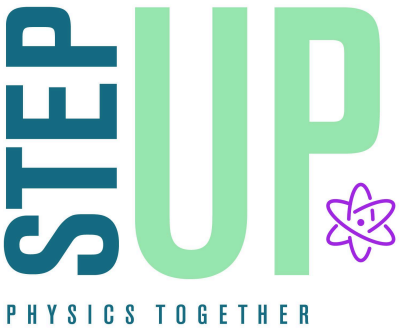
Fusion Energy/Plasma Science Career Profiles



Developed by APS Public Engagement

modeled after the STEP UP Careers in Physics Online Matching Tool

This tool can be used for any level. It matches students to relevant fusion energy/plasma scientists' profiles based on their interests and values. They can then research, create their own profiles, and discuss with the class. Encourage your students to take this interactive Career Matching Survey to see what fusion energy/plasma science careers fit them best.

STEP 1: Provide students with the following survey. Have them think about what career types excite them and what they think they will value in their job.

Q1. Mark the **three** most important factors for your future career satisfaction:

- ❑ a. Making money
- ❑ b. Helping other people
- ❑ c. Having job security
- ❑ d. Working with people
- ❑ e. Having lots of family time
- ❑ f. Having an exciting job
- ❑ g. Making use of my talents/abilities
- ❑ h. Ability to tinker
- ❑ i. Impact sustainability and society

Q2. Mark **two** areas you are most interested in:

- ❑ a. Administration/Management
- ❑ b. Arts/Media
- ❑ c. Astronomy
- ❑ d. Biology
- ❑ e. Chemistry
- ❑ f. Computer Science
- ❑ g. Education/Academia
- ❑ h. Engineering
- ❑ i. English/Writing
- ❑ j. Finance/Business/Consultancy
- ❑ k. Medicine/Health
- ❑ l. Physics
- ❑ m. Technology
- ❑ n. Math
- ❑ o. Government/Public Policy/Social studies
- ❑ p. Psychology/Philosophy

Profile Matching Matrix

How to use the table:

1: Have students look at their responses to Question 2 (Q2, left-most column) and mark (highlight, star, circle) the rows that match their responses.

Example: *Sally chooses **e** (Astronomy) and **j** (Arts/Media) for **Q2**. She goes to the table and sees three people listed for **Q2e** and two for **Q2j**. Once she highlights/circles the responses she moves on to the next step.*

Q2	PROFILES	Q1						
		a	b	c	d	e	f	g
e	Kelle Cruz - Astrophysicist	-	-	-	✔	✔	✔	✔
e	Gabriela Gonzalez - Astrophysicist	✔	-	✔	✔	-	✔	-
e	Sara Seager - Astronomer and Planetary Scientist	✔	-	✔	-	-	-	✔
j	Dianna Cowern - YouTuber	✔	✔	-	✔	-	✔	✔
j	Laura Kasian - Production Technician/Software Engineer	✔	-	✔	-	-	✔	✔

2: From the groups marked in Step One, mark the columns she chose for Question 1 (Q1, columns on the right) noting that ✔ indicates recommended profiles to read and " - " denotes a less relevant profile to read.

Example: *For **Q1**, Sally picks **b** (helping other people), **d** (working with people), and **e** (having lots of family time). She goes to the table and highlights or circles columns matching her responses, taking note of every one that has a ✔.*

Q2	PROFILES	Q1						
		a	b	c	d	e	f	g
e	Kelle Cruz - Astrophysicist	-	-	-	✔	✔	✔	✔
e	Gabriela Gonzalez - Astrophysicist	✔	-	✔	✔	-	✔	-
e	Sara Seager - Astronomer and Planetary Scientist	✔	-	✔	-	-	-	✔
j	Dianna Cowern - YouTuber	✔	✔	-	✔	-	✔	✔
j	Laura Kasian - Production Technician/Software Engineer	✔	-	✔	-	-	✔	✔

3: Once all the responses have been marked, find the people selected that have the most ✔ marks that match the student's responses.

Example: *Sally highlights/circles her choices in yellow and sees that two profiles have the same number of ✔ marks. She then reads the job title of the profiles that have tied with the highest number of ✔ marks and chooses the one she finds most interesting.*

Q2	PROFILES	Q1						
		a	b	c	d	e	f	g
e	Kelle Cruz - Astrophysicist	-	-	-	✔	✔	✔	✔
e	Gabriela Gonzalez - Astrophysicist	✔	-	✔	✔	-	✔	-
e	Sara Seager - Astronomer and Planetary Scientist	✔	-	✔	-	-	-	✔
j	Dianna Cowern - YouTuber	✔	✔	-	✔	-	✔	✔
j	Laura Kasian - Production Technician/Software Engineer	✔	-	✔	-	-	✔	✔

STEP 2: Have the student follow the direction above to find profiles of fusion energy/plasma science scientists that match their interests and values. Have the students read the profiles for one or two of their matches.

Profile Matching Matrix

After completing the **Career Goals Pre-Survey**, find which career profiles best fit your response using the table below. See next page for instructions.

Q2↓	**Q1 Responses →** **Profiles↓**	**Q1a**	**Q1b**	**Q1c**	**Q1d**	**Q1e**	**Q1f**	**Q1g**	**Q1h**	**Q1i**	**Q1j**
Q2a	Matthew Munderville	✔		✔	✔	✔	✔	✔			
Q2a	Brad Smith				✔		✔	✔			
Q2a	Caroline Anderson		✔		✔		✔	✔			
Q2b	Wataru Hayashi			✔	✔		✔				
Q2b	Alex Tinguely	✔	✔	✔	✔		✔	✔			
Q2b	Leonardo Corsaro				✔		✔	✔			
Q2b	Rogerio Jorge				✔		✔	✔			
Q2b	Vincent Ritola		✔			✔	✔	✔			
Q2c	Dave Schlossberg				✔		✔	✔			
Q2c	Angelica Ottaviano		✔		✔	✔		✔		✔	
Q2c	Daniel Andruczyk		✔		✔	✔	✔	✔			✔
Q2c	Caroline Anderson		✔		✔		✔	✔			
Q2c	Nikolai de Boucaud	✔					✔	✔			
Q2d	Brad Smith				✔		✔	✔			
Q2d	Jenn Scarborough		✔		✔		✔	✔			
Q2e	Daniel Andruczyk		✔		✔	✔	✔	✔			✔
Q2e	Jenn Scarborough		✔		✔		✔	✔			
Q2f	Erica Salzar		✔		✔		✔				
Q2f	Wataru Hayashi			✔	✔		✔				
Q2f	Dave Schlossberg				✔		✔	✔			
Q2f	Leonardo Corsaro				✔		✔	✔			

Q2f	Daniel Andruczyk		✔		✔	✔	✔	✔			✔
Q2f	David Pace		✔		✔			✔			
Q2f	Vincent Ritola		✔			✔	✔	✔			
Q2f	Mario A Morales			✔	✔			✔			
Q2f	Jessica Wu	✔	✔	✔		✔	✔	✔			
Q2g	Alex Tinguely	✔	✔	✔	✔		✔	✔			
Q2g	Rogerio Jorge				✔		✔	✔			
Q2g	Brad Smith				✔		✔	✔			
Q2g	Jenn Scarborough		✔		✔		✔	✔			
Q2g	Andrew "Oak" Nelson		✔			✔		✔			
Q2g	David Pace		✔		✔			✔			
Q2g	Robert J. Davis		✔		✔		✔	✔			
Q2g	Jessica Wu	✔	✔	✔		✔	✔	✔			
Q2h	Amanda Hubbard				✔		✔	✔	✔		
Q2h	Daniel Andruczyk		✔		✔	✔	✔	✔			✔
Q2h	Erica Salzar		✔		✔		✔				
Q2h	Wataru Hayashi			✔	✔		✔				
Q2h	Jenn Scarborough		✔		✔		✔	✔			
Q2h	Andrew "Oak" Nelson		✔			✔		✔			
Q2h	Robert J. Davis		✔		✔		✔	✔			
Q2h	Nikolai de Boucaud	✔					✔	✔			
Q2h	Vincent Ritola		✔			✔	✔	✔			
Q2i	Matthew Munderville	✔		✔	✔	✔	✔	✔			
Q2i	Angelica Ottaviano		✔		✔	✔		✔		✔	
Q2i	Jenn Scarborough		✔		✔		✔	✔			
Q2i	Robert J. Davis		✔		✔		✔	✔			
Q2i	Caroline Anderson		✔		✔		✔	✔			
Q2i	Maria Gatu Johnson				✔		✔	✔			

Q2j	Brad Smith				✔		✔	✔			
Q2j	Matthew Munderville	✔		✔	✔	✔	✔	✔			
Q2j	Jessica Wu	✔	✔	✔		✔	✔	✔			
Q2j	Caroline Anderson		✔		✔		✔	✔			
Q2k	Alex Tinguely	✔	✔	✔	✔		✔	✔			
Q2l	Wataru Hayashi			✔	✔		✔				
Q2l	Rogerio Jorge				✔		✔	✔			
Q2l	Angelica Ottaviano		✔		✔	✔		✔		✔	
Q2l	Jenn Scarborough		✔		✔		✔	✔			
Q2l	Dr. Kathreen Thome		✔		✔			✔			
Q2l	Andrew "Oak" Nelson		✔			✔		✔			
Q2l	Daniel Brian Sinars		✔		✔			✔			
Q2l	Amanda Hubbard				✔		✔	✔	✔		
Q2l	Nikolai de Boucaud	✔					✔	✔			
Q2l	Maria Gatu Johnson				✔		✔	✔			
Q2m	Wataru Hayashi			✔	✔		✔				
Q2m	Erica Salzar		✔		✔		✔				
Q2m	Dave Schlossberg				✔		✔	✔			
Q2m	Leonardo Corsaro				✔		✔	✔			
Q2m	Daniel Andruczyk		✔		✔	✔	✔	✔			✔
Q2m	David Pace		✔		✔			✔			
Q2m	Robert J. Davis		✔		✔		✔	✔			
Q2m	Vincent Ritola		✔			✔	✔	✔			
Q2m	Mario A Morales			✔	✔			✔			
Q2m	Jessica Wu	✔	✔	✔		✔	✔	✔			
Q2n	Dr. Kathreen Thome		✔		✔			✔			
Q2o	Jenn Scarborough		✔		✔		✔	✔			

STEP 3: Read 1-2 Physicist Career Profiles

Wataru Hayashi - Graduate Student Researcher

I was born and raised in a small town called Hilo on the island of Hawaii. From elementary through high school, I was involved in robotics clubs where I learned skills in mechanical and electrical engineering as well as programming. I still use many of these skills today as part of my work on experimental plasma fusion devices. After high school, I attended the University of Nevada, Reno where I received a Bachelor of Science in physics and I am now pursuing a PhD in plasma physics at the University of California, Irvine.

My PhD work involves experimental research of fast charged particles (ions) with the Large Helical Device in Japan. I am also involved in the development of a similar test at the DIII-D device in San Diego. Overall, my research requires an understanding of plasmas physics, computer science, and diagnostic instrumentation. My work is conducted through international collaboration which involves managing communication between various teams and traveling around the world.

Outside of work I spend most of my time dog sitting, learning new languages, sewing and repurposing clothes. I also volunteer as an educator in the annual Journey Through the Universe program in my hometown to teach various STEM concepts to K-12 students.

www.linkedin.com/in/wataru-hayashi-329bab1b5/

Matthew Munderville - Program Director

My career in fusion began in a high school Physics class. My teacher, Mr. Arnold, introduced me to the laws of motion and gravity; to the nature of sound and light; to the basic principles of electricity and magnetism. I started to wonder, to really think about, how the world worked—everything from cars and computers to the magic systems in my favorite books. But most importantly, Physics solidified an approach to problem solving—questioning, hypothesizing, attempting to understand—that has served me in every job since and which, frankly, shapes how I view my place in the world.

While I quickly realized in my college years that my place was not in the lab, I knew that I needed to work on something tangible—on hardware—to feel fulfilled. I thrived in small companies and tech start-ups, where I could employ this problem solving approach (with a "broad, not deep" understanding of physics and engineering) to connect research and lab work to the outside world—everything from project formulation and funding to product commercialization and adoption (yes, even sales!).

Fusion is the ultimate technology challenge—the Holy Grail of energy, eluding the brightest minds on the planet for more than half a century. When achieved, it will change our civilization forever. But for today, with kids of my own, I spend my time managing the R&D collaboration between the MIT Plasma Science and Fusion Center and Commonwealth Fusion Systems, in pursuit of this Fusion future against a rapidly ticking clock.

https://www.linkedin.com/in/matthewmunderville/

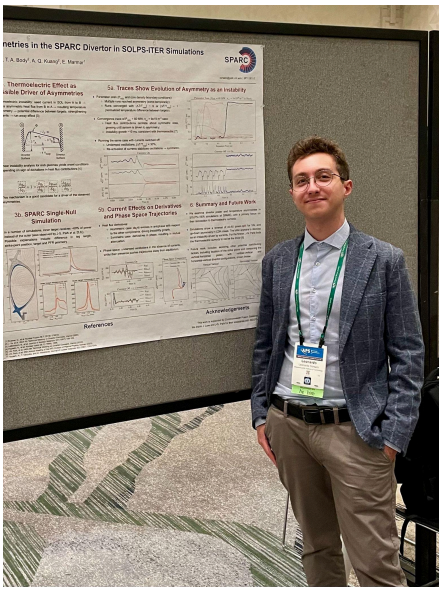
Alex Tinguely - Research Scientist

I grew up in a small town in Iowa. My high school of 100 students did not offer a physics course, so I took one online. I often performed my experiments in the school chapel. I remember building ramps out of bibles to study gravitational acceleration. Both of my parents are in medicine, so I prepared myself to become a doctor, but I actually longed to be a physicist. To me, both professions have similar motivations and methods: theorizing, experimenting, problem-solving, and ultimately improving lives. That is what drew me to plasma physics and fusion energy as an undergraduate intern: I can study the guts of stars and also work on delivering an unlimited clean energy source for humanity.

I received my PhD from MIT in the area of magnetic confinement fusion. In other words, I studied how to squeeze a star into a magnetic bottle. Afterward, I continued as a postdoctoral fellow at Oxford University. Now I am a research scientist at MIT's Plasma Science and Fusion Center (PSFC). I study energetic particles in fusion plasmas, like fast ions and neutrons produced in deuterium-tritium fusion reactions or relativistic electrons produced in plasma disruptions. I run simulations of plasmas, analyze experimental data from fusion devices, and prototype detectors for future experiments. A good knowledge of plasma physics, fusion science, and mathematics is necessary for my work, in addition to proficiency in computer science, programming, and data analysis. Basic engineering principles and technical skills with electronics also come in handy.

I am passionate about education and community. I manage a small research group, supervising several postdocs, graduate and undergraduate students. I also help lead a working group to support diversity, equity, inclusion, and accessibility at the PSFC, since science should be open and welcoming to all. Soft skills are incredibly important to my work, too: organization, prioritization, and effective communication.

alextinguely.com



Leonardo Corsaro - Research Assistant

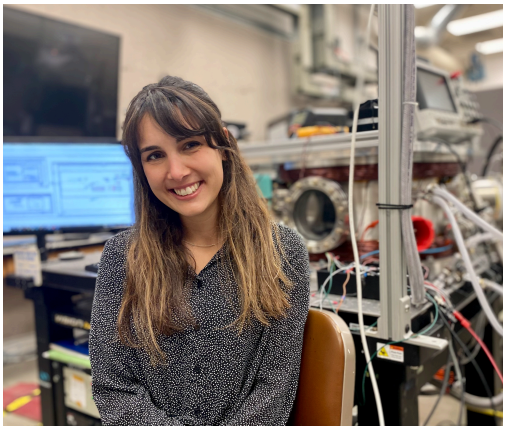
I was born and raised in Italy, where I stayed until I graduated highschool from the international "LII" program in Milan. I then moved to London soon after I turned 18, to pursue a Masters in Science degree in Physics at University College London. I graduated with a First Class Honors, and was included in the 2022 Mathematical & Physical Sciences Faculty's Dean's List of commendees.

I was drawn to plasma physics for fusion as it combines the elegance of theoretical work with groundbreaking experimental results, and it will positively affect generations to come by aiming to solve the climate crisis with new clean energy sources.

Although my university did not conduct research on fusion energy, I pursued internships in the field (ITER, UKAEA), and I set up an external master thesis with the Center for Nonlinear Plasma Physics in Frascati, Italy.
I am currently a Plasma Physics graduate student at the MIT Plasma Science and Fusion Center, working on modeling the heat exhaust of SPARC.

I am always happy to have a chat about fusion and how to navigate the academic and professional landscape as a young (and international) researcher, so feel free to contact me!

http://leonardocorsaro.mit.edu/
https://www.linkedin.com/in/leonardo-corsaro-558112193



Angelica Ottaviano - Research Scientist

My career path has not been very conventional: I grew up in Italy and moved to California after high school. This transition took a few years of working part-time jobs while acclimating to a new country and taking classes in community college. My favorite subjects growing up were physics, astronomy, and philosophy, and so I chose the physics major, and eventually transferred to a Cal State university to complete my bachelors degree. At my university I was fortunate to find a very supportive department which helped connect me with tutoring and research opportunities alongside my coursework. After graduating, I decided to find a job so that I could narrow down a specific field of interest within plasma technologies, and at the same time get some hands-on experience in the real world. These experiences included researching in national labs in the US and abroad, and working at a private fusion startup.

I later completed my PhD at UCLA in mechanical engineering and specialized in plasma-material interactions. Plasma science is a phenomenal platform for making use of creative thinking and with a vast array of possible applications. The technical skills I continue to use and expand on include basic plasma physics, laser-plasma diagnostics, low temperature plasmas, surface science techniques, RF breakdown phenomena, plasma-spacecraft effects, and aerospace engineering at large.

My favorite thing to do at work is to collaborate, whether it be across departments, institutions, or disciplines. When I am not working I love to cook (and eat), play music, swim in the sea in the summer, and spend as much time as possible traveling and nurturing my dual culture and life with family and friends.

https://www.linkedin.com/in/angelica-ottaviano-553a9667/

Jenn Scarborough - Education & Outreach Coordinator

I share the research being done at our center with anyone who is interested! Sometimes I am teaching kindergarten classes what magnets are, and sometimes I'm showing our lab to physics researchers from around the world. I have to understand the science well enough to communicate it, so I need at least a basic level of understanding of any project we talk about. This means I get to know a little bit about a huge breadth of work, so I constantly get to learn new science. I've wanted to be a scientist since I saw a lightning show at my local science museum when I was nine years old, and now I get to learn about new science and engineering work every day.

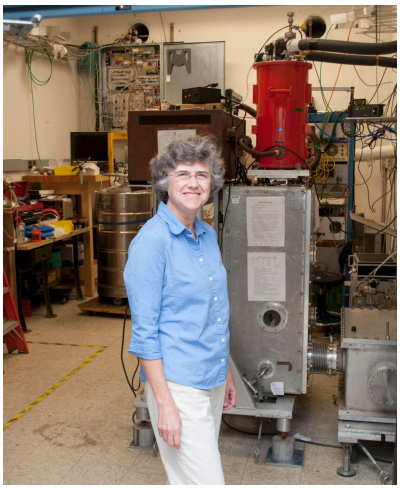
In addition to science content knowledge I need public speaking and communication skills to present to audiences from preschoolers to adults. My favorite thing to do is share science with young children- it's really exciting to get to be the first scientist a kid has ever met. When I'm not teaching science I love hiking and swimming at the beach.

https://www.linkedin.com/in/jmscarborough173/

Rogerio Jorge - Assistant Professor

I spent the first 20 years of my life in Portugal. At first, I wanted to be a musician and play classical guitar professionally. During my music studies, I kept learning about science and computer programming. After I turned 16, I developed a passion for physics and mathematics. After reading books about prominent figures like Einstein, and exciting topics such as black holes and string theory, I decided to do a bachelor's and master's in engineering physics. Around that time, I also started an educational YouTube channel that ended up having more than 500 videos and more than ten thousand subscribers.
https://www.youtube.com/matmania1

I eventually got a Ph.D. in plasma physics and went on developing software both as a postdoc in fusion energy and as an IT consultant at a private company. More recently, I started leading research grants and eventually settled at the University of Wisconsin-Madison where I teach and perform research on plasma physics and fusion energy. I love to teach, so this is a wonderful opportunity to do something I am passionate about. Coding is also a big part of my job, and I enjoy mentoring students who are venturing both into computational physics and more theoretical physics. I'm still involved in music in my free time, learning to play new instruments and occasionally playing guitar in small venues.



Amanda Hubbard - Principal Research Scientist

Most of my career has been as a fusion plasma (tokamak) experimentalist, running diagnostics of plasma temperature (record 110 million C!) and experiments to study plasma behavior. The photo is of my lab on the Alcator C-Mod tokamak at MIT. But for the past 5 years I have worked on making new kinds of high temperature superconducting magnets, running a process to fill them with liquid metal. Really using my early engineering training!

You can catch a glimpse of me and my 'solder team' at around 3:49 in this SPARC video - which also shows a lot of the other cool engineers on the TFMC fusion magnet project. https://youtu.be/WdoI1X5m96s?t=229
I'm the older one - it was 2021 so we all had to wear masks. And we are beside a really huge oven!

Both projects - though quite different - involved working in teams with really good people. And to get my hands on hardware. My Dad always said I was happiest with a wrench in my pocket. And I also get to use my brain and learn new things, all the time. I've traveled to many different countries to do fusion experiments and go to conferences, have friends and colleagues all over the world. I was able to have family time too, and my daughter is now in college.

Daniel Andruczyk - Research Associate Professor

I am the head of the Hybrid Illinois Device for Research and Applications (HIDRA). This is a small-mid scale steady-state stellarator housed in the center for plasma material interactions (CPMI) in the department of Nuclear, Plasma and Radiological Engineering (NPRE) at the University of Illinois Urbana Champaign (UIUC). I focus on the development of liquid metals as a first wall material and plasma-facing components for fusion devices. I am part of the lead institutions for the US liquid metal PFC development program and also the director of the Master of Engineering Plasma Engineering program at UIUC. The position requires critical thinking. This also means looking at all "out of the box" solutions to problems. Good knowledge of math, physics and chemistry is recommended.

Growing up I had a strong interest in nuclear physics. I remember when I was 9 or 10 reading a national geographic article about elementary particles and wanted to do that. At school I went heavy into all the STEM subjects. Math, physics, chemistry and computer science (back then a very emerging field). I always had books that talked about all things science, from black holes to the way DNA and genes work to quantum computing. It was all fascinating to me and I wanted to know more. During my undergraduate degree, I had the opportunity to do work at the premier particle accelerator lab in Australia at the ANU. But I was fortuitously introduced to the fusion reactor, H-1, and there was something there that drew me in. It was big science, but it was also something that will benefit humanity and the planet. This was the career I launched myself on and I have not looked back. Through postdocs in Germany at MPIPP Greifswald and then at UIUC, I have been able to establish myself in a world class establishment, and have a family, travel and enjoy sport (this is a big part of who I am, I love sport af all kind), but also have time to myself. I am a beer brewer, and that just goes along with everything I do. It's as much science as it is art to brew a beer.

Fusion has allowed me to meet some amazing people, see the world and live an amazing life.

https://www.linkedin.com/in/daniel-andruczyk-69524447/

Brad Smith - Director of Strategic Initiatives

In my role, my main focus is to secure funding for research initiatives at the MIT Plasma Science and Fusion Center. This involves building relationships with donors and identifying opportunities for corporate partnerships as well as foundation and individual donations. I work closely with researchers to understand their projects and communicate their impact to potential donors. Additionally, I collaborate with other departments within the university to ensure that fundraising efforts align with the institution's priorities.

In this role, Brad gets to meld his interest in finance with his passion for science.

https://www.linkedin.com/in/bradsmithjunior

Robert J. Davis - Electromagnetic Analysis Engineer II

My job at Commonwealth Fusion Systems involves modeling the physics of superconducting magnets used in tokamak fusion reactors (SPARC). Detailed knowledge of electromagnetics, thermal/cryogenic physics, numerical optimization, and material science are all used daily, both to do simulation/modeling tasks, as well as understand results. Light exposure to plasma physics and concepts like neutron irradiation are also needed. Knowing a thing or two about sensors (voltage, current, etc) and experimental techniques at cryogenic temperatures is also extremely useful.

Early on in high school math and physics were interesting to me, and that led me to electrical engineering for my undergraduate, mostly because it seemed "sciency" while still having some practical use. I didn't know about fusion or its possibilities till I wound up in graduate school, but found out that all the amazing equations and physical properties I had been studying were of immediate importance to devices like tokamaks and stellarators. Having a job that allows me to explore and understand special materials like superconductors, while at the same time helping push towards a greener energy source, has been wonderful. Another side benefit is how public the fusion industry is. Reading, writing, and public speaking have all been passions of mine since high school, and working fusion energy gives many opportunities to meet with others and talk about it.

Outside my "day job" in fusion, I'm an avid reader with a soft spot for ancient Greek and Roman classics, a rock climber (bouldering mostly), and a big fan of board games.

Erica Salazar - Senior Manager, Magnet Systems Lead

I did not consider fusion as a career choice until after I graduated from my Master's program. I was not very familiar with tokamak devices or superconducting magnets until I started looking at job opportunities. I was excited to learn about the extremely cold working temperatures of superconducting magnets that are controlling the extremely hot temperatures of the fusion plasma. How exciting! My first job out of college was an exciting opportunity to learn about a completely different field. Since then, I continued my higher level learning through completing my phd in nuclear science and continued working in the fusion industry at Commonwealth Fusion Systems (CFS).

At CFS, I work on the research and development of superconducting magnet technologies to enable magnetic fusion energy commercialization. Understanding and utilizing knowledge regarding E&M physics, irradiation of materials, and tokamak operations are important for my work. However, the skills that are most important for my job are teamwork, curiosity, learning new concepts, and problem solving!

https://www.linkedin.com/in/ericaesalazar

Kathreen Thome - Scientist

I have always loved trees and bears ever since she was a kid and wanted to help protect them. I was good at math and enjoyed legos and loved to read but did not know what job would suit her. I heard about fusion from her 10th grade chemistry teacher and was instantly hooked! A clean energy source that would protect the environment sounded amazing. I went home and looked up fusion on the Internet. The more she learned about fusion, the more excited she became. I knew that she wanted to study fusion and make that her career. However, I knew I wanted to use her lego skills and do hands-on research, so I ended up picking schools and a path based on that.

Now, I am an experimental scientist at the two biggest magnetic fusion experiments in the U.S. Her hands-on research time is not as much as I would like, but I love operating the experiment for others in the control room and working on a measurement device. Operating DIII-D for others is both exhilarating and terrifying, since other people are depending on me! When I work on this measurement device, I am often wearing a hard hat or standing inside the experiment, DIII-D, in coveralls, gloves, booties and a hairnet. This is one of my favorite things to do but I only get to do it occasionally when the experiment is not running.

Andrew "Oak" Nelson - Associate Research Scientist

I

Growing up exploring the mountains of Colorado, I developed a deep love of the natural world and became inspired to devote my career to finding energy solutions that would allow communities to live sustainably for decades to come. explored many options along this path before finding fusion when studying engineering physics as an undergraduate at the University of Colorado, Boulder. What initially struck him about this field was the incredibly interdisciplinary nature of the work. I am someone who quickly tires of old activities but is always excited about new adventures and opportunities, and to him the many different problems that fusion faces seemed like an excellent mixture that would never grow stale. I say that to conduct research in fusion, I have to be able to communicate with experts from various fields and try to find common ground between engineering and physics constraints, which can sometimes conflict with each other. To do this, I spend a lot of time thinking about the big picture while quickly learning and assessing various theories that help to balance collaborations with people all over the globe.

Despite the often chaotic nature of his day-to-day job, I make it a priority to reserve ample time for his personal life and supporting communities. I rarely has service on weekends, instead using the time to explore the backcountry surrounding various physics labs with family and friends. This commitment to community building has impacted his professional life as well: I say that I spend more and more time on outreach-oriented assignments (like Fusion Energy Week) each year.

www.oaknelson.com

David Pace - Deputy Director

I was born and raised in Stockton, California, where my family's work in auto repair provided ample opportunity to learn how machines function, though I mostly just like to take things apart. This led me to study physics at University of the Pacific, which allowed me to build experiments and learn how the world works. Through an internship, I spent a summer at the Princeton Plasma Physics Laboratory, where he was introduced to plasma physics and fusion energy. From that point onward, continuing today, I was hooked on the science and engineering of fusion energy. "Fusion is our chance to harness an entirely new energy source," David says, "and the teams of people who work on this are dedicated and helpful as we all make our own meaningful contributions to the cause."

After completing my Ph.D. in plasma physics at the University of California, Los Angeles, I studied how high energy particles move around in fusion devices. This led to multiple projects designing, building, and using new tests to measure the behaviors of these particles. To improve my ability to contribute to the commercial fusion energy industry, I completed an MBA at San Diego State University in 2022, submitting a thesis on the topic of partnerships between public labs and industry to accelerate the development of commercial fusion energy. I am now the Deputy Director at the DIII-D National Fusion Facility in San Diego. As David describes it, "I did some science, and now I help other people do lots of science, and I really enjoy being able to continue learning along the way."

https://fusion.energy

Caroline Anderson - Manager for Outreach, Fusion Industry Association

The Fusion Industry Association (FIA) is a non-profit organization composed of private companies working to make commercial fusion energy a reality. Together, we are accelerating the development of commercial fusion energy through advocacy and education. FIA is driven by a passionate belief that affordable, clean energy is desperately needed in the world, and that fusion power is a viable solution.

As fusion grows into a new industry, it needs a level playing field. That's why we support efforts across the private, public, and philanthropic sectors to accelerate the development of tomorrow's fusion power economy. Our main priorities are advocating for public private partnerships, ensuring fusion's regulatory certainty, and growing the global fusion energy economy.

Skills useful for my position: Writing, analysis, management, strategic thinking, ability to juggle multiple projects at the same time, efficiency, interpersonal skills, communication, outreach

https://www.fusionindustryassociation.org/

Nikolai de Boucaud - Electromechanical Engineer

Nikolai has been able to take his Bachelor's degree in Aerospace Engineering to land a job as an engineer at the DII-D National Fusion Facility in San Diego, CA. His job includes understanding the Electron Cyclotron Heating system at the DIII-D tokamak. He also strives to learn and understand the physics of fusion plasmas and various heating mechanisms.

During high school, he was interested in Astronomy, Computer Science and Engineering. He followed these interests to his current career. His job allows him to help others, obtain financial security, and make use of his many talents.

Many people often believe that to find a good paying job in science and engineering, one needs many degrees past a Bachelors. Nikolai shows us that this isn't always the case.

Vincent Ritola - Technician

Vincent wanted a job where he could help others, have lots of family time, and create things that would not otherwise exist. He also wasn't sure if the traditional college route would get him to this goal. Therefore, he pursued an Automation Certificate to become a technician with General Atomics. This is what Vincent has to say about his job, "As a technician my job is to ensure the smooth operations and functions of various fusion systems, both mechanical and electrical. Power supplies, vacuum systems, pressurized systems, electrical, automation systems, components and instruments are all a part of my job. Generally my time is spent fabricating, repairing, installing, and troubleshooting. A core concept is the ability to understand how various systems and designs work at a fundamental level. A high degree of skill with tools and procedures is needed. This could involve welding, brazing, CAD design, custom tooling, machining, and even carpentry. A good technician can create nearly anything an engineer can design and likewise repair nearly anything. Often designs need to be customized or modified, rarely do designs work perfectly straight from blueprints, this is where technicians excel. People with a wide range of skills over multiple disciplines that love to fix things make the best technicians. Lastly, the ability to be efficient in your work is necessary to keep the time minimal and the quality high."

Mario A Morales - Power Systems Technician

Mario provides preventive maintenance and troubleshooting of magnetic field power supplies and anything that uses AC facility power at the DIII-D facility for General Atomics. He likes that he gets to help others, has great job security, and makes use of his many talents. When he was in high school, he was interested in computer science, technology and engineering. He gets to use these interests every day in his current role.

https://www.linkedin.com/in/mario-a-morales-b0924554/

Maria Gatu Johnson - Principal Research Scientist

Maria explains her job this way, "I do experiments related to inertial confinement fusion and high energy density plasma science. I need to know nuclear physics, plasma physics, computer programming, detector technology etc to do my job."

When she was in high school, she was really interested in English and Writing and Physics. It is interesting how one's interests in high school can really mold where they end up with a career and how when you are interested in one topic, you can always find ways to use it in your job.

Jessica Wu - Data Scientist

My team creates the parts that are assembled into targets for inertial fusion energy experiments. This is where plasma is contained by rapidly compressing and heating a small quantity of fusion fuel.

During an experiment, lasers are blasted at a target to trigger nuclear fusion and measure the energy outputted.

Our hope is that nuclear fusion can be the next sustainable renewable energy resource if we can consistently achieve fusion ignition, where more energy is outputted than inputted. In the past year, we've hit ignition many times so there's a lot of excitement around fusion energy! It's very important that scientists capture as much data as they can from these experiments, so they can figure out how to achieve fusion ignition consistently.

As a data scientist, I take care of the data side. I make sure that the database system is flexible enough to capture everything scientists' want, make sure that we are sending all the data in a timely manner, and analyze data to characterize whether we think it will be a "good" target or not in upcoming experiments.

The skills and concepts required for this type of job are, knowledge of databases, programming (especially with data science libraries like Pandas for Python), and especially a willingness to learn.

STEP 4: Optional (but very effective for students to "see" themselves in these roles). Have students create their own profile for a fusion energy/plasma science career they choose. It can be based on the profile they read or they can research additional careers and roles in fusion energy/plasma science. Be creative and have fun. Students can share or you can post in the classroom.

Personal Career Profile (Planning Sheet)

Name: _____ Date: _____

Part 1: Use this sheet to plan your career profile.

I want to pursue a career in _____

In this career I will focus on:

What do you hope to contribute or accomplish through your career choice? (How will you help the world or contribute to society?)

I need the following skills (What skills or traits do you need to pursue this career?):

Based on what you learned from the physicist profiles, what are the ways you could achieve this career with a degree in STEM? (How can a degree in STEM lead you into this career or support your growth in this career?)

Personal Career Profile (Final)

Name: _____ Date: _____

Part 2: Using the information you documented in Part 1, create a profile of your future self that achieves your career goals with a degree in STEM. Imagine that this profile will be read by students like you to illustrate that STEM can help them achieve their goals. Use the template below (2 page maximum).

Name
Career Title

[Insert a picture of YOU that relates to your career]

Who I Am [Describe who you are and aspects of your background that are important to you].

Why STEM [Give a brief personal background including how you became interested in STEM, the degree(s) you earned, and the steps you took to reach your career through STEM.]

Using STEM [Describe the skills and traits from your STEM degree that you use in your career. Describe ways that you have contributed to your field, or ways your work benefits others, or interesting projects/accomplishments that have occurred in your career.]

Advice for Students [Suggest ways for students to pursue their career goals using a STEM degree, what they may not know about STEM, etc.]