

Marquette University: Engineering professor receives NSF CAREER grant with climate change and public health implications

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MILWAUKEE — [Dr. Somesh Roy](#), assistant professor of mechanical engineering in Marquette University's Opus College of Engineering, is the recipient of a CAREER grant from the National Science Foundation to create a framework that will model soot emission from combustion engines, leading to cleaner combustion systems.

The project, "A scalable multiscale modeling framework to explore soot formation in reacting flows," has an anticipated value of about \$550,000 over five years. Its goals include a more detailed understanding of the physics and chemistry of soot, a better predictive capability of soot emission from combustion systems and an increased understanding of the effects of soot on the planet.

"I am appreciative to the NSF for the opportunity to pursue this project," Roy said. "Soot has such a large impact on both climate change and public health, but there are critical gaps in current knowledge that lead to large scientific uncertainty in predicting the effects of soot. This project is designed to develop a complete understanding of the fundamental physics of soot inception, an improved understanding of bulk evolution of soot in reacting flows, and a better method for modeling soot emission."

Soot is one of the most important forcing agents in climate change and has significant adverse effects on public health and welfare. To accurately understand and mitigate the effects of soot, there needs to be an understanding of all the processes related to soot formation and growth—from the inception of soot at an

atomic level to its maturation in real-world combustion systems at the device level. This project will utilize novel computational tools and techniques to create a framework of models to combine small-scale atomistic modeling with larger-scale engineering modeling of combustion systems.

“This award reflects a high potential for Dr. Roy’s research and leadership in his field and at Marquette,” said [Dr. Kristina Ropella](#), Opus Dean of the Opus College of Engineering. “We are inspired by his work to address two key challenges to our society – climate change and public health. By working to reduce soot emissions and educate the public on the science behind his work, Dr. Roy is driven to use his engineering expertise to Be The Difference.”

To better educate the public, Roy’s team will collaborate with the Haggerty Museum of Art to organize a series of activities to engage the community on the science of soot and air quality. The planned activities include a future art exhibition in the Haggerty and several innovative community outreach programs to encourage participants in fact- and data-based discourse on issues such as the complexities of soot processes, the effect of soot on society, and environmental policies and justice. The project team will also organize activities to encourage the pursuit of STEM research for high school students.

The Faculty Early Career Development (CAREER) Program is a foundation-wide activity that offers the National Science Foundation’s most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization. Activities pursued by early-career faculty should build a firm foundation for a lifetime of leadership in integrating education and research. NSF encourages submission of CAREER proposals from early-career faculty at all CAREER-eligible organizations and especially encourages women, members of underrepresented minority groups, and persons with disabilities to apply.