



Limit Less

Change the world

Jobs that make a difference

IOP Institute of Physics

New technologies

Finance

Construction

Energy

Global inequality

Culture

Design

Data security

Government

Communications

Healthcare

Food security

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**Shape
your future,
shape
your world**



Where do you think choosing physics could take you?

Could it be creating computer models to predict weather events? Perhaps into education, to inspire the next generation? Or to a hospital, using physics to help to save lives? Maybe even into agriculture or the arts, using creative problem-solving skills and physics knowledge in a totally different way!

We know that young people are well aware of the challenges the world faces today, and the impact those challenges will have on your future. In response to climate change, poverty and pollution, many of you are already taking action to make a positive difference. **Physics can give you the skills to understand and solve complex problems.** Not just in theory. Not just on paper. But in the real world, where there are plenty of complex problems waiting to be solved.

There are thousands of jobs to choose from – so where do you start? We've talked to people working in some exciting, rewarding industries to help you understand what their jobs involve, and to see how many amazing, unexpected places doing physics could take you.

However, we know that some people are put off choosing physics because they think it's too hard, or boring or not creative. Others are discouraged from choosing physics because of stereotypes around who they are. Too many young people are made to feel that they can't do physics, or that they just don't fit in.

Physics is for everyone and doing physics could take you anywhere. The people in this booklet may be doing very different jobs in very different places, but they have one thing in common – they all did physics at 16.

Saoirse Anton

Touring & Projects Officer,
Company Manager, Writer

I am a writer, producer and theatre critic. I'm also a feminist, optimist, enthusiast, opinionated scamp and human being. I currently work as Touring and Projects Officer with National Dance Company Wales, and Company Manager of Richard Chappell Dance, as well as maintaining an active writing career spanning poetry, theatre and film.

Cardiff



Hello, Saoirse! What gets you excited about physics?

I've always had a fascination with understanding how things work – whether that's in the mechanical sense of an object, an understanding of the world around me more generally, or even now, understanding the systems that govern the industry I work in. **I love the breadth of things physics covers – from mechanics to nuclear physics.** It always felt like a subject that had an immediate real-world application and could help fulfil my curiosity about the world.

Do you have a favourite physics memory?

I remember visiting an exhibition about CERN, the world's largest particle accelerator, on a school trip. It was fascinating. I still have the t-shirt I bought at the exhibition!

But my favourite memory is probably when, left to our own devices during an experiment on determining the focal length of a convex lens, myself and two friends realised we could do much more fun things than just focus an image, and so began creating stories across the screen with various objects we found whose images we could project.

Who did you look up to as a teenager?

Lots of people – from Irish politician, Mary Robinson, to Jane Goodall, who studied chimpanzees, to the poet, Maya Angelou. One strong thread through was an admiration of **women who defied expectations!**

“I have found that my physics knowledge appears in unexpected places.”

Did that inspire you to become someone who defied expectations?

Well, the four of us who studied physics at Leaving Cert had to go over to the boys' school next door three times a week because the girls' school didn't even offer a physics class. So, maybe!

You work in the arts now – do you still use your physics skills?

My job involves a lot of creative problem solving and planning, and the big picture logical and creative thinking involved in physics (and science in general!) definitely helps with that. While opportunities for practical applications are fairly minimal, I have found that my physics knowledge appears in unexpected places, particularly informing the poems I write. **Who could have imagined a knowledge of electrical circuits would become the basis for a love poem?**

What would you tell your teenage self if you got the chance?

Study what you love. If you get that excited buzz as you learn that makes you want to dive further into a subject and that leaves you thinking far beyond the hour of a class. **If it's the thing that sets your mind and imagination alight, then that's the thing for you.** And that might not be just one thing. You don't have to stick squarely to one path. Explore, investigate and enjoy!

Lex Millins

Student

I'm studying to be a particle physicist, which is very exciting as I'm really interested in the very big and the very small. As well as studying, I enjoy organising physics competitions and interactive events.

As a young trans person I never saw anyone like me in the physics community. I always felt like I would not belong or that it was not for me. I want young people like me to have the confidence to do physics. Although my A-levels were tough, and there weren't that many encouraging people around me at that time, I've really found my place within the physics community at university.



Birmingham



Hello Lex! What first got you excited about physics?

I always wanted to understand how the world around me worked, and the more I found out the more I wanted to know. Early in secondary school, learning about atoms and electrons, and the idea that **there was so much happening at a scale so small** was incredible to me. I also used to go out with my telescope and look at the moon and the stars. Discovering that it was possible to learn so much about things that were both so small and so big was incredibly exciting to me.

Do you have a favourite physics memory?

Making it through the first year of my degree. I finally felt like I had found my place in physics and **I had proved that I was more than capable of pursuing my passion.**

Who inspired you when you were a teenager?

I inspired myself! I often felt very lost and struggled to figure out who I was and what I should do. With fewer role models who were like me than there are now, I decided to **achieve what I was capable of** for myself and go for what would make me happiest without worrying about other people.

What route did you take into university?

I chose to study A-levels in Maths, Physics, and Chemistry as these were the subjects I enjoyed most at school, and I knew that they would provide me with **plenty of career opportunities.** What really drove me to study these subjects was my desire to understand the world around us better.

How have you overcome any challenges in your physics study?

When I was in my 2nd year of A-levels I became very unwell due to my disability, and I couldn't complete my exams. I decided to take some time off and think about my plan. Eventually I decided to go back and finish my A-levels which went better than I could have imagined when I was ill! I have often felt like I don't belong in physics because of my identity and at first felt like I had to hide myself to fit in. As I became more confident in myself and **met more people like me in physics,** I realised that there is a place in physics for everyone. Studying physics gives you so many options that you might not have even considered.

What advice would you give your teenage self about study and career choices?

Don't let others tell you what you should study, you know yourself better than anyone, and who you are does not affect your ability. So, my advice is – **have confidence in yourself and pursue what makes you happiest,** there is a place for you.

“I realised that there is a place in physics for everyone.”

Femi Bankole

IT Risk Management Consultant

I'm Femi Bankole and I'm an IT risk consultant. I work as a manager within Ernst & Young's business consulting practice in Dublin. My job is based around governance, risk and compliance of IT assets for some of the largest companies in the world. I'm a football fanatic and I enjoy gaming and playing sports in my spare time.



Dublin



Hi, Femi! What first got you interested in physics?

I like learning new and non-traditional things. I really enjoyed getting an in-depth understanding of the world around me – and beyond!

Do you have a favourite physics memory?

It was really fun to watch the movie Interstellar and to actually understand all the theories and concepts. I remember reading and watching videos for months afterwards about space theory, time travel and relativity.

Who was your role model as a teenager?

I was really inspired by Barack Obama. He demonstrated that it was **possible to break barriers in new places**.

How did you get into your current job?

During my final year of college, a few professional service firms came in to give talks around choosing management consultancy as a career and my interest was piqued from there. I like that **the role is extremely technical but mixed with lots of soft skills** that I use on a daily basis.

“Physics equips you with great critical thinking and problem-solving skills.”

Do you use your physics skills on a daily basis too?

I do! Physics equips you with great critical thinking and problem-solving skills. I need these skills every day in my current role, which is client facing and requires versatility and flexible thinking.

How do you overcome challenging situations?

I’ve always overcome challenges by knowing that with enough hard work and study, I’d eventually figure things out and work through the problem. I’ve definitely felt discouraged at times as my personality isn’t one that is stereotypically associated with someone who does physics. But **I was happy to be an example to break down the stereotypes associated with studying physics** and science subjects – anyone can do it.

Do you have any advice for someone who’s thinking of pursuing physics?

If you’re an inquisitive person who constantly finds yourself asking questions about how things work, physics is the subject for you. It **equips you with the skills to ask great questions**, but even better – it equips you with the tools to explore and understand the answers to these questions too.

Siobhan Liddle

School Physics Technician

I work as a physics technician in a school. I design and set up experiments and demonstrations, and I look after all the school's physics equipment.

I also volunteer a lot! – with Girlguiding and at science events like Edinburgh Science Festival. Volunteering has been so valuable to me and it's really rewarding and fun!

Edinburgh



Hi Siobhan! Why are you excited about physics?

I've always wanted to know how everything works. Physics has lots of answers!

You work in a school. Do you use the physics that you learned at school in your job?

I use it all every day! It's helpful to think about what I enjoyed and thought was cool, particularly when I'm setting up practicals and demos. And **I run a science club every week** which usually has a physics theme.

What skills are useful for your job?

Physics knowledge is useful, but **the general problem-solving skills I gained studying physics have been useful for every single job I've had**, from working in supermarkets, to working as a technician.

Have you overcome any challenges in your physics career?

I was a woman from a low socio-economic background on my university course.

I had to balance my work with my studies and felt left out of so much of the chat about holidays and gap years. Luckily, I found a great group of friends who valued me as myself and I'm still friends with most of them today. It was also difficult being the first person in my family to go to university. Nobody I knew had any idea of what it would be like.

What advice would you give your teenage self?

It's **impossible to know everything that's out there** and you don't pick just one thing forever. So just try things, volunteer, have some fun, build your skills and whatever choice you make next will be the right one.

“The general problem-solving skills I gained studying physics have been useful for every single job I've had.”

Mary Erlund

Equality, Diversity and Inclusion Manager

I work at the National Nuclear Laboratory as their Equality, Diversity and Inclusion manager. I'm passionate about making the workplace (and physics!) a fairer, more diverse, more open and welcoming place.



Hello Mary! What first got you excited about physics?

I don't remember exactly when that happened! I always **liked the logic of physics and the way that it conceptualises daily life** through to the complexities of our universe.

Do you have a favourite physics memory?

That's hard – I think **standing on the top of Mauna Kea in Hawaii looking at the laser guide star** (which is an artificial star created by a laser beam!) after looking around the Gemini telescope. I'd spent a lot of time in physics learning the theory of large telescopes but the reality is awe inspiring, as is what we can see with them!

Who inspired you when you were a teenager?

My Nana. In my late teens I was really ill, so my education and everything else was on pause. Nana was calm, kind and never judged.

How did you get into your current role? And what do you enjoy most about it?

I did an undergraduate degree and PhD in astrophysics, then worked in nuclear safety and became a trade union rep for Prospect. I took up opportunities that matched my interests and personal values. I like that my current role is about **making a positive difference to our workforce** and hopefully the wider industry.

“The physics way of thinking is one of the fundamental skills I brought to all my roles.”

Do you use the physics you learned in school in your current role?

I don't use the scientific detail, but I would say that the physics way of thinking is one of the fundamental skills I brought to all my roles, including my current non-technical one.

Have you overcome any challenges in your physics career?

I'm dyslexic (though only mildly), and I was ill and house bound for 4 years when I was 15. Despite the challenges of my teenage years, **I found the various evolutions of my physics career interesting and rewarding.**

What advice would you give your teenage self?

To me it's simple: a job needs to feel worthwhile, it needs to be interesting and it needs to be a good fit for you and there are jobs out there which can be these things even if you don't yet know they exist.

Kristina Bordas

AI Product Manager

My job involves using coding and computer models to make decisions about where money is invested. My physics background has definitely given me the skills to excel in my job.

London



Hello Kristina. What first got you excited about physics?

I loved things like telescopes and magnets as a child. And **being able to discover lessons for yourself through experimentation** made physics a clear favourite of mine throughout school too.

What is your favourite physics memory?

I remember viewing nano structures on an electron microscope at university. **I processed the images from these tiny, and normally invisible-to-the-eye structures – seeing them blew my mind!**

Who inspired you when you were a teenager?

As well as my grandparents, my physics teacher was really inspirational. The effort and lengths they went to include extra demonstrations was incredibly admirable and opened my eyes to the world beyond the curriculum.

How did you get into your current job?

I now work in artificial intelligence, which requires similar problem-solving skills and the ability to think about the world in an alternative way. The **computer modelling systems we're building will completely change the way we work in the future**, which is really exciting.

Have you overcome any challenges in your physics study or career?

Early in my career it certainly felt that there were opportunities open to male graduates that I was actively discouraged from applying for. Finance was a very male dominated place at the time and I was aware going into the field that **I might be expected to prove myself more** than my male peers.

Do you use the physics you learned in school in your current role?

I think school physics encourages you to start exploring around a base topic and **gather proof for yourself** with experiments or further research. I use these skills a lot now when creating prototypes of AI products. I have to judge the success or failure of an idea purely on data.

What skills are useful for your job and for the industry you work in?

Working in the rapidly changing field of artificial intelligence I'm constantly learning about new concepts and then experimenting with potential applications and expanding on the ideas of others. Physics teaches you to use assumptions when appropriate in order to make progress on a problem. I use that today to make sure we don't get stuck in the detail when the bigger picture can actually teach us more.

“Physics teaches you to use assumptions when appropriate in order to make progress on a problem.”

Jade May

Optical Engineer

My name is Jade and I'm an Optical Engineer at Valeo Vision Systems. I'm responsible for the quality testing of lenses and cameras for imaging systems that will eventually be used in self-driving vehicles! In my free time, whenever I can get it, I am a guitarist and a gamer.



Hello, Jade! What was your first experience of physics?

My first experience of physics was failing my pre-exam for Leaving Cert. I went back and read the whole textbook from start to finish – I just had to understand it! It clicked when I reached the section on magnetism. Before that, equations were just something to be learned. But **seeing equations where the variables weren't just interchangeable letters, they represented actual physical ideas... it was satisfying!**

It felt elegant to be able to use an equation to describe something that I could actually visualise.

How did you get into your current job?

I worked with Valeo for my work placement in my third year of college. When I graduated, the COVID-19 pandemic was in full swing and there were very few jobs available because of all the uncertainty. But because Valeo knew and trusted me from working with me before, I was able to get a job within six months.

So, your work experience was important!

It made all the difference. It was the only work experience I had, but it was enough. If you graduate and aren't sure what your options are, I'd say **even one bit of work experience can make the world of difference**. Massive bonus points if it's in the same industry you want to work in. And if it's the same company you want to work with, even better.

"I was able to get a job within six months."

Did you ever face any challenges in pursuing physics?

In college, I was surrounded by people constantly making self-deprecating jokes about all physicists having something wrong with them. **Don't believe it!** Putting yourself down to make other people laugh eventually affects how you see yourself and no matter how much it might feel like it, it's definitely not a requirement for having a great college experience.

Now that I'm in the workplace, being openly trans is something that I'm still figuring out. I'm working on being less afraid to dress in ways that make me feel comfortable, regardless of whether people around me know why. I don't really know how I'm going end up saying it but from the experience of coming out to other people, eventually you just do. That's how I overcome the challenge; knowing that it'll pass no matter what because **there's no alternative to being myself** that is worth it.

What advice would you give your teenage self?

Do what makes you happy. The exact choice you make doesn't matter. What matters is that you know why you made it and that it was what you wanted. That's the single most valuable piece of advice I can give anybody.

Bethany Cousins

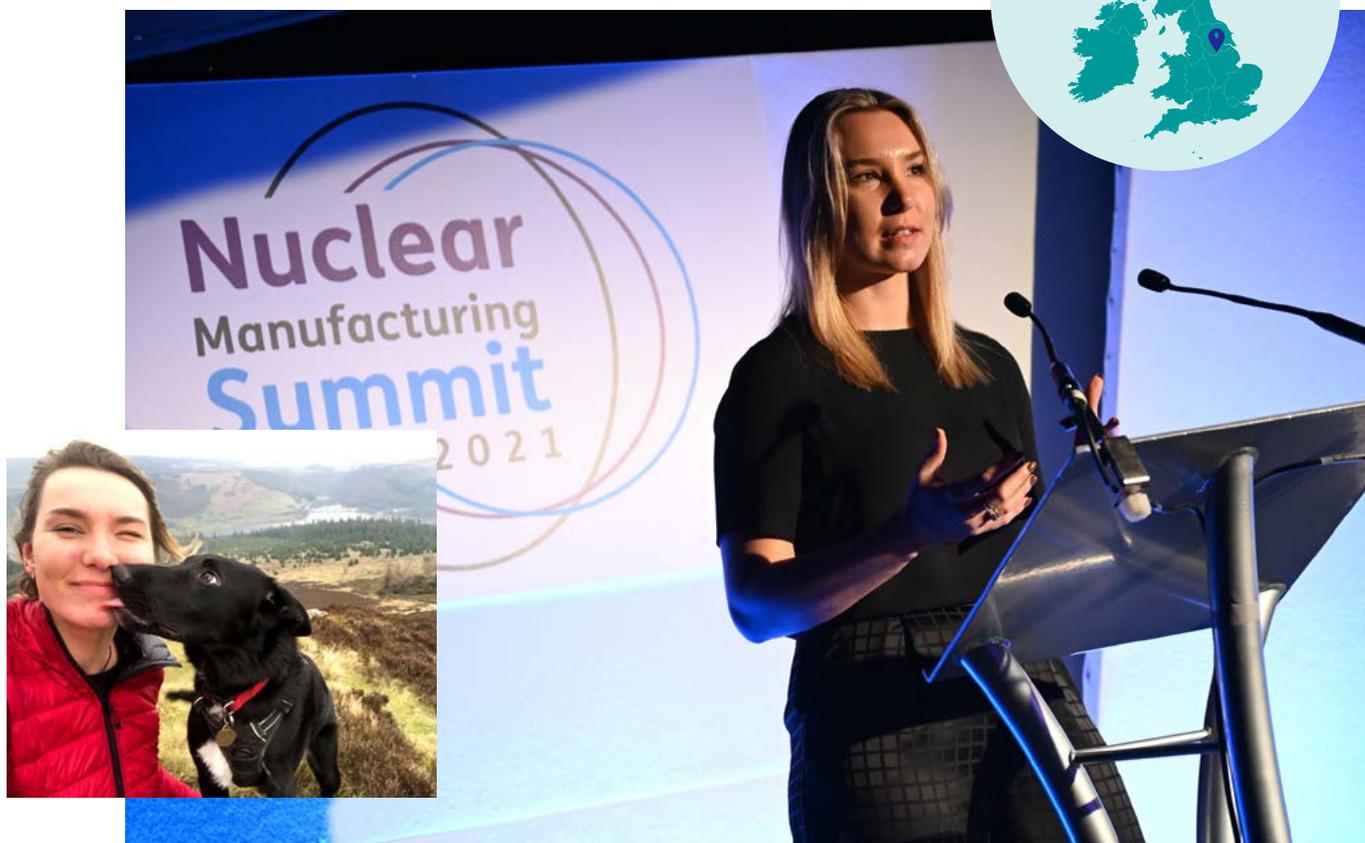
Manufacturing Engineer

I work at the University of Sheffield Advanced Manufacturing Research Centre (AMRC) in the Machining Group. We do lots of development work trying to improve processes or develop new machining methods for use in industry.

Hi Bethany! What first got you excited about physics?

In school I did quite well in physics and was lucky to have a teacher that made the subject engaging and interesting. However, the subject still seemed like you were solving the problems and learning the maths for no specific reason. As soon as I began to consider a career in physics and engineering, I could see that the work we were doing in lessons could contribute to solving real-world problems.

Sheffield



Who inspired you when you were a teenager?

It's hard to pinpoint just one person who was an inspiration but I think it's important to recognise that there have been so many women who have made great discoveries and contributions to science. Ada Lovelace, Marie Curie and Rosalind Franklin are some of the more well-known but **I would encourage anyone interested in science, technology, engineering or maths to seek out and learn about some of the women whose names are less well known** but have been impressive pioneers in these fields.

How did you get into your current job?

After my A-levels I was accepted onto a BTEC Level 3 apprenticeship at AMRC Training Centre, employed by the AMRC. The first year was at the training centre learning the basic manufacturing techniques and practical skills I needed to become a technician. I then worked for 18 months as a technician and was treated just like any other employee. Throughout my apprenticeship I spent four days a week getting hands-on experience, and one day a week in the classroom on academic study.

After my apprenticeship, I progressed onto a HNC and then a HND qualification. The AMRC continued to sponsor me and allow me to study one day a week. I now had the job title of Machine Operator and I worked on larger research projects.

I then progressed onto a Level 7 degree apprenticeship. At the same time, I also became a Project Engineer. This is a role which would **usually require a degree but due to my apprenticeship background it was accepted that I already had the required background knowledge** and five years' experience at the company.

Due to my HNC and HND I was able to complete the degree in two years instead of the usual three! And two years on have the job title of Manufacturing Engineer, where I have more responsibility.

Do you use the physics you learned in school in your current role?

There are some aspects of physics in every research project I complete at the AMRC.

In engineering, **you continually apply physics to real-world situations to solve and understand problems** and, at the AMRC, we aim to resolve these problems through physics-based techniques.

What skills are useful for your job and for the industry you work in?

I would say anyone with a physics background would be able to find an engineering-based career.

An important skill is **the continuous desire to keep learning**; with engineering there is always something new and exciting in development.

A practical understanding helps in a lot of cases, and communication is always key. The more we all work together and collaborate often the better the result and the faster we can get there.

What advice would you give your teenage self about study and career choices?

I would tell myself to look at all the options that are available. The apprenticeship route has given me a wealth of background knowledge matched with 'hands-on' experience. I've **progressed much faster** and reached the position I have much sooner than I would have done if I had taken an alternative route.

Dipendra Mistry

Student

Hi, I'm Dipendra. I grew up in Essex and was the first one in my family to go to university. I always knew I loved physics but made sure a degree course would be right for me. It was here that I discovered my passion for medical physics. I am truly grateful that I have had the opportunity to work on problems that help society.



Nottingham



What first got you excited about physics?

From a young age, I remember being **fascinated by how things worked**, and I used to constantly ask my dad for answers. One of my biggest sources of inspiration was sci-fi and superhero movies – I always wanted to be one of the scientists that invents cool tech and uses their wits to save the world!

What is your favourite physics memory?

Watching a liquid nitrogen experiment at a university open day – I was mesmerised and I still love seeing that same experiment today. It's cooled to -196°C to get it to be a liquid!

Who inspired you when you were a teenager?

At school I was fortunate to meet Mr Harper, my GCSE physics teacher, who changed the course of my life. He **inspired and encouraged me daily to keep at the subject, despite my low grades** in mock exams. After a lot of hard work and patience I passed my GCSEs and that set me on the course to becoming a physicist.

How did you get to where you are today?

What do you enjoy most about what you do?

I love to solve problems and understand the world through the lens of physics. I was inspired to study at university after college to continue this journey and be the best I could be in this exciting field. I most enjoy understanding something from basics and then seeing how it can apply to our lived experience.

Have you overcome any challenges in your physics study or career?

As the first person in my British Asian family to consider university I was naturally scared and apprehensive, and naturally so were my parents. So, **to get a taster for this life, I secured a place on a week-long summer school** at Oxford University to study physics. This was a memorable experience during my A-levels and I also found my real interest in physics. After attending a talk on MRI scanners, machines that use magnetic fields and radio waves to scan and produce images of the body, I knew my heart was set on specialising in medical physics.

What advice would you give your teenage self about study and career choices?

Do what you enjoy!

“I am truly grateful that I have had the opportunity to work on problems that help society.”

Helen Johnson

Data scientist

As an astrophysics researcher, I used the world's largest telescopes to “time travel”, studying the Universe as it was billions of years ago. Now, as a data scientist for Co-op, it's my job to make predictions about the future! I'm passionate about diversity, and I work with volunteer organisations to show that science and technology are for everyone.

Hi Helen! What first got you excited about physics?

I think I've always loved science. Growing up, I constantly had my nose in a book and was curious about how the world worked. I collected bugs in the back garden, ran Chemistry “experiments” in the garage, and had glow-in-the-dark stars on my bedroom ceiling.

It wasn't until A level that I discovered my passion for Physics. Learning about sub-atomic particles, relativity, and astronomy just blew my mind.



Who inspired you when you were a teenager?

My parents were my main inspiration. They encouraged me to be curious, work hard, and push boundaries, and they believed that **I could achieve anything I set my mind to**. I also had some wonderful teachers, particularly at A Level. However, **Physicists in the media and in books were never people I could identify with**. They were always quirky, wild-haired men from posh Universities, and I was a shy teenage girl from a Liverpool state school.

Does your physics background help in your current job?

I switched from the study of distant galaxies to a job as a data scientist at Co-op. This might sound like a brave career move, but the two industries actually have a lot in common. I use the skills I learnt as a Physicist to make sense of massive amounts of data. I approach complex problems in a logical way, I ask lots of questions, and I keep going even when things get tough. Physics taught me that **it's okay not to have all the answers – being challenged is how we grow**.

Problem-solving and independent research are also really important. Data science is a relatively new field, so I spend a lot of my time reading blogs, trying out pieces of code, and getting stuck. Collaboration and good communication are also key – **working in tech doesn't mean slogging away at a keyboard on your own!** Within the team, we're always encouraged to share ideas and learn from each other, and outside of the team, we often need to break down technical concepts so they can be understood by other people. My science outreach work has been perfect preparation for this.

Have you overcome any challenges in your physics career?

My biggest struggle has been finding my confidence. When I arrived at university, only one in five of my Physics class were women, and many students had a private school education or parents who had been to University. The course was tough, and I was full of doubt. Thirteen years later, I have an Astrophysics PhD and brilliant memories of my time in Durham. But the imposter syndrome does still creep in sometimes. For anyone else who struggles, my advice is this. **Listen to the people who know you best, who believe in you, and who are cheering you on**. You are capable of so much more than you know.

What advice would you give your teenage self?

I would tell her that it's okay to feel uncertain about the future. The unexpected twists and turns are what make life exciting. Work hard, learn as much as you can, and most importantly, believe in yourself. My biggest regret is that I spent so much time comparing myself to other people. Focus on your own journey, do what makes you happy, and you'll be just fine.

“I use the skills I learnt as a Physicist to make sense of massive amounts of data.”

Emily Gleeson

Meteorologist

I'm Emily Gleeson and I'm from Thurles in Co. Tipperary. I have a degree in Physics and Chemistry and a PhD in physics. At university worked on a project that measured remnant radiation from the Big Bang! Now I'm working as a meteorologist with Met Éireann, studying the weather and climate, using data from the land, sea, and atmosphere.



I'm on my second course of professional Irish. My hobbies include travel, especially to the Arctic, theatre, escape rooming, learning the drums in the National Concert Hall, and hiking around Ireland.

Hi, Emily! Can you tell us what first got you interested in physics?

Learning science in secondary school! I always liked maths and then got into science and physics. The school I went to had great labs and all the equipment. My teachers definitely inspired me to study science.

How did you get into your current job?

Another student told me about jobs in Met Éireann. I love extreme weather, so I applied. And here I am!

Do you still use the physics you learned in secondary school?

Of course! Physics is problem solving, so the methods can be applied to any scientific or technical task. **I now lead a team in Europe who develop the physics of the weather model that we use for operational weather forecasting.** I specialise in solar radiation, radiation-aerosol interactions and surface physiography – so both surface and upper-air physics. My job requires lots of different skills. Problem solving, definitely, but also communication, adaptability, teamwork and patience.

“There are so many different paths.”

What do you like best about your role?

I love my job because it's also my hobby. **Every day is different** and there are so many different aspects to the job. And so many opportunities within the organisation! I work with so many fantastic people in Ireland and all over Europe.

Do you have any advice for someone who's considering studying physics?

To steal a line from Dr Seuss, **you can steer yourself in any direction you choose!** I've gone from submillimetre astronomy, to engineering in Intel, to weather forecasting, to climate change modelling, to short range numerical weather prediction model development. There are so many different paths.

Amy Oana

Clinical Scientist in Medical Physics

I'm a clinical scientist in medical physics. Being a clinical scientist means that I get to help improve diagnosis and treatment of patients. Medical physicists working in hospitals help to decide how best to use treatments such as radiotherapy to help patients with cancer, and work with medical imaging equipment to help produce good images for diagnosing patients.



Hello Amy! What gets you excited about physics?

I've always loved to know how things worked, and from a young age I was always asking 'but why?'. For a long time, I wanted to be an astronaut. When I started studying science and then physics in high school, I realised how much physics there was in everyday life, and that's when I decided I wanted to go on to study it further.

Do you have a favourite physics memory?

My favourite physics memory is visiting the medical physics department in my local hospital for a few days. I had thought about doing medical physics but had heard it was really competitive and I never thought I'd be able to get into it. **Being able to shadow physicists showed me how much of a variety there is to the job.** It gave me so much motivation to apply to see if I would be able to train to do it too.

What's the best thing about your job?

There are a lot of things I enjoy about my job, but the part I enjoy most is the variety. Clinical scientists in diagnostic radiology and radiation protection get involved in lots of different tasks, from testing x-ray equipment to make sure the images produced and radiation delivered are what we would expect, to assessing shielding of areas to check staff and patients are protected from radiation that doesn't have a clinical benefit to them. **I love being able to learn about new technologies** or treatments being introduced.

Do you use the physics you learned in school in your current role?

The basic physics such as the properties of electromagnetic radiation is something that I use all the time in my current job, as electromagnetic radiation is central to medical imaging. The health physics topics we covered, such as the basic concepts of radioactivity, also form the basis of a lot of

“There are a lot of things I enjoy about my job, but the part I enjoy most is the variety.”

the knowledge I use to do my job every day.

I use not only the knowledge that studying physics has taught me, but also the skills, such as applying problem solving skills to troubleshoot issues we sometimes come across when testing x-ray equipment.

What other skills are useful for your job?

One of the **most important skills for a clinical scientist is to be able to work together with others.** In my job, I work a lot with radiographers who can give me an insight into how things work from the patient side. I also work with laboratory staff to make sure they have everything they need from a radiation protection standpoint.

Did you ever face any challenges in pursuing physics?

I was the only woman in several of my university classes. I was lucky to have brilliant course-mates who always made me feel included. It is sometimes difficult to keep going when you don't really see yourself represented and it can make you feel like maybe you're not meant to be there. But **attitudes definitely are changing in science for the better.**

What advice would you give your teenage self?

Just because something appears to be competitive, don't let that discourage you from applying! Let your enthusiasm drive you. And don't worry about not knowing enough to do something. There's always time to learn and develop your skills, even if it doesn't feel like it.

Mahfuj Ali

Data Analyst

My interest in learning how the world works and exploring by experimentation has led to me to working with data in the financial sector for a company called Deloitte.

Although I didn't have many role models growing up, I'm glad I studied physics. I enjoyed it greatly and it gave me the skills I need to do the job I love.

Hello Mahfuj! What first got you excited about physics?

I have always wanted to understand how things around me worked. This started with opening up household appliances when they broke to have a look inside and building home-made boats using bottles, but also included helping my dad around the house with DIY to fix things; and watching documentaries about science and engineering. These experiences naturally led me to study physics.



Do you have a favourite physics memory?

My earliest memory of physics was in school. I was about ten years old and we were learning about electrical circuits. We had batteries, bulbs and wire, and a basic diagram on the whiteboard to try and copy. I remember being fascinated by seeing the brightness of the bulbs changing when varying the number of cells or bulbs in the circuit. I love this memory as it shows that **everyone can discover science for themselves by experimenting** whether you are familiar with the scientific concepts or not, it's always exciting to figure something out for yourself.

Who inspired you when you were a teenager?

My older sister inspired me as a teenager. Being a South Asian woman and going off to study chemistry at university, at the time, for a second-generation immigrant was quite a feat. I admired her courage and determination to study. Jim Al-Khalili's documentaries on BBC were what got me into physics. His ability to explain to the audience in just the right amount of detail kept me engaged and intrigued.

How did you get into your current job? And what do you enjoy most about it?

I had worked in geophysics for almost a year, but soon discovered that the part of my job I most enjoyed was data analysis. Since moving to Deloitte and working as a data analyst I genuinely enjoy my work and love problem solving. While I continue to learn, the **most fulfilling part of my job is building brand new tools and solutions to solve problems** for my clients and having a product at the end that I can be proud of having developed.

What skills are useful for your job?

There are two things that I got from studying physics that are vital to my work as a data analyst. Firstly, being able to collect data from experiments or simulations and then making sense of that data; and secondly, being able to take a complex process and break it down into smaller manageable components. I would say the **ability to communicate complex topics in a simple way** really helps too.

Have you overcome any challenges in your physics career?

The biggest challenge for me wanting to pursue physics was not having any role models who also studied physics in my life. Those that I did come across who studied physics, I couldn't relate to as they didn't look like me or come from the same background. I overcame these challenges by diving headfirst into each experience and figuring it out as I went along.

What advice would you give your teenage self about study and work choices?

I wish I was given more encouragement that I could achieve something rather than just going out there and hoping for the best. Being on this path has really helped me grow as a person, especially studying abroad. This was completely out of my comfort zone and really pushed me to my limits. I would tell my younger self to **try and do something abroad earlier on**, be it backpacking, volunteering, an internship, studying or working.

“I'm glad I studied physics. I enjoyed it greatly and it gave me the skills I need to do the job I love.”

Maria Dugdale

Company Founder

At university, I did a PhD in particle physics. After that I worked as a lab manager in a spin-off company, and shortly afterwards set up my own business. We design sensors for detecting natural radiation and that from nuclear reactors. I enjoy the freedom that comes along being your own boss and the freedom to pursue work that looks interesting.

I also love talking about science and spent lots of time as a student doing interactive shows about space for schools and families.

Bristol



“Realising that you can use basic physics to explain exciting things happening in the universe is amazing!”

Hello Maria! What first got you excited about physics?

A space show in a planetarium got me excited about space. As I grew up, I learned that to understand how space works you need to understand physics. Realising that **you can use basic physics to explain exciting things happening in the universe** is amazing!

Who inspired you when you were a teenager?

My physics teacher was great – they explained everything really well and was great and showing us extra things to stimulate our interest.

What skills are useful for your job and for the industry you work in?

I think it's the overall problem-solving skill set you have to develop studying physics.

Have you overcome any challenges in your physics career?

There were definitely some adults that weren't very encouraging, and some patronising remarks. **As a teenager it wasn't always easy to like physics** when other kids saw me as different. So I didn't shout it out loud.

I was told by one of my teachers that physics wasn't for me, but fortunately my physics teacher was very inspiring. I'm so glad I did- not only did it give me the skills and knowledge to understand space (my first inspiration) but I use those daily in both my job and in my life.

What advice would you give your teenage self about study and career choices?

I would point out that **physics doesn't mean you'll spend your life in a lab**, you can do many different things because it's the problem-solving skills you develop that are so very powerful.

Abbey Barnard

Student

Hi, I'm Abbey. I'm in the middle of my third year of university studying physics. Even though I've always loved physics, nobody in my life told me I could make that into a job or had much interest in it themselves. I'm so glad that this is what I chose to do. I think physics should be for everyone, if that's what they want to do. After finishing this degree, I will start on a PhD where I'll get to pick what I focus on. I can't wait.



Lancaster



Hi Abbey! What first got you excited about physics?

Even though my parents had no interest in science, my grandparents would take me to Jodrell Bank Observatory, where I could see the telescopes that astronomers use to see the stars.

Do you have a favourite physics memory?

When I went to CERN with my school! CERN is on the border of Switzerland and France. It's the largest particle physics lab in the world and most of it is underground! I stepped off the tram in front of the main building on the most beautiful day of the trip so far and cried, because it was a place I had heard so much about and had aspired for a long time to work there.

Who inspired you when you were a teenager?

As well as my grandparents, my physics teacher was really inspirational. The effort and lengths they went to include extra demonstrations was incredibly admirable and **opened my eyes to the world beyond the curriculum.**

What route did you take into physics?

I had wanted to be everything other than a physicist before I chose physics. The idea I got from my parents was that work wasn't supposed to be fun, but once I saw the career options provided by studying physics, I realised **I could make my lifetime hobby into my job.**

Have you overcome any challenges in your physics study?

My own parents and stepparents told me that physics research was pointless, I would never be able to compete against a man doing the same job and that I would end up in a retail job anyway. Also being from a low-income, single-parent family I knew I wouldn't be able to rely on them for financial help if I studied at university.

People used to make me feel uncomfortable for doing a subject that they didn't see as feminine, but I have now surpassed my peers and **proved to my parents that women can do physics.** Having come from a low-income, single-parent family I didn't receive any help in school from my parents relating to my choice to do physics.

What advice would you give your teenage self about study and career choices?

I would tell my teenage self to care less about what other people thought, and to not let them stop me from achieving what I wanted to achieve. Regardless of what people say, you can do whatever you want.

“Once I saw the career options provided by studying physics, I realised I could make my lifetime hobby into my job.”

Pathways to jobs

How to find your way

School and university

Depending on where you live, from the age of 16, you can choose to study a physics A level, Higher, or Leaving Certificate. You will delve deeper into topics you have already covered to give you a solid grounding in the fundamentals of physics but also in exciting new areas of cutting-edge research. You'll develop the tools needed to tackle questions about the universe that you've always wanted to answer for yourself.

Many physics students go on to further study at university. Some choose to continue with physics, studying a physics degree or specialising in topics like theoretical physics, astrophysics or geophysics. Others choose related subjects like chemistry, biology or maths – but physics also opens pathways to subjects like engineering, design, computing, sports science, medicine, economics and law.

Developing practical skills

A great option if you like to learn by doing – choosing a technical course doesn't mean saying goodbye to physics. Technical courses are designed in collaboration with industry, and they can provide you with skills and knowledge that employers value. You put what you learn into practice through assignments set in real-life scenarios, offering a more direct route into the workplace.

Technical qualifications can also be a pathway to university. Most universities are happy to consider candidates with technical qualifications.



Learning as you work

Apprenticeships are real, paid jobs with training programmes attached. Apprentices earn while they learn, gaining valuable skills and knowledge.

Apprenticeships are designed by employers, so they help you to develop the sorts of skills that employers really want. Your qualification and work experience will help you stand out to future employers and support your long-term career plans. You'll gain job-specific skills while earning a wage and getting time for study related to your role (usually one day a week).

There's a huge range of apprenticeship opportunities to choose from – physics, engineering, laboratory technician or metrology, to name a few!

These are not the only routes into jobs. Physics opens doors to a multitude of job opportunities because of the skills and ways of thinking it teaches you. It is often the types of skills workers have that matter to many employers, rather than just their level or the route through which they were acquired. As you will have seen from this booklet, finding your way is often not a straight line; it is ok to change your mind and explore other options. There is a route that is right for you.

Supporting young people on their journey

As a family member, teacher, friend or mentor, you have a huge role in influencing your young person's choices and opinions. Every young person should have the chance to build their future and to change their world for the better. Now, more than ever, we need to support young people to tackle global challenges and make a positive difference.

Doing physics equips young people with an amazing range of skills – skills that can take them further into physics, or in another direction entirely.

Doing physics opens doors to some of the most exciting, cutting-edge, rewarding jobs in the world. From cancer treatment to tackling climate change, gaming, robotics, and artificial intelligence, people with physics in their background are on the front line, helping to shape the future.



Did you know that:



1 in 20 (or 1.85 million!)

jobs across the UK and Ireland make use of physics skills and knowledge.



Demand for physics skills

is widespread across critical industries, in **engineering, construction, manufacturing, energy** and **transport**, as well as in **business** and **finance, digital, teaching, health**, and the **public sectors**.



Physics skills and ways of thinking are

valuable to a wide variety of careers

and are valued and recognised by employers. In a **survey** commissioned by the IOP in **2020**,

78% of employers

across the UK's professional sectors, including **legal, sales, media** and **marketing** said that they have a positive impression when they see a candidate has studied physics to A-level or above.



Jobs related to physics are well paid



You don't need a degree

to access physics-related jobs. In fact, more than half of all jobs that demand physics do not typically require a university degree. Many require qualifications such as **A Levels, Highers, Leaving Certificate, apprenticeships** or **technical qualifications**.



iop.org/LimitLess

Limit Less is the campaign to encourage and support young people to change the world and fulfil their potential by doing physics. It seeks to challenge the misconceptions and stereotypes about the subject and remove the barriers to young people doing physics beyond the age of 16.

Parents, carers and teachers: sign up as a Limit Less supporter to receive more information and updates on the campaign by visiting: iop.org/strategy/limit-less

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