

SKY HIGH & DOWN TO EARTH

Careers and transferable skills in Astronomy and Geophysics

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INTRODUCTION

Astronomers use scientific techniques to study the origin and make-up of stars, planets, galaxies and other celestial bodies, as well as the origin and structure of the Universe in general.

Geophysicists apply physics concepts and techniques to study the gravitational, magnetic and electric fields of the Earth and further our knowledge of both the planet's interior and surface.

If you like the sound of astronomy and geophysics but you aren't sure what careers are out there, or what skills you could gain by studying these subjects, this guide is for you!

In this booklet you will find information about astronomy and geophysics careers, profiles of people who have studied these subjects and gone on to success in various sectors, and useful links that might help you pursue your dream job.

In the future you might move away from being a professional astronomer or geophysicist, but the training in scientific, mathematical and computing techniques will make a sound foundation for many different jobs, and a solid physics degree can lead to the widest range of career options. Exciting new fields include renewable energy sources and astrobiology.

When you think of space, your first thought might be of NASA, but the UK has a space agency and is a global leader in the space industry. The number of jobs is growing by 8-10% per year, and it is expected that there will be an additional 100,000 jobs in the space industry by 2030. Already the space industry brings in £14 billion to the UK every year.

WHAT IS THE RAS?

The Royal Astronomical Society (RAS) is a learned society, charity and membership organisation formed in 1820. Based in the UK, the RAS comprises members from across the world.

The purpose of the RAS is to encourage and promote the study of astronomy, solar system science, geophysics and closely related branches of science.

The RAS motto is:

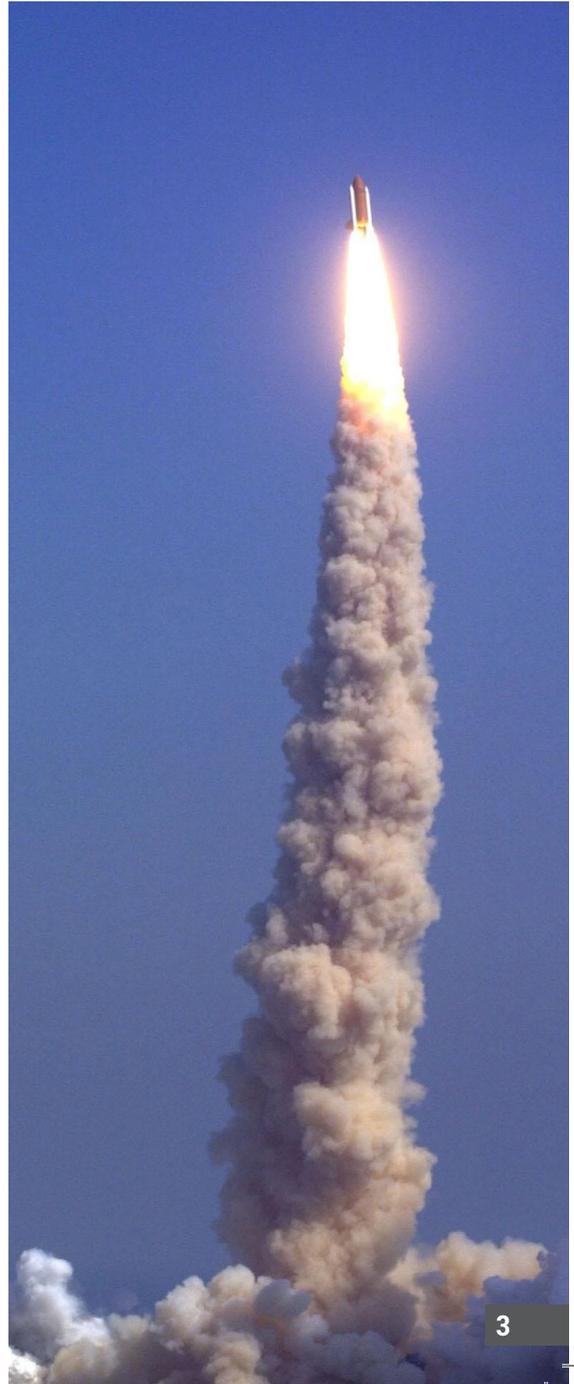
"Quicquid nitet notandum"

*"Whatever shines
should be noted down"*

William Herschel was the first president in 1820, and his sister Caroline Herschel was the first woman to win an RAS Gold Medal in 1828. William's 40-foot telescope, which Caroline helped to make, makes up part of the logo.

THE RAS:

- Organises scientific meetings in Burlington House, the London HQ, and throughout the country
- Publishes international research and review journals
- Recognises outstanding achievements by the award of medals and prizes
- Maintains an extensive library and archives
- Supports education through grants and outreach activities
- Represents UK astronomy and geophysics, nationally and internationally



WHAT DO YOU NEED TO HAVE A CAREER IN ASTRONOMY OR GEOPHYSICS?

Some advice from people who have been there and done it!

"Do what you enjoy and work hard at it. Use exciting things to spur you on (it could be anything from the thought of going into space or exploring the interior of the Earth). Be proactive as you never know what amazing opportunities might come your way!"

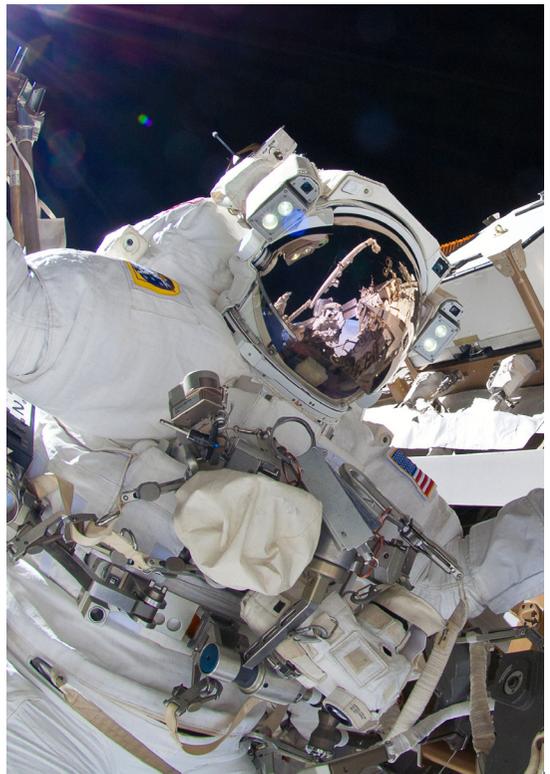
"Get a solid degree in something like Physics (with options such as Astrophysics), Geology or Maths."

"When you have finished your degree you may decide that you want to study for a PhD or use your degree directly in a different area (e.g. science communication) or apply your skills to a different discipline entirely (e.g. in the finance sector). Whatever you decide, it is OK! You should make the best choices for you, and don't let anyone tell you otherwise."

"Join an amateur astronomy society to be able to speak to other people that share your love of the subject and get some observing experience too."

"Get some work experience in a university or go to a summer school like Space School UK or Space Camp USA!"

Have a look at the jobs Word Cloud and all the case studies to see what incredible opportunities there are in astronomy and geophysics. What takes your fancy? You might be surprised at the range of amazing careers available to you.



Skills you might need (or gain) with an astronomy or geophysics related career:

- scientific and technical skills
- good powers of observation and attention to detail
- a methodical and logical approach to work
- the ability to analyse problems, work with abstract ideas and do calculations
- the ability to produce scientific reports for publication and present your research findings
- strong computing skills – you may be expected to use and write computer codes
- the ability to work with statistical and graphical information

What you might do

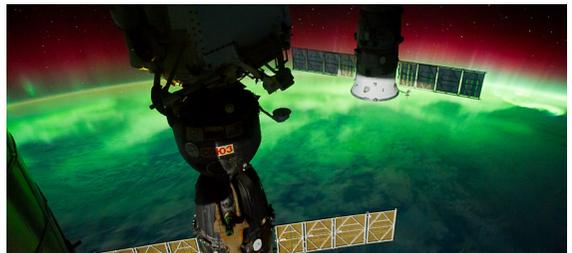
- conduct research in the field and in laboratories
- make observations or collect data in situ or from satellites and spacecraft
- use equipment such as telescopes, seismographs, aerial imagery or drills
- develop new instrumentation and maintain existing equipment
- develop software to interpret data
- analyse data and test theories
- use theories to develop and test new predictions
- help deepen our understanding of the Earth and space
- create computer models to develop theories about physical processes
- study volcanic and seismic activity to develop early warning systems for communities living close to earthquake zones
- search for energy resources and minerals, like gas and oil
- develop next-generation renewables or clean energy sources
- present and discuss your findings at international meetings and conferences with world experts
- build a satellite and launch it into space

WHERE YOU MIGHT WORK

Careers relating to astronomy and geophysics can lead you to work in interesting locations across the UK and all over the world!

You might work:

- In the field
- In museums
- In a field!
- In planetaria
- In laboratories
- In universities
- In observatories
- Under the sea



CAREER PROGRESSION AS A PROFESSIONAL SCIENTIST

- A post-doctoral position in a university or research institution after your PhD. This is typically a short-term position lasting between one and three years, where you carry out research in your chosen area. Most astronomers and geophysicists who go on to permanent positions in academia do two or three post-docs first.
- Once you have been a post-doc for some years, you might start to look for a permanent position in a university department, national facility, or government research centre. These positions are quite rare, and many people choose to explore the other possible exciting careers outside of academic research.
- Other closely related careers exist in areas such as aerospace, satellite research and development or the geophysics industry, or you could progress towards a consultant's position or move into teaching or management. You could also use your skills in systems analysis, software engineering, the finance sector, scientific journalism or accountancy.

Salary:

£14000 as a PhD student (tax free) up to salaries like £75000 as a professor, on average per year, depending on level and experience. If you are in industry, or in careers related to astronomy and geophysics but not in academia, the salaries can vary widely.

Hours:

Flexible, variable, including national and international travel.

However, an academic career is just one potential path. There are many other interesting careers in astronomy and geophysics in different industries.

If the academic route isn't for you, there are other paths to working in an astronomy or geophysics related career, such as doing an apprenticeship or following an industry based route. Have a look at the 'Useful links and what's next' section for more information about industry routes and apprenticeships like Space Engineering.

You could also move into an astronomy or geophysics related career if you have a background in computer science, maths, chemistry, biology, engineering etc. and you can move out of academia into a related career if you have the right qualifications too!

CHECK OUT THE CASE STUDIES FOR MORE INSPIRATION...

SHERELL SALMON



My job

I volunteer at the Royal Astronomical Society where I occasionally write blogs about diversity in astronomy and geophysics on the Astronomy and Geophysics website (www.aandg.org). Topics range from the history of women in astronomy to an account of an event that was particularly diverse.

I also help with presentations and travel to primary/secondary schools around London on an ad hoc basis encouraging young people to get involved in STEM. I'm starting a Masters in Astrophysics in 2017.

The best of my job

The best part of my job is being able to combine my two favourite things: writing and astrophysics! I also enjoy school visits, especially primary school visits, as watching the pupils' faces light up as they learn something new is just inspirational and it reminds me of the first time I learnt about astronomy.

The worst of my job

As of yet I am not too sure what is the worst of my job; nothing comes to mind!

BTW!

I have borderline personality disorder (BPD) so when I'm not at the RAS, I'm either at groups and appointments getting support on managing my mental health or having an episode. Episodes make me incapable of doing anything so I usually end up hiding from the world until I feel more stable. Having BPD or any other type of mental illness is hard at times as I feel I have to prove that I am capable of maintaining a normal life to fit in in the world and achieve my dreams when most of the time I don't feel I can. I am my own worst enemy, I put myself down and tell myself that I am not good enough and when people give me praise I don't believe them. I was diagnosed with selective mutism when I was 3 and throughout life I have had mental health support.

At secondary school my physics teacher was my rock - he supported me to achieve my dreams, even when I was ready to give up. I feel it is because of him I have got to this point so far.

My ethnicity has never been an issue for me getting where I want to be. I am Black-British Caribbean and I grew up in a predominantly white area. Race was never a thought in my mind as no one acknowledged it.

I considered myself to be a geek; I collect graphic novels, retro games and DVDs/Blu-rays. My DVD/Blu-ray collection means everything to me; I own over 1800 DVDs and 200 Blu-rays – most are horror films but I do collect a wide genre.

Recently I have developed an obsession with concerts and festivals and go and see live music whenever I can...including Ed Sheeran, Adele, Linkin Park, Evanescence... I used to be scared to attend events like these but now most events are accessible for people with mental health issues. For example I am always able to get an aisle seat so I'm not in the crowd and can easily escape, and I get a free companion ticket.

How did astrophysics/geophysics inspire me to get to where I am today?

I remember the first time I learnt about astronomy at the age of 8, the class was sitting on the carpet being taught about the solar system. It captured my imagination so much so that I went home, got my typewriter out and wrote a book about the solar system. When I started secondary school my physics teacher noticed my passion for astronomy and he selected me to be put in the 'gifted and talented' group, where the school paid for me to attend Space School at the University of Kent every year from the age of 12 to 18 during the summer holidays. During my studies at the University of Kent I devised and prepared outreach resources, which made me realise how important it is to encourage students of all ages to get involved in STEM.

What transferable skills have astronomy/geophysics given me?

The ability to work independently or in a team, time management, problem solving, reliability, listening and organisational skills, how to effectively present my work. I believe that I am able to often take the initiative, I have strong research skills and the ability to communicate effectively on paper as well as through presentations.

Bullet point CV

- **(1999 – 2006)** Cator Park School for Girls
- **Year 10 Work Experience 2003**
Royal Observatory Greenwich
- **GCSEs (2004)**
English – B,
Mathematics – A, Physics – A,
Biology – A, Chemistry – B, History – C,
German – D, P.E – B, R.E – D,
Graphics Design – A
- **A Levels (2004 – 2006)**
Physics – B, Biology – C,
Mathematics – B
- **Orpington College (2006 – 2008)**
BTEC Sports & Exercise Science
- **The University of Kent (2008 – 2012)**
Foundation Physics year 0 (2008-2009)
BSc (Hons) Astronomy, Space Science,
and Astrophysics (grade 2:1) (2009-2012)
- **February 2015 – August 2015:**
Royal Astronomical Society (Voluntary)
- **February 2017 – Present:**
Royal Astronomical Society (Voluntary)

SAM LINDSAY



My job

Government data scientist – adding new tools and techniques, scientific methodology and sophisticated data visualisation to improve existing data analysis and decision making in government.

The best of my job

Coming from an academic background, I like being around a team with a very similar academic ethos of continuous learning and development. Many of my team also have PhDs (in Physics, Biology, Geology etc.), while others have worked their way through the civil service career path as statisticians or operational researchers, but everyone is actively encouraged to learn interesting new techniques and tools from each other and from outside.

The worst of my job

There can be a lot of jumping through hoops in order to get anything done in the civil service, usually to do with communicating between different teams of people with different ways of working and priorities, or to do with the sensitive nature of the data being used and negotiating the red tape required to gain access to what you need. Also, being new to the job and to the team, it can be difficult to get up to speed, because there isn't the luxury of a lengthy, structured and formal training process in such a broad field as data science, so, much like embarking on a PhD, it can be daunting. (Also, radio galaxies will always be incredibly interesting to me!)

BTW!

My GCSE Physics teacher said at a parents evening (with me right there with them) that I “obviously had no interest in the subject” but that “if I really put my mind to it, I could get an A”. This baffled me as it was one of my best subjects, I was doing it for A-level, and I got an A* in the mock exam the following week. 10+ years later, as I was finishing my PhD, I confess to thinking about shoving it in that teacher's face.

Neither of my parents went to university, so after my older sister's BA in Hispanic Studies, I was the first in the family to get a Masters degree and a PhD. However, I did once overhear my mum telling my granny about my astrology PhD (not the same as an 'astronomy' PhD!) so I'm not sure my family have ever really known what I do. I've got no chance explaining what a “data scientist” is!

Believe it or not, I don't actually like to spend my free time buried in books or staring at a computer screen. Through GCSEs, A-levels and into uni, I blew off steam playing drums in a punk/metal band called The Outer Limits, and then for most of my university life I was a competitive rower, training up to 12 times per week, starting at 6am some mornings before lectures. I even worked evenings and weekends as a personal trainer at my local gym. These days, I quite like my down time, but I still play rugby week in, week out, which doesn't require quite the same dedication as rowing but keeps me active and helps shake off the geeky stereotype!

How did astrophysics/geophysics inspire me to get to where I am today?

I always liked maths/science/engineering. Theoretical Physics was the best combination with the "coolest" subjects, before leading me towards cosmology, and radio astronomy as a PhD. As for many science PhDs, I found a happy compromise between my scientific nature and skill-set, and a more "standard" career path, by becoming a data scientist.

What transferable skills have astronomy/geophysics given me?

Computer programming! Even as an undergraduate, I deliberately avoided non-compulsory programming modules, and scraped through by copying friends. Without the motivation of the various pieces of work required over the course of my PhD, I never would have forced myself to learn more languages and more techniques. Now, I wish I could go back and embrace any opportunity to learn more as a student, because it is a useful skill in any technical/analytical profession.

Estimation and problem solving – Astronomy, perhaps more than other areas of physics and the sciences, can often be performed in "back of an envelope" calculations.

Having the confidence to break down a problem into a series of simple parts, and being able to estimate each of them is a powerful skill to have in any area of life, whether it's working out the size of the observable universe, or how many tins of paint you need to do two coats of your living room.

Bullet point CV

- **10 GCSEs:**
6 A* (incl. French and Spanish), 4 As
- **4 A Levels:**
Maths (A), Further Maths (A), Physics (A), Chemistry (B)
- **MSci Physics with Theoretical Physics (2:1) from Imperial College London**
MSci project title: 'Theory and Simulation of Large-Scale Dark Matter Structure Formation'
- **PhD Astronomy from University of Hertfordshire**
Thesis title: 'Tracing Large-Scale Structure with Radio Sources'
- **Post-doctoral Research Assistant at University of Oxford (1 year)**
- **Assistant Editor and Deputy Press Officer at Royal Astronomical Society (2 years)**
- **Data Scientist at Ministry of Justice (April 2017 – Present)**

ROSIE JOHNSON



My job

I study Jupiter's northern lights using infrared observations taken with the Very Large Telescope (Chile) and the NASA Infrared telescope (Hawaii).

The best of my job

I'm not going to lie, travelling to new places and meeting new people from all around the world is definitely my favourite part of my PhD! I've been lucky enough to visit places like Hawaii and Uppsala, Sweden to do research and use telescopes!

I go to Hawaii to use the NASA Infrared Telescope Facility (IRTF) regularly. I'm very proud to have had my telescope proposals accepted by IRTF and then travelled to Hawaii as the Principal Investigator of an observing run!

The worst of my job

Doing a PhD can definitely be hard work,

not only understanding the physics and your data sets but it's mentally taxing trying to motivate yourself. Sometimes it can be overwhelming but you get good at prioritising important tasks. I think having shorter term deadlines of writing papers or finishing work before presenting at a conference really helps rather than having one big daunting deadline: the thesis hand in!

BTW!

I feel lucky because no one has outright said to me you can't do physics because you're a girl. I feel that so far in my career I have not been put at a disadvantage compared to my male peers but I know this is not the case for many women and especially those who fit into one or more minority groups, such as women of colour, women with disabilities and those who identify as LGBT+. I feel very strongly that men weren't biologically built to be somehow better at physics than women and so during my PhD I've tried to help work towards parity in academia by being on the Equality and Diversity Committee in my department at the University of Leicester. Recently I attended the International Conference of Women in Physics, which was super empowering, with speakers such as Professor Dame Jocelyn Bell Burnell and Malala Yousafzai.

I am also a white water kayaker. I've kayaked all over the UK, in the Alps and in Uganda; I've paddled 10m waterfalls and I was the first woman to kayak down a remote river in Wales (I may have fallen out of my kayak the first time, but the second time I nailed it!).

How did astronomy/geophysics inspire me?

When I was at school my favourite subject was physical geography and I was all set on doing that subject at university. I went to Space School UK, which is a summer residential school based at the University of Leicester, and there I realised that you can use physics to further understand things like volcanoes and glaciers, which were my favourite topics in my geography classes. I decided that I wanted to study physics at university and made sure I picked a course which had a strong focus on planets. While studying at Aberystwyth the courses I most enjoyed were those on the planets and I found myself being particularly interested in planetary atmospheres. In my final year at Aberystwyth I studied at UNIS, Svalbard, where I took a course on the Earth's aurora. In Svalbard I decided that I wanted to continue studying the aurora at postgraduate level, but turned my attention to Jupiter's aurora!

What transferable skills have astronomy/geophysics given me?

Critical thinking and problem solving, but even the more specific skills, such as my knowledge of spectroscopy, are transferable as they apply to research fields other than astronomy, such as medical physics.

Day to day I do a lot of writing; whether that is writing telescope proposals, academic papers, blogging about observing or cracking on with my thesis, a big part of being a scientist is writing. All this writing, in addition to presenting at conferences and doing outreach has improved my ability to communicate. Being able to communicate difficult concepts effectively takes creativity and being an effective communicator is a transferable skill astronomy has given me.

Bullet point CV

- **GCSE:**
 - English (literature & language)
 - Maths
 - French
 - Religious Studies
 - Geography
 - Biology
 - Chemistry
 - Physics
 - **A Level:**
 - AS English Language
 - A2 Physics
 - Maths
 - Geography
 - **Undergraduate:**
 - Aberystwyth University MPhys Physics with Planetary and Space Physics, including one semester abroad studying at UNIS, Svalbard.
- During my undergraduate degree I had a couple of summer jobs which included mentoring at Space School UK (a summer residential school for students, aged 13-18, who love space, based at the University of Leicester) and being a kayak instructor in Spain.
- **Postgraduate:**
 - Currently completing my PhD at the University of Leicester studying infrared observations of Jupiter.

ROBERT BURSTON



My job

My job is to 'do science'; I'm a planetary scientist. This includes all stages of the process: Developing ideas, getting funding, doing experiments, writing up/publishing results and going to scientific conferences.

The best of my job

The best parts of my job are identifying unsolved scientific questions and finding new ways to try to answer them – then the excitement of getting the results! Being around like-minded people is also extremely rewarding.

The worst of my job

The biggest negative of my job is the process of attempting to get funding to conduct my research – this is in large part a selling job and I'm not a keen salesman!

Conferences are also a struggle for me as an autistic person: travel, meeting strangers, dealing with crowds of people and many other issues make conferences very challenging for me but they are an essential part of being an academic scientist.

BTW!

I have Asperger's Syndrome, a form of autism, but I didn't know until 2015, when I was 43! Life as an autistic person has many challenges but there are numerous successful scientists who have the condition. It is not an automatic bar to success and some features of the condition can even be advantageous to scientists. Whilst it is considered a disability in UK law and autistic people often need some extra help to deal with life's challenges, really it is just a different way of perceiving and thinking about the world that seems to be caused by having a somewhat different brain structure to most people.

How did astronomy/geophysics inspire me?

What inspired me was, when I was in school, my elder brother returning from University at the end of each term and telling me about the crazy things he was studying: the Bohr Theory of the hydrogen atom, super-fluids, curvy space-time and other things that made no sense to me at all and were therefore really exciting! (Look them up!) He also gave me the book,

Surely You're Joking, Mr. Feynman! by the Nobel Prize for Physics winner, Richard Feynman, who was an incredible scientist, made important contributions to quantum computing theory, cracked safes, cracked wise, played bongos and generally had a good time. That was inspirational, too.

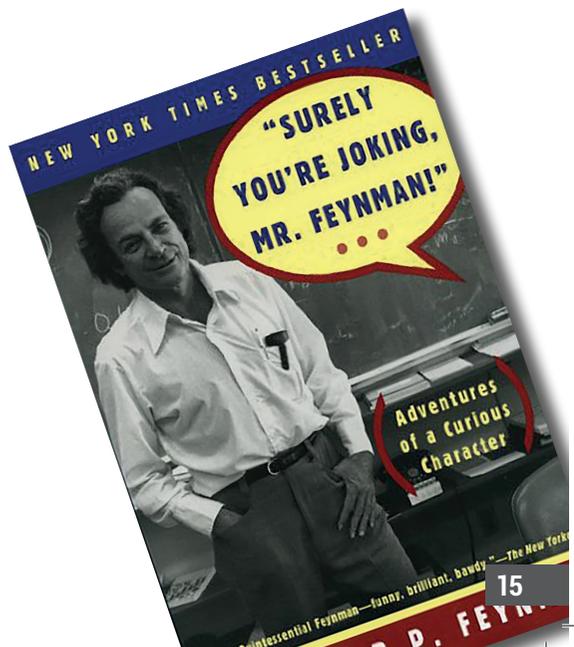
What transferable skills have astronomy/geophysics given me?

Becoming a scientist has permanently affected how I think. The methods of evaluating evidence, making simple checks to see if what I'm hearing or reading in the news, adverts or science documents makes sense, spotting logical flaws or gaps in arguments, checking for errors in my own and other people's work all become second nature and are useful every day in every situation where I need to make a decision. I have also developed the skills necessary to explain things to others, whether verbally or in writing, in an intelligible manner, taking account of variations in people's knowledge and ability – this is as useful for explaining where the nearest bus stop is as for describing how a mass on a spring, a dripping tap and Earth's (and some other planets') magnetic field happen to be very similar to each other from the perspective of physics. Problem solving skills are also an important part of science with wide applications in other jobs and in daily life.

Bullet point CV

- **A Levels:**
Chemistry C, Physics, D, Maths, E
- **BSc (Hons) (lower second class)**
from University of Wales, Aberystwyth
(now University of Aberystwyth)

- Worked in the “technical coatings” industry as a lab technician, quality assurance officer, trouble shooter and manufacturing systems developer for a decade. This included three years in the USA.
- Studied remotely for a PhD in the physics of Earth's upper atmosphere (where satellites orbit) with the University of Bath. PhD awarded 2009.
- **2010 – 2011**
Research scientist at the Royal Observatory of Belgium in Brussels
- **2011 – 2012**
Research scientist at the University of New Brunswick (Canada)
- **2013 – 2015**
Part-time research scientist at the University of Bath
- **2017 – Present**
Ernest Rutherford Fellow,
University of Bath



PIYAL SAMARA-RATNA



My job

My main area of expertise is as a Mechanical Engineer though I am also a project manager and technical lead for different projects. My role can vary, though it can be summarised as working as a member of a team in projects which have to deliver incredibly complicated instruments, to very strict timescales and budgets. Like all members of the team it is my role to use my skills and experience to help the project reach its goal. Depending on the stage in the project the day to day role will vary. When designing a lot of time is spent in front of the computer making sure designs are right. Once we start building more time is spent in the laboratory and clean room building and testing. If the project has national or international partners then we will often spend time in meetings making sure that everything is developing in the right direction. This can often involve lots of travel.

The best of my job

Knowing that you are building equipment that will answer some really important questions about the Universe and the Earth is incredibly rewarding. Often answering these questions will require developing technologies that have not been invented, so will allow you to work with the latest technologies, which is very exciting. There are very few industries that allow you to push the boundaries of what is achievable, but this happens a lot in the space industry!

The worst of my job

Funnily enough the aspects that are the most enjoyable can also often be the most challenging. The reason that questions have not been answered is often that the technology required to do this is incredibly difficult to build. The level of detail required to build a successfully working space instrument is incredibly challenging and requires a lot of effort, persistence and organisation.

BTW!

Don't get too disheartened if you are rejected from what appears to be the ideal job. A better opportunity may be just around the corner! After graduating I was hoping for a career in the RAF. When that did not happen I really struggled to find a good job. I cannot remember how many job applications went out but it was a lot. At one point I had to leave engineering and take a job in a hotel as a waiter to ensure ends met.

However during this time I continued to work on developing my skills and kept a look out for potential job opportunities. One day I spotted the advert for a mechanical engineer at the Space Research Centre in the back of an engineering magazine and took a punt to apply. I wasn't sure if I was suitable but at interview it turned out that my experience suited a lot of what they were looking for. As they say, the rest is history and I would advise anyone to keep persisting and looking for opportunities to get them on the right career path. Now I am very happy that I was rejected from the RAF.

If you want to pursue a career as an engineer then getting real-world experience to complement your academic knowledge is essential. To allow me to do this I undertook as many work experience opportunities as possible. This included taking two year-out placements during my degree. It was actually the experience during my second industrial placement (not in the space industry) which gave me the best experience for me to apply to work in my current role.

Bullet point CV

- **10 GCSEs:**
7 As, 1 B, 2 Cs
- **A Levels:**
Art (A), Physics (B), Maths (C),
AS English (D)
- **2:1 Mechanical Engineering (MEng Hons) at University College London.**
My degree included 2 years of industrial placements, taken before my first year and after my 3rd year
- **2004 – Present:**
Mechanical Engineer at the Space Research Centre, University of Leicester

How did astronomy/geophysics inspire me?

Seeing the shuttle launch, astronauts working on the International Space Station and the launch of the Hubble Space Telescope definitely inspired me growing up. It wasn't an industry that I particularly thought was open to me and I was delighted when I was offered this opportunity. Space is one of the few industries that truly allow you to push the boundaries of what is achievable.



MATTHEW NORTH



My job

I'm currently training under the Schools Initial Teacher Training scheme to become a Physics and Astronomy specialist teacher and I have a background in stellar astrophysics.

The best of my job

Some of the best moments from my post-doc at Surrey were the very aspect of a post-doc career that I had feared the most – public speaking!

Yet standing in front of an audience and connecting with them by conveying your passion and excitement for what you have learnt, are currently learning, or even just wrestling to understand, is one of the real highlights of a science career. Indeed, sharing the workings of a star with sixty 10 year olds was just a wonderful feeling to see just how excited and enthusiastic they became as they learnt more and more about the physics of a star. This, I guess, was particularly amplified as I feared I was asking too much of them. Turns out they were totally up for the challenge! This experience has played a huge part in bringing me to the start of a teaching career now, as my post-doc has come to an end.

The worst of my job

Well I struggle to comment here as I am just beginning as a teacher. However, if I were to put my astrophysicist hat on, I would say that the biggest negative is the short-term contracts that are used to employ early career post-docs and the expectation that you travel the world taking up post-docs to essentially accrue your research portfolio. This is obviously a marvellous experience for a young person, or one with no family ties, but has placed huge barriers in my way and in the way of any individual with ambitions of starting their own family.

BTW!

I probably would never have achieved all that I have in the academic world and likely not had the many wonderful experiences if it were not for a maths teacher who, on a day (like many) when I had driven him to distraction, demanded I stay behind after school. Fully expecting to have my eardrums burst by the release of his anger, I was completely caught off-guard by his calm concern for my future. He simply expressed his desire to help me if he could and suggested that he thought I could be exceptionally good at mathematics if I ever bothered to try!

Though it took me many years and much trial and error to work it out, his words have remained with me all this time and have certainly influenced my life for the better.

How did astronomy/geophysics inspire me?

Astronomy has inspired me throughout my life in multiple ways. Firstly, as someone who always wants to understand all that I observe, astronomy has been an obvious beacon of the human race's attempt to do exactly that. By the application of logical reasoning astronomy builds on beautifully simple and concise mathematical and physical constructs and extends them to understand and probe the most distant, spectacular and powerful events that occur in this Universe. It is the amount of knowledge that we can gain by the application of simple theories to such limited information that I find so inspiring. This is intelligence at its most glorious best!

What transferable skills have astronomy/geophysics given me?

Well the list for this is potentially vast. But the obvious ones are the most powerful and these include:

- Logical reasoning.
- Problem solving.
- The skill of teaching yourself.
- Developing exceptional analytical skills which enable you to break seemingly huge problems down into simple, digestible chunks.
- Becoming highly skilled with computer technology.

Bullet point CV

- **1986:** I left school at 16 with 5 O levels and 4 fails. I obtained a grade 'B' for English Literature, Maths and Biology and a grade 'C' for Physics and Chemistry. I failed Art, Geography, Electronics and English Language.
- **1986 – 1988:** Though I started by working at the local supermarket I had worked at part-time as a school pupil, I eventually got a permanent job as a Eurobond Settlements Clerk for a Japanese Securities House in the City.

- **1988 – 1990:** Returned to college to do A Levels and obtained a 'C' in Maths, a 'D' in Physics and a 'B' in GCSE English Language.
- **1990 – 1991:** Started a Physics and Astronomy degree at Cardiff University but was suspended for one year for poor attendance.
- **1991 – 1994:** Rather than wait for the suspension to end I transferred to Plymouth University and did a Maths with Astronomy degree. I 'passed' – but had a fantastic time, learnt how to sail and spent lots of time at the beach and on the moors!
- **1994 – 1996:** Sailed! And worked in a local Plymouth pub.
- **1996 – 2000:** Worked for Essex and Suffolk Water Company, first in procurement and contracts but latterly as an accountant (CIMA stage 1).
- **2000 – 2003:** Paid for myself to go back to Uni. This time to 'work!' Got a 2:1 in Physics and Astronomy at Southampton University.
- **2003 – 2004:** Completed an MPhil in just 1 year, publishing my first paper on extra-galactic astronomy.
- **2004 – 2008:** Awarded a funded PhD studentship at UCL and gained my PhD in Stellar Astrophysics.
- **2008 – 2010:** Completed my PhD in 2008 whilst looking after my 9 month old daughter. Remained at home as the primary carer for my daughter.
- **2010 – 2014:** IT consultant and developer.
- **2014 – 2017:** Daphne Jackson Research Fellow with the University of Surrey's Astrophysics Group.
- **2017 – Present:** Teacher Training (SCITT route) to become a Physics specialist teacher.

LAURA DALY



BTW!

Nearly two years ago I moved from the UK to Austin, Texas to work out of Arm's design centre in the capital of the Lone Star State. People are sometimes surprised that my husband was willing to move continents for his wife's career, but being with someone who is supportive of your aspirations is so important.

As well as work I ride horses competitively, competing in (English/Classical!) dressage with my horse Satchmeaux.

My job

I'm a patent attorney at Arm, the largest processor design company (by number of chips licensed) in the world. I'm responsible for protecting the intellectual property created by Arm's engineers when they are designing new processors and related technology.

The best of my job

I enjoy the fact that I get to work with some incredibly smart people. I'm constantly learning about new technology and every day is different. Sometimes I might be working with engineers, other times with commercial lawyers or business people.

The worst of my job

Sometimes it seems like there aren't enough hours in the day to get everything done we would like to achieve. There are periods when I do a lot of travelling and business travel isn't nearly as glamorous as it seemed when I was younger.

How did astronomy/geophysics inspire me?

I have always been fascinated by astronomy, but after a few years in a research role realised that I couldn't see myself doing it as a career for the rest of my life. I was attracted to my current role because it sits at the intersection of science and the law. You have to have a science background to be a patent attorney as well as a thorough knowledge of intellectual property law.

What transferable skills have astronomy/geophysics given me?

The study of astronomy has given me a thorough grounding in basic science and engineering. This gives me the ability to quickly learn about and conceptually grasp technologies in a broad spectrum of areas, which is critical in my current role.

Bullet point CV

- **SQA Highers**
in English, Maths, Physics, Chemistry, Geography (ABAAA)
- **MSci (Hons) Astrophysics –**
University of St. Andrews
- **PhD Physics –**
University of Glasgow
- **Post-Doc in Space Science, MSSL, UCL**
- **PGCert IP Law –**
QMW University of London

Trained to be a patent attorney at a London Law firm

- **CPA (Chartered Patent Attorney) and EPA (European Patent Attorney)**
- **Senior Patent Attorney at Arm Ltd.**



DOM GALLIANO



My job

I direct and run a programme of activities which takes physics out to unusual places so many different audiences can engage with the latest research.

The best of my job

Working with an amazing team of outreach officers! Throughout my career I have enjoyed working with other people, so it's a pleasure to mentor a team of enthusiastic people that love their jobs.

This job also means I get to find out about the latest research in physics, especially what we know about the Universe.

The worst of my job

A lot of administration and paperwork! I love having big ideas and thinking of big

strategies, I'm not as great with the little tiny details. If I have a lot of small dull tasks I can make them drag for too long...

Also not being able to do everything. We get a lot of requests but there aren't enough hours to do everything. Sometimes you have to say no so you can concentrate on other projects well.

BTW!

Over the years I have had many hobbies from Caving & Pothole Club to salsa dancing. I wasn't great! In my free time I now like to read comics, watch live drag shows, go cycling and swimming, travel out to the countryside with my boyfriend and even play a round or two of bingo. I also used to help run a club night in the queer community in London, which was great fun as I met loads of people.

How did astronomy/geophysics inspire me?

I always wanted to know how the Universe worked! My parents didn't know a lot about physics or space so they used to buy me loads of books. I liked Greek myths as the heroes were all in the night sky! As I grew older I started reading comics and was amazed by the ideas they presented.

There weren't any universities where I grew up so my science idols were all fictional scientists such as Mr Fantastic from the Fantastic Four and Dr Ellie Arroway from the film Contact.

What transferable skills have astronomy/geophysics given me?

Communication, logic & problem solving, just not in the way people normally expect to use it! Writing a strategic plan, managing projects and running events all use these skills every day. I have learnt a lot about working in an office environment, dealing and pitching to clients and giving presentations and coding.

Bullet point CV

- **1996 – 2002:** Bayside Comprehensive School Gibraltar
11 GCSE:
A* – Spanish
A – Physics, Maths, Geography, English Language, English Literature, Chemistry, Religious Studies
B – Biology, IT
D – First Language Spanish
AS Level:
B – Biology
A Level:
B – Maths, Chemistry
A – Physics

Was a member of the Drama Society, School Magazine, School Choir.

I was also a helper at a local Cub Scout and Brownie Guide group. I helped them with their astronomy badges.

- **2002 – 2006:** Undergraduate, University of York. First Class Degree, Masters in Physics (MPhys) in Mathematics and Physics.
I couldn't pick between the subjects so I picked a course that had both! My final project was in Computational Quantum Optics.
- **2006 – 2008:** Graduate Transport Planner, AECOM, York.
I was a little tired of studying and wanted to see what a job in industry was like.

- **2008 – 2009:** Postgraduate Student, Imperial College London Masters in Science (MSc) in Theoretical Physics.

I missed physics and astrophysics so went to do a Masters! I realised I really didn't enjoy theoretical physics. Luckily there were some amazing cosmology courses which I enjoyed and had a supervisor who helped me write a dissertation in cosmic inflation. I struggled with this course and had to repeat a few core modules as I didn't enjoy the theoretical physics and had found returning to study challenging after being away.

- **2009 – 2013:** Institute of Cosmology & Gravitation, University of Portsmouth, PhD in Theoretical Cosmology

My project looked at bridging the gap between theoretical cosmologists and scientists who were analysing the data from satellites orbiting Earth.

I also started doing a lot of workshops in schools and public events and realised I really enjoyed talking about cosmology to the public. I decided that this was the career I wanted to follow.

- **2013 – 2015:** Outreach Officer, Institute of Physics (IOP), London.
I worked on projects which took physics into unexpected places to new audiences, such as pubs, art galleries and music festivals. A lot of the work involved project management, which actually involves a lot of logic!
- **2015 – Present:** Director of Outreach & Public Engagement, South East Physics Network, London

JO MORGAN



My job

Using geophysical methods to investigate asteroid impacts, active volcanoes and earthquake behaviour.

Teaching geophysical methods to undergraduate students.

The best of my job

Being able to manage my own time and choose what research I do.

Winning research grants – which means you can carry out the research you proposed in your grant application, and also that your peers have read your application and agreed that your research is exciting and worth funding.

Chatting to students.

Travelling around the globe for fieldwork, meetings and conferences.

The worst of my job

Filling out forms.

Multi-tasking during term time and marking.

BTW!

Neither my parents or older brother went to university – they seemed surprised that I wanted to. University was a life-changing experience for me, moving from a village to a big town, and meeting students with very different backgrounds and life experiences. University is an ideal place to learn, think, have fun, and gain some independence in fairly secure surroundings. I was one of the first women employed by Schlumberger to work on drilling platforms as a logging engineer. This was a big positive step forward by Schlumberger, slightly offset by my local boss's decision to mainly send me on onshore jobs, so as not to inconvenience the client (in having to accommodate a woman offshore), which meant I earned less than the men. I am always shocked when I encounter misogynistic behaviour, but at least it is now frowned upon – it wasn't early on in my career.

How did astronomy/geophysics inspire me?

I was attracted to a subject area in which new hypotheses are constantly emerging, and that covered topics that are both useful and important.

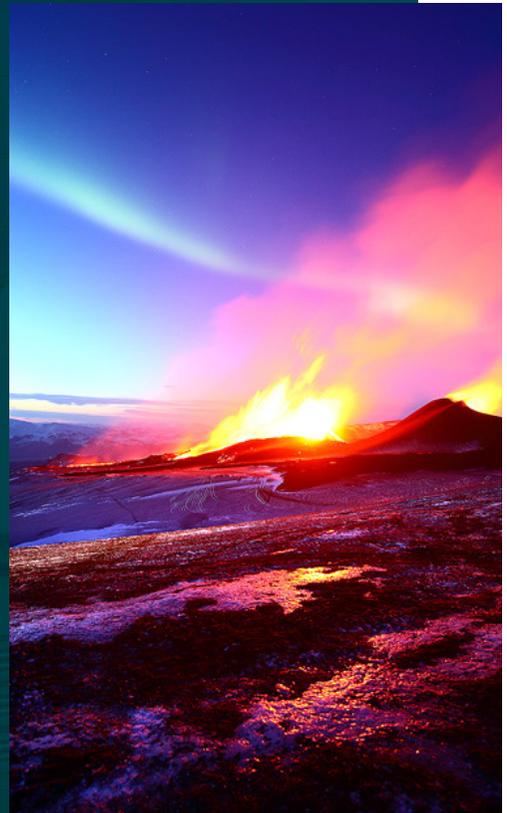
- **2000 – 2004**
Senior Lecturer in Geophysics,
Imperial College
- **2004 – 2011** Reader in Geophysics,
Imperial College London
- **2011 – Present**
Professor of Geophysics,
Imperial College London

What transferable skills have astronomy/geophysics given you?

Geoscientists are numerate, taught to solve problems, synthesise and model data, work independently, and write computer codes. This leads to a high employment rate and wide range of career opportunities.

Bullet point CV

- **1977**
A Level Maths (B) Physics (B)
- **1977 – 1980**
BSc Hons Degree Geophysics
Southampton University (2:1)
- **1980 – 1981**
Field Geologist/Geophysicist,
Kratos NL, Australia
- **1982 – 1984**
Wireline Logging Engineer,
Schlumberger, based in Italy
- **1984 – 1988**
PhD University of Cambridge,
Marine Geophysics
- **1991 – 1994**
Senior Lecturer in Geophysics,
Kingston University
- **1995 – 2000**
Lecturer in Geophysics,
Imperial College



JAZ PEARSON



My job

I am a software engineer working for a company called Autodesk. We create software for people who make things: films, buildings, engines, anything! Autodesk work with a variety of partners such as Disney Pixar to make 3D animated films, engineers and architects to create 3D models of different structures, and the construction industry to plan and carry out building works.

The best of my job

I get to write really cool software for lots of people, helping to make their jobs as easy as possible, to make really amazing things!

The worst of your job

Sitting at a desk all day!

BTW!

I came from a very poor town and a working class background. People like me aren't supposed to be giving talks at NASA, or so I thought. If I can do it, I think anyone can. I didn't do too badly at school, but I could have done better. But at college, I really struggled and ended up leaving with only one A Level. After working in jobs that I hated and being paid terribly for a couple of years, I went back to college and ended up getting a place to study at university.

How did astronomy/geophysics inspire me?

After completing my degree in mathematics, I was asked to do a PhD by my favourite lecturer, who happened to be a world expert in solar physics. Using my mathematical skills in something as cool-sounding as solar astrophysics was too good an opportunity to turn down.

What transferable skills have astronomy/geophysics given me?

During my PhD I learnt how to apply my mathematical skills and write code to try and work out some of the fascinating physics puzzles of the solar atmosphere. I also had to present my work to lots of people, giving several seminars on my research at lots of international and national institutions, such as NASA and the RAS and in countries such as China and the USA.

Bullet point CV

- **School: GCSEs –**

- 2 As
- 5 Bs
- 3 Cs
- 1 D

- **Blackburn College: A Levels –**

- Maths – C

Warehouse: labouring, cleaning jobs
for 2 years

- **Preston College:**

- Year 0 Science
(entry course on to a BSc degree course)
for 1 year

- **UCLan:**

- BSc (Hons) Mathematics – 3 years,
1st class degree

- **UCLan:**

- PhD Solar astrophysics –
approx. 4.5 years

- **Autodesk:** Current position

JOANNE WHEELER



My job

I specialise in satellite law, policy, advocacy, regulation and all forms of commercial contracts. I never dreamt I'd be lucky enough to be working on: large constellations; in-orbit servicing; launch contracts (from the UK!); launch and operations licensing; advising various Governments on drafting legislation; spectrum authorisations and ITU advice; complex EU regulatory advice; helping companies raise finance and find strategic partners; Government advocacy; and everything else for satellite-related companies – I am very lucky to be doing something I have such a passion for.

The best of my job

I am absolutely passionate about the satellite and space industry and have been for a long time – this is my 25th year connected with the industry. I very much enjoy assisting innovative companies with complex regulatory or contractual issues and finding or creating solutions – there is always a solution! What I

love most is marrying up practical commercial innovative ideas with national, regional and international law, international relations, insurance, commercial contracts, policy and finance – and making the innovative ideas feasible.

The worst of my job

I work long hours but still don't have the time to do everything I want to do. I have to prioritise carefully. It is difficult to implement everything I want to do work-wise, with the articles I write, the speeches I give and with the Satellite Finance Network! I need a Harry Potter time-turner!

BTW!

I am the first in my family to go to university. My family has been brilliantly supportive – as is my husband and three girls. However, trying to establish a practice in satellite and space law, where one did not exist, has been tough. I'm getting good at defending what I do (even in law firms), and indeed defending and advocating for the industry, which is now a success story – particularly in the UK. I was really honoured to receive an MBE for services to the UK space industry in 2017.

I feel lucky every day and have a wide and general interest in the subject and embedding myself in it. I very much enjoy writing my quarterly contributions for the Via Satellite and Satellite Finance journals for example.

I am confident that the UK satellite industry will continue to go from strength to strength – I love working in it, with the people within the

industry and helping bleeding edge companies find solutions to allow them to grow. I am excited about the future for the industry; onwards and upwards!

How did astronomy/geophysics inspire me?

At the age of 9, our class teacher invited all the pupils to write a project on any subject we wished. I chose astronomy – and spent every minute I could researching and writing the project in a blank bound book that my father had given me (he worked in book printing). I still have it. Our teaching assistant told me to “keep up the astronomy” – I did!

I wanted to combine that interest with the international relations and international collaborative side of the subject.

What transferable skills have astronomy/geophysics given me?

Although Professor Lyall told me to learn the physics behind the subject, I have never formally studied it. I have spent a lot of time with the brilliant engineers in ESA and Ofcom and have learnt as much as I could from them, and indeed every day from clients and people I collaborate with. That knowledge is needed to understand what clients are seeking to achieve – and I use and need that every day.

Bullet point CV

- **School** – George Watson’s College, Edinburgh – did OK in Highers and CSYSs
- **University of Aberdeen** – Where the inspirational Professor Lyall taught me space law – one of my choices for my law degree – LLB (Hons).
- **University of Oxford** – Mst in Law and Economics – where I did my thesis on the intellectual property protection of remote sensing data derived from satellite

(took me a while to convince the professors to allow me to write on space law!).

- **Erasmus University of Rotterdam** – LLM Law and Economics (with distinction)
- **University of Aberdeen** – Diploma in Legal Practice
- **BLPP** – Exams to re-qualify as a lawyer in England and Wales (while working)
- **University of London, Queen Mary** – Diploma in Telecommunications Law (I also did this while working).
- **Professional Qualifications** – Qualified as a lawyer in Scotland, England and Wales.
- **Work Experience:**
 - Trained as lawyer at McGrigor Donald in Scotland
 - Assistant solicitor Slaughter and May
 - Associate solicitor Baker & McKenzie
 - Senior Associate solicitor Allen & Overy – leading the satellite practice group
 - Partner, Bird & Bird – leading satellite sector group
 - European Space Agency (Paris) – lawyer specialising in human space flight, commercial contracts, ISS negotiations, commercial tender evaluation boards (I loved every minute of this job)
 - Ofcom – in particular drafting the Procedures for the Management of Satellite Filings
 - Partner, CMS – leading the satellite practice
- **Currently:**
 - Co-Chair of the Satellite Finance Network (which I am very proud of)
 - Founding Director of Alden Advisers, specialist advisers to the satellite, space, telecomms and applications industries.
 - Consultant to Bird & Bird and Keystone Law.

DEEPAK MAHTANI



My job

I talk to graduate students about careers in data science, I mentor teams on Pivigo's 'Science to Data Science' boot-camp, and I'm a data scientist for Pivigo.

The best of my job

I am a people person, so I love being able to speak to so many amazing people! Showing the variety of jobs open to them is something I take great pride in doing. To spread this message, I get to travel to universities all over the country and to both national and international conferences. Also, I get to work with some really awesome people! With such a welcoming and inclusive culture, I definitely feel at home when I am at work.

The worst of my job

The hardest part of my job is not being able to be everywhere every day. If there were more than 24 hours in day and 7 days in a week, I would love to visit every university in the world talking to the graduate students about the awesome world of data science.

BTW!

I love playing and watching sports and so the great work-life balance I have is amazing. I really enjoy the work I do, but am also able to enjoy my evenings and weekends. I love playing golf and going to the gym. I am also a huge NFL fan so being able to watch that on a Sunday night is great! When I was studying for my PhD I was able to go climbing with my supervisor. This was a great way to unwind after a long day in the office.

How did astronomy/geophysics inspire me?

When I was at school, my physics teacher noticed I was interested in astronomy, so he gave me different topics weekly to read up on. As my knowledge grew I began reading more and more articles and magazines. In my final year at school I started a club where students and I would discuss some of the interesting articles I had read about. From there I knew I wanted to study astronomy at university but I really enjoyed mathematics too. I began looking at dual honours degrees. I went on to study Mathematics and Astronomy at Sheffield and my PhD at Keele. Now I am a data scientist and community manager here at Pivigo.

What transferable skills have astronomy/geophysics given me?

Programming, statistics and communication are some, but the ability to pick up new things quickly is the one I find most useful.

Bullet point CV

- **GCSE:**
 - 4 As
 - 3 Bs
 - 2 Cs
- **A Level:**
 - A Mathematics
 - B Physics
 - B Chemistry
 - C French (AS Level)
- **2007 – 2011**
 - Undergraduate (MMath): Mathematics and Astronomy, 2:1 (Hons), University of Sheffield
- **2011 – 2016**
 - PhD: Astronomy, Exoplanet Atmospheres, Keele University
- **March 2016 – April 2016**
 - Pivigo Science to Data Science Boot-camp
- **June 2016 – February 2017**
 - Insight Analyst, Inspired Entertainment Inc.
- **February 2017 – Present**
 - Data Scientist and Community Manager, Pivigo



CASSIE WARREN



My job

I am currently working as a Petroleum Systems Geologist in the oil and gas industry. I work with software to evaluate and predict if and how oil and gas accumulations were formed, from the geological past to the present day. I specialise in building dynamic geological models that simulate geological processes over millions of years. For example, we can model fluvial channels that exist today but also existed millions of years ago. It is all about interpreting and analysing the data to come up with a coherent geological story, that honours physical principles and matches measured data.

The best of my job

I have worked on global projects across the geoscience domains, integrating my geophysical and geological knowledge gained

from on the job training and also from my university degrees. I have had the fantastic opportunity of working with people from all over the world, from different backgrounds (geologists, geophysicists, engineers, managers, finance). The job is very diverse. I get to work in many areas, tying all different kinds of data together to come up with a coherent geological story, of how oil and gas accumulated over geological time. I get to look at all different kinds of data from across the world, including geological maps, heat flow maps, gravity data, magnetic data, well logs, seismic data, stress and strain data and more.

The worst of my job

When studying I found that the subject was very male dominated, but I really encourage females to take up this subject. It's great fun, you get to travel the world, field trips are fantastic! During my studies, I got to go to the USA, Greece, Dorset and Scotland.

Also, the oil and gas industry is very cyclic, it goes through ups and downs. This means that there are limited jobs when the oil price is not doing very well!

BTW!

You get to travel a lot! To amazing places as well! Not only for work but meeting and making friends from all over the world and from different backgrounds. It opens the opportunities for fun-filled, memory making holidays! I have travelled to Dubai, Abu Dhabi, Houston, Aberdeen, Paris, Spain, South Africa, Namibia, Zambia and Malaysia.

I have presented at conferences in Paris and Barcelona and even travelled to present results to customers in Kuala Lumpur.

How did astronomy/geophysics inspire me?

When I was at school, my favourite subjects were physical geography and physics. At this time, I was not really interested in 'rocks' but the physical processes that were forming the Earth and planets. It was not until I was considering university degrees that I found that I could study both combined: Geophysics!

What transferable skills have astronomy/geophysics given me?

I've got to combine all the sciences and how these subjects tie into the real world around us. Applying the subjects that you learn at school and how these apply to the physical world and help predict what happened in the geological past. I also got to learn about chemistry and biology when considering the chemical components of rocks and fossils and how these can provide further evidence of the geological past.

In addition to skills, there are many industries that geophysics can lead into. I have friends not only in the oil and gas industry but also in ground surveying for buildings, renewable energy, natural hazards and their prediction, hydrology and research.

Bullet point CV

- **A Level and AS Levels**
Geography A
Mathematics A
Physics B
Chemistry A (AS Level)

- **Durham University**
First Class Bachelor of Sciences (Hons)
– Geology with Geophysics
- **Imperial College**
Masters degree – Petroleum Geoscience
- **2013 – Present**
Geologist in the oil and gas industry



DAVID WADE



to happen. Having a ring-side seat to see, in advance, what new developments are in the pipeline is another highlight for me.

When we are insuring a satellite we often have to visit the facilities to see the satellite or rocket being built. Without doubt though, the best trips are those to attend a launch. You do need to be patient though. A minor technical hitch or change in the weather can delay a launch at the last minute. I made three trips to French Guiana before I saw an Ariane 5 lift off the pad!

My job

As a space underwriter I provide insurance for many of the satellites that modern-day life relies on. We insure the satellite for launch, as well as its time in orbit.

The best of my job

What I enjoy most about my job is the mixture of skills that it requires. On a daily basis I find myself drawing on my education and work experience to understand the technical aspects of the satellites we are asked to insure, but then have to combine this technical knowledge with maths and IT skills and an understanding of legal and business skills to complete the insurance policy.

Insurance is a business enabling tool. When a company is looking to launch a satellite, banks and investors will usually insist that insurance must be purchased to protect their investment. Without insurance many of the commercial space projects would not be able

The worst of my job

The space sector and finance sector are both heavily regulated industries, and rightly so. When two heavily regulated industries come together, however, such as in space insurance, the regulations can often present an impediment to innovation. The commercial space sector is developing very quickly at present with new satellite constellations and cubesats being launched, satellite servicing missions in the planning stage and asteroid mining gaining attention. Potential insurance solutions for the more innovative ventures can sometimes founder because of regulatory roadblocks. Running into these roadblocks can be frustrating.

BTW!

Never give up on your dream. When I was studying for my A-levels and choosing which degree course to follow my careers advisor was surprised to hear I was interested in working in the space industry.

His advice was that I was “ahead of my time” and I should scale back my ideas. With a career now spanning 25 years since I graduated, all related to space, I guess he was wrong. Set yourself realistic goals and ambitions, but don’t be put off.

Also, if you intend to go to university, look at the syllabus of the course and think carefully about which one best suits your learning style and longer term objectives. A poor performance in my Further Maths A-level (Grade E) meant I could not go to my first choice university, despite doing well in both of my other A-levels. Even though I had sufficient points to go through clearing I stuck with my second choice (Kingston). Looking back at this time I realise that the focus on design, and the practical elements of the course at Kingston, suited me much better than my first choice university would have.

How did astronomy/geophysics inspire me?

Being born just a few months before Neil Armstrong’s historic first steps on the Moon I am too young to remember the Apollo programme, but the Viking landings on Mars in 1976 and the first launch of the space shuttle in 1981 were both great inspirations for me when I was at school. I never wanted to be an astronaut but from an early age wanted to work on satellites. This interest grew as I started to understand the full societal benefits that satellites could provide, via better communications, improved land usage and enhanced navigation services for example. After a few years designing satellite components and teaching satellite design it was time for a change and the world of space insurance appealed. Since that time I have provided insurance not only for the large commercial satellite operators providing satellite TV across the world, but for numerous start-ups and developing nations making their first forays into space.

What transferable skills have astronomy/geophysics given me?

Having a science and engineering background has been a tremendous benefit, even in the insurance sector. The analytical approach that science subjects engender allows me to break down a risk into its component parts and understand what the real issues are and how they can be addressed.

Bullet point CV

- **1980 – 1985:** 11 O levels in Maths; Physics; Chemistry; Biology; English Language (passed on a resit); English Literature; Art; Craft, Design and Technology; Geography; Computer Studies and Electronics
- **1985 – 1987:** 3 A Levels in Maths; Further Maths and Physics
- **1987 – 1991:** BEng (Hons) degree in Aerospace Engineering (Kingston University)
- **1991 – 1992:** MSc degree in Astronautics and Space Engineering (Cranfield University)
- **1992 – 1994:** Satellite Systems Engineer, Satellites International Limited
- **1994 – 2000:** Lecturer/Senior Lecturer in Satellite Systems Engineering, Kingston University
- **2000 – 2007:** Space Underwriter, Marham Space Consortium
- **2007 – Present:** Space Underwriter, Atrium Space Insurance Consortium (ASIC)

ANASUYA ARULIAH



My job

Arctic research, observing aurorae during winter; working with international scientists; teaching Physics at UCL, and being MSc Admissions Tutor.

The best of my job

I love to nurture and inspire people with an understanding of physics and why they need the tools of maths. I enjoy playing with data and concepts in order to see things differently, and hopefully to learn more. I like putting together teams with complementary skills to solve problems.

The worst of my job

I wish there was more time to think and plan. I spend a great deal of time scrabbling for funds to support my research, and particularly to fund the salaries of my

team. There is a sad lack of job security for researchers and technical support staff which is stressful for us all, and limits the building up of skills in strong teams.

BTW!

When I was growing up in the 60s and 70s, there were very few role models for girls who did not want traditional "women's jobs". I was a feminist from a very early age, and come from a line of strong women. My biggest break was to win an 11+ scholarship to a direct grant girls' school, Sutton High School. The teachers were practically all female, enthusiastic and excellent. Nobody told us there was anything that we girls could not do. I loved school and enjoyed most subjects. Particularly important was that my parents encouraged my brothers and me to speak to all people as equals. This helped when entering a male dominated field. I have been a lecturer, supervisor and pastoral tutor to many students from many backgrounds over the years. I hope I have given encouragement and support, and been a reasonably good role model as a female scientist of Sri Lankan origin.

How did astronomy/geophysics inspire me?

My parents valued education highly, and my father inspired my love of physics. I loved learning about science, and understanding how things worked in biology through to physics. I admire the ingenuity and

craftsmanship of people who invent and build instruments; and those with the insight to fill in the jigsaw of knowledge from limited observations.

What transferable skills have astronomy/geophysics given me?

It is really important to realise what extra skills we are acquiring during our studies and research. I have learnt to be critical, methodical, to judge data quality from errors and statistics; to gather lots of information quickly, then digest, summarise, evaluate and infer. Who wouldn't want to employ a (geo)physicist/astrophysicist who's learnt such skills?

Bullet point CV

- **O Levels:** 7 As and 1 B
- **A Levels:** As in Chemistry and Maths; and a B in Physics (as a result of not revising dimensional analysis since it seemed too trivial, and I didn't realise its value in checking the consistency of equations until using it years later).
- Twice sat the Cambridge Natural Sciences entrance exam. Both times was interviewed and transferred to the Oxford pool. For the 2nd attempt took extra lessons in Further Maths from my brothers' school, resulting in an offer to study Physics at Somerville College Oxford. In 1981 when I arrived the ratio of women to men at Oxford was around 1:5 and at Cambridge was 1:7. Thankfully there are more women nowadays!
- Oxford was much tougher than school, as it was a somewhat macho 'sink or swim' culture. I spent more time on extracurricular activities (Oxford University Scientific Society committee, college hockey and badminton, and parties) than studying.

- With a 2nd class degree, I didn't know what direction to take, though my childhood ambition was to be a scientist. My mother spotted a job advert for the Atmospheric Physics Group at UCL, and there began my career.
- I registered to do a PhD about 6 months after I started the job, learning to program and analyse data from Fabry Perot Interferometers (FPIs) in Arctic Scandinavia. Six years later I submitted my thesis and a year later missed the graduation ceremony as my daughter arrived.
- Two and a half years later I had my son. I worked part-time – 3 days a week for 5 years, until a lectureship in the Atmospheric Physics Group was advertised in 1997. Such opportunities are too rare to miss, so I applied and got it. This meant full-time work, and the juggling of childcare between my husband and I, nursery, school and daycare, for the next 10ish years.
- With the lectureship I took over the leadership of the FPI observational programme, and began lecturing and also demonstrating in the undergraduate labs. I also supervised PhD students and worked with post-doc researchers in my team. The research job entails writing and reviewing grant proposals, research papers, presenting and organising sessions at conferences, and international multi-instrument experimental collaborations. The lectureship gave me a wide range of teaching experience, from lecturing large classes of up to 180 students, to teaching small tutorial classes and managing pastoral care meetings. I was in charge of the large 2nd year undergraduate labs for 3 years and 3rd year labs for 2 years.

Go to our website to find out about even more astronomy and geophysics related careers, and case studies such as:



HELEN MASON

Solar Physicist and Public Engagement Fellow.



HAIDA LANG

Professor of Physics and Head of Imaging & Sensing for Archaeology, Art History and Conservation.



CAROLE HASWELL

Professor of Astrophysics, Head of Astronomy at the Open University, and Exoplanet Investigator.



KIMBERLEY STEED GERMAN

Business Relationship Manager and Designer.



STEPH KELLET

Secondary school teacher with a PhD in Planetary Physics using the Cassini spacecraft.



SIMON FOSTER

Outreach Officer and Teacher, Imperial College London.



CAROLIN CRAWFORD

Public Astronomer at the Institute of Astronomy, Cambridge.



SHEILA KANANI

Education, Outreach and Diversity Officer, Royal Astronomical Society.

WHAT'S NEXT?

Are you interested in finding out more? If so, there are a number of places you could look... here are some listed on below:

The RAS www.ras.ac.uk

European Space Education Resource Office www.stem.org.uk/esero

STEM Learning resources www.stem.org.uk

Space Careers www.space-careers.com

UKSEDS ukseds.org

UK Space Agency www.gov.uk/government/organisations/uk-space-agency

UK Space Agency Jobs

www.gov.uk/government/organisations/uk-space-agency/about/recruitment

Space Careers UK spacecareers.uk

Work experience programmes

spacecareers.uk/?p=article_public&id=167

Placements in industry sa.catapult.org.uk/people/space-placements-industry-spin/

Geophysics industry examples and links:

- britishgeotech.org/
- www.bgs.ac.uk/
- www.groundsure.com/report/geo-insight
- www.imperial.ac.uk/study/ug/courses/earth-science-department/geophysics-bsc/
- www.see.leeds.ac.uk/admissions-and-study/masters-degrees/masters-courses/msc-exploration-geophysics/
- www.srk.com/en/our-services/petroleum/exploration/ww-geophysics
- britgeophysics.org/tag/industry/
- www.geolsoc.org.uk/UniversityGeoscienceUK
- www.bas.ac.uk/
- seg.org/

Space industry examples:

- www.ukspacedirectory.com/members
- www.ukspace.org/space-organisations/
- www.baesystems.com/en/capability/space-systems
- www.airbus.com/
- astrosat.space/
- www.ukspace2015.co.uk/exhibitors

Apprenticeship programmes:

- spacecareers.uk/?p=article_public&id=149
- www.space-engineering.co.uk/careers/apprenticeships/
- sa.catapult.org.uk/news-events-gallery/events/higher-apprenticeships-in-space-engineering/
- www.stfc.ac.uk/skills/apprenticeships/
- space.blog.gov.uk/2017/09/01/want-your-career-to-take-off-the-uk-space-agency-is-looking-for-apprentices/
- www.uk.leonardocompany.com/people-careers/apprenticeships

Summer camps

spacecareers.uk/?p=article_public&id=197

Courses

spacecareers.uk/?p=article_public&id=154

Interviews spacecareers.uk/?p=interviews

Graduate training

spacecareers.uk/?p=article_public&id=155

RAS jobs list www.jiscmail.ac.uk/cgi-bin/webadmin?A0=RASJOBS

AAS jobs list jobregister.aas.org

Institute of Physics (IOP) www.iop.org

Look at university physics department websites or visit them in person:

- **Think Physics** www.thinkphysics.org
- **Research physics degrees** www.myphysicscourse.org
- **Physics degrees top universities guide** www.topuniversities.com/courses/physics-astronomy/guide
- **Careers from A-level physics** www.physics.org/careers

Career pack for primary schools

www.stem.org.uk/elibrary/resource/35260

Space resources for secondary schools

astroacademy.org.uk/

Space Careers quiz www.destinationspace.uk/meet-space-crew/find-your-role-space-crew/

STEM Ambassadors

www.stem.org.uk/stem-ambassadors

A day in the life of UK space scientists and engineers

www.stem.org.uk/elibrary/resource/32016

Space Careers information www.stem.org.uk/elibrary/collection/3572?page=1

Career profiles in STEM

www.wherestemcantakeyou.com/

Amateur astronomy organisations:

- fedastro.org.uk/fas/
- www.britastro.org/
- www.popastro.com/

Space School UK spaceschool.co.uk/

Institute for Research in Schools

www.researchinschools.org/

Teaching physics in the UK:

- getintoteaching.education.gov.uk/explore-my-options/training-to-teach-secondary-subjects/training-to-teach-physics
- getintoteaching.education.gov.uk/explore-my-options/teacher-training-routes/school-led-training/scitt
- www.iop.org/education/teach/routes/page_57436.html



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Thank you.

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