



**Sukesh Aghara, Ph.D., Associate Professor of Chemical Engineering**

## ANS CAREER PROFILES

# Nuclear Researcher

### Who are they?

Nuclear researchers are professors, scientists, and researchers. They work for universities, corporations, and the government. Some nuclear researchers study the basic principles of nuclear energy, such as how it interacts with matter. Others study how humans use nuclear energy for power generation as well as health and medicine, and how it plays a deterrent role in foreign policy. Nuclear researchers are important to the aerospace industry, where they work with other scientists and engineers to study how nuclear energy can power spacecraft and other important methods of propulsion.

### What do they do?

Nuclear researchers use computers, data, and other tools to investigate nuclear energy and its place in our world and society. They are often called to serve as experts and advisors for governments and agencies, helping to establish laws, policies, and best practices for the use of nuclear energy. If a nuclear emergency happens, nuclear researchers will be called in to help determine what happened and develop protocols on how to prevent another emergency in the future. Nuclear researchers may also teach students and future nuclear engineers who will be joining the nuclear workforce.

### How do I become one?

Nuclear researchers must have a bachelor's degree in engineering or chemistry. From there, they go on to earn a doctorate in nuclear engineering. Once they have a Ph.D., nuclear researchers may work as faculty members for universities or for a variety of private and public companies and organizations. Having a strong background in math, science, and computers is essential to becoming a nuclear researcher. Internships are also an important part of gaining hands-on experience and training in nuclear science. Organizations like NASA and the Department of Energy (DOE) are great places to look for internship opportunities.

## Spotlight on a real Nuclear Researcher!

Sukesh Aghara, Ph.D., is an Associate Professor of Chemical Engineering and the Director of the Nuclear Engineering Program and the Integrated Nuclear Security and Safeguards Laboratory at the University of Massachusetts, Lowell (UMass Lowell).

Prof. Aghara's research expertise is the interaction of nuclear energy and matter. He started out as an environmental engineer, but his passion to make lives and communities better quickly led him to study nuclear waste sites and how they

impact the ecosystems around them. He went on to earn a doctorate in nuclear engineering and now serves as a faculty member of the Department of Chemical Engineering at UMass Lowell. In addition to his academic responsibilities, Prof. Aghara serves as an advisor and expert on nuclear energy to many important agencies, including NASA, the Department of State, and the International Atomic Energy Agency (IAEA).

A word of advice: Prof. Aghara says that aspiring nuclear researchers should be analytical thinkers who are naturally curious and have a predisposition to saying “yes.”

## Let’s chat with Dr. Aghara!

### Tell us about some of the exciting projects and innovations you have worked on.

What I like most about my job as a university professor is that I get to choose projects that excite me. It also allows me to work with the brightest and most motivated young minds. Two projects stand out for me in all the different research that I have had the opportunity to be a part of. First, my work at NASA’s Langley Research Center in Virginia where, as a NASA Administrator’s Fellow, I had the opportunity to work alongside the space agency’s top scientists, solving the radiation transport problems for the International Space Station as well as lunar and deep-space missions. More recently, I have been involved in research that is at the cutting edge of technology and policy, with a focus on security and safeguards of nuclear materials and facilities. This project has led to tremendous professional and personal growth for me as I apply my technical knowledge and develop my communications skills to engage experts from around the world working on national and global nuclear security and safeguards challenges. The effort has stoked the fire in me to continue to be part of an international community that seeks technology solutions for the safe and secure use of nuclear energy.

### What skills are required in your position on a day-to-day basis?

The use of advanced computational and analysis tools is fundamental to the work we do in our research group. This includes using several radiation transport codes running on multiple OS and hardware platforms. We use MatLab, Python, and Excel for most of our analysis tools. To be able

to communicate scientific data in a meaningful way to a broad range of audiences is a skill that I continue to develop and expand.

### What do you do in your spare time?

I grew up playing tennis, and it continues to be something that I really enjoy, particularly on clay courts. I also enjoy hiking with friends and family. My wife and I share a passion for food from around the country and the world. We seek new cuisines and learn new cultures whenever and wherever we can.

### What educational preparation would you recommend for someone who wants to enter this field?

Science and mathematics are the fundamental building blocks to any engineering field. Nuclear engineering is by definition a multidisciplinary field, with nuclear energy being an engineering system that integrates many core areas of engineering—chemical, mechanical, civil, electrical, and computer.

### From your experience, how do most people enter this profession?

Although the typical career pathway is through science and engineering fields, I have come across some exceptionally talented nuclear energy professionals who had their formal education in policy, communication, and history! Internships at national laboratories and fellowships through DOE and NASA can offer pathways for a successful career in nuclear energy.

### Are there professional organizations or events that teens and college students can join/participate in?

At UMass Lowell, we host Boy and Girl Scouts for their merit badges. This is also an excellent way to learn or visit nuclear facilities in the area. Several high schools also have radiation science kits, which are a great way to learn about the fundamentals of nuclear science. The American Nuclear Society has local chapters that organize public events and are very receptive to aspiring young members.