveling (observing, conferences, collaborations, ...), and therefore is much more family-friendly than research.

  - It's a job that is finished when you exit your office in the evening: no late-checking email, no proposal deadline to meet by working over hours, no funding proposals to write in the middle of your holidays, no experiment or observations to attend to during the night. Although I liked the thrill of research, I very much value having now more space for developing a private life.

  - It involves much less personal interaction with people than research/teaching. Depending on one's personality, it can be either a pro or a con.

- What were they looking for?
  - Specific expertise in chemistry/physics/optics
  - Advanced technical writing skills
  - Languages

Mark on your sheet

Government…

GCHQ

INTELLECTUAL PROPERTY OFFICE

HM Revenue & Customs

Met Office

DWP Department for Work and Pensions

national STATISTICS

MINISTRY OF DEFENCE

AWE

PhD gave the experience of working on a large piece of work, a real sense of achievement

Dr Piers Horner,
Fast Stream Civil Service

What do you do?

- Put together policy on complex issues
- Background research, White Papers, Bill Teams
- Brief Ministers on visits, speeches, meetings, summits
- Very structured Career, lots of high level training, moved on every couple of years.
- Move about between departments, can have international postings eg Brussels.

Mark on your sheet

- What were they looking for?
  - Big brain
  - Quick on the uptake- you move around from job to job, have to pick up new material
  - Excellent communication both written/verbal
  - Numeracy
  - May use science skills in the future, big advantage as more posts open to science specialists

Operational Research

"….A recent project has been around looking at the impact of increasing the state pension age to 66.

My degree from Cardiff not only ensured I passed the entry requirements needed to get through the graduate recruitment process, but gave me the analytical skills and problem structuring skills I use on a day-to-day basis.

A big part of the job is to turn messy, unstructured problems into analytical problems that can be solved using computer modelling and simulation, a skill which forms part of many of the modules I took as an undergraduate…"

Dr Melanie Bowden, Dept Work and Pensions

Industry…

Dr Hannah Loebl,EDF

Robbie Auld

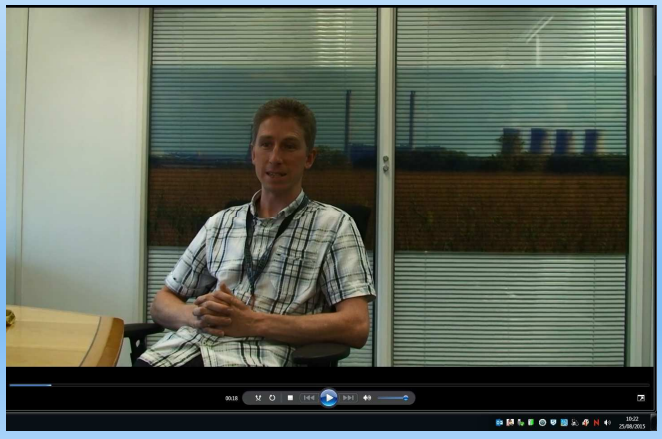
- Quantitative analyst at EDF
- Discuss handout with your neighbours.

Robbie, key points

- He mentions how some of his skills came from the UNDERGRADUATE TEACHING he did;
- He admits that there were courses available but he did not do them .
- Also, note comments on how hard the on-line tests can be. Don't assume they will be easy!
- It is up to YOU to look for opportunities to build your CV...

Dave Nutter

- Data Steward, EDF



NOTE

- Importance of professional standards in coding and handling of large data
  - Proper documentation
  - Structure
  - Version/release control
  - Backup
  - Testing regimes
- You should be able to talk about all this and have evidence of applying professional standards.

Computer games, animation…

Gwen Raymond. See her advice on getting into the industry on https://www.youtube.com/watch?v=OX-3-RPY4B4&feature=youtu.be

- http://gwenraymond.com/
- http://www.mediatonicgames.com/
- - https://www.youtube.com/watch?v=uj3-VkbRSKQ
- Total War: Rome 2 - https://www.youtube.com/watch?v=kTDBj_YxrfY
- Total War: Attila - https://www.youtube.com/watch?v=h9xmbMLyMuo

- What were they looking for?
  - Computer skills.
  - Specialist interest which she could demonstrate, had built up while doing her PhD. Mark on your sheet

Software : Lucy Wilcock

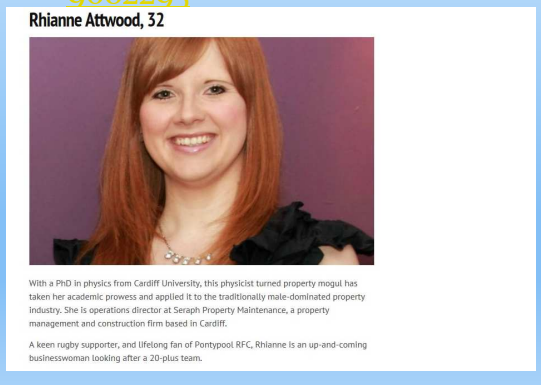
- I write software for a wireless lighting system called EyeNut. This is used primarily in office and businesses. The user uses a user interface to control their lighting, this can be done through schedules (certain groups of lights turn on/off/to a given level at a certain time on certain days), through sensors and switches or through the interface itself. I work as one member of a small team who write the front and back end of the user interface for a wireless lighting system (EyeNut). This is done primarily in Java but also in xhtml, javascript, css and little bits of groovy...

- Skills- Aside from the obvious in that I did some basic programming as part of my phd, software engineering is basically a lot of analysis and problem solving - something which I did a lot of in my phd. Using the information you have to figure out a bug or finding the best and most efficient way to introduce new features is all logical thinking. I've also found that I'm better able to effectively articulate and argue an opinion since my phd, both written and verbally. I'm also much more comfortable with public speaking than I was previously.
- Pros/cons:
- My working hours are more restricted now than previously, although I do have fairly flexible workings hours it is required I be in the office 10-4 everyday, as long as you work your required hours. I also don't get as many holidays and the job doesn't involve as much travel. There isn't as much freedom in what you can do - you are given an assignment and you are expected to complete it within a given deadline and to a given spec - I will say however that I prefer the more structured environment. I do find that there is less pressure to work long hours, nobody takes work home. As everybody is working on the same problems I feel more supported by my team and manager than I did in academia. There is also much more stability, I've been on a permanent contract in both jobs since leaving academia. I've been able to settle and buy a house. I still learn new skills all the time, the pay is good and I'm sufficiently challenged intellectually - I don't often get bored. There are also a lot of job opportunities around at the moment, especially for java developers, you can live pretty much wherever you want and you can find a job.

Mark on your sheet

Business in general

- http://www.walesonline.co.uk/business/business-news/top-young-business-professional-women-9602295



Rhianne Attwood, 32

With a PhD in physics from Cardiff University, this physicist turned property mogul has taken her academic prowess and applied it to the traditionally male-dominated property industry. She is operations director at Seraph Property Maintenance, a property management and construction firm based in Cardiff.

A keen rugby supporter, and lifelong fan of Pontypool RFC, Rhianne is an up-and-coming businesswoman looking after a 20-plus team.

Listed as one of the top 35 young business and professional women under 35 in Wales, 2015

Science careers-

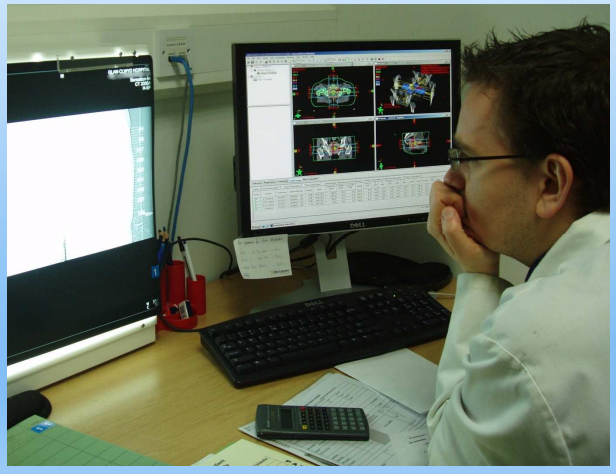
- Do they have to be in Universities?
- Any other suggestions?

Research OUTSIDE Universities….

Dr Emma Robinson, Institute for Hydrographic Research Mark on your sheet

- Very similar to university research, but no teaching, not the same promotion structure etc
- Other possibilities eg Met Office, RAL, etc

Medical physics



Aled Parry

- Highly competitive MSc, usual route
- Uses same physics as eg radiation transfer in interstellar medium!
- Lots of physics, opportunities to do research, very person-facing

Mark on your sheet

Teaching

Rhian Chard

teaching

"I'm doing really well. I finished my teacher training and have a job as the physics and chemistry lecturer at the new Rhyl sixth form. I'm also the technician there, so very busy! I love the job and have some fantastic students and colleagues....

Dr David Porter

- LOTS more routes into this than simply a PGCE.
- Can do on the job training in a school
- Very generous bursaries to do teacher training, and then rapid promotion once you are employed.
- VERY flexible career, well paid, very mobile.

Mark on your sheet

astronomy

Rhys Taylor

- Work hard at your PhD, aim to produce several papers.
- Attend conferences and network.
- Make the most of your Teaching/Demonstrating opportunities. This is where you can demonstrate communication, teamwork, innovation.
- Sign up for all the training you can, and help to run things (eg conferences)

- Look for opportunities to specialise/stand out, eg
  - Duncan Forgan, Edinburgh, published a paper on updated Drake Equation estimates of life elsewhere in the Galaxy. Was picked up internationally;
  - Robert Simpson, while at Cardiff, specialised in e-science, now running Zooniverse etc at Oxford;
  - Me, volunteered to be the Careers Officer, started tracking down alumni etc

Then- brace yourself for Postdoc life

- Must do several postdocs
- Find out about FELLOWSHIPS. Ask for advice and help applying.
- To repeat, nobody will do this for you. Unlike any other career, you are not being managed and groomed for promotion.

Life as an academic ?

- Pros and Cons.

Mark on your sheet

- Any questions?