



Education



Steven Arndt, then ANS vice president/president-elect, visiting the ANS UPRM in March 2022. Pictured, from left: Harry Colón Sánchez, Alondra González, faculty advisor Dr. Silvina Cancelos, Desiré Rivera Borges, Arndt, Xaymara Medina García, Calleb Díaz Acevedo, and Edgeliz Ramos. (All photos: ANS UPRM)

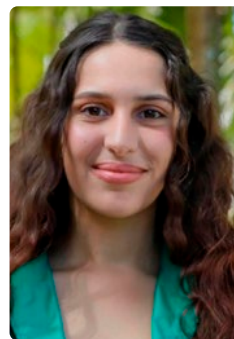
ANS student section seeks to “re-light the passion for nuclear sciences” in Puerto Rico

The American Nuclear Society student section at the University of Puerto Rico–Mayagüez (ANS UPRM) is trying to change the prevailing negative attitudes about nuclear energy in the U.S. territory. Economic struggles and safety concerns combined during the 1960s and 1970s, leading to the shutdown of most nuclear projects on the island, as well as the closing of the nuclear engineering program at UPRM. Puerto Rico’s Boiling Nuclear Superheater (BONUS) reactor, a prototype nuclear power plant designed to investigate the boiling-superheating concept, was decommissioned in 1969–70 because it required costly modifications related to technical difficulties. The perceived failure of BONUS,

followed by the Three Mile Island and Chernobyl accidents, led to a lack of support for nuclear power in Puerto Rico.

Today, nuclear energy remains “a controversial topic on the island, as the public opinion about nuclear energy is very strong and negative,” said Desiré Rivera Borges, vice president of the ANS UPRM board of

directors. “Our student section is focusing its efforts on pursuing its mission of educating the student and general community by providing reliable and unbiased information.” Rivera Borges, a fifth-year chemical engineering student, is



Rivera Borges





one of four cofounders of the student section, which was established on November 20, 2019.

She added, “Despite our university’s rich history in nuclear engineering research during the 1950s to [the] 1970s, the University of Puerto Rico does not currently have a nuclear engineering program or a nuclear reactor on any of its 11 campuses. Our section is advocating for the implementation of a nuclear engineering minor at UPRM, an initiative that has gained a significant following among the university’s student community and faculty.” That is one of the ambitious goals set by the ANS UPRM.

In July, the outstanding work of the ANS UPRM was recognized by ANS’s Student Sections Committee (SSC) and the Education, Training, and Workforce Development Division, which bestowed on them the 2022 Samuel Glasstone Award for best ANS student section.

Mission and main objective

The ANS UPRM is one of 54 student sections in the United States and other countries overseen by the SSC, which regulates general section activities. “For the most part, each section operates independently,” noted Rivera Borges, “although we have invited other sections to collaborate with us in virtual events, such as webinars.”

The student section at UPRM seeks to “re-light the passion for nuclear sciences our community once had,” according to the ANS UPRM’s 2022 annual report. The section’s website (student.ans.org/uprm/) elaborates on its mission:

Our main objective consists of educating the Puerto Rican communities on subjects regarding nuclear sciences to help reduce and prevent the propagation of stigmas and misinformation. Students will be offered opportunities to learn about the wide range of topics within nuclear science and recent nuclear advancements. Members of the chapter will actively aid in the growth of awareness for nuclear fields within the campus and nearby communities through on-campus activities and school visits. This interest will

consequently help the development of nuclear science related courses, which would potentially lead to the establishment of a minor in Nuclear Science and Engineering.

In March 2022, Steven Arndt, then ANS vice president/president-elect, visited the ANS UPRM. He delivered a presentation on becoming a nuclear engineer, commended the section for promoting nuclear power in Puerto Rico, and encouraged the students to keep engaging with ANS at the local and national levels as it continued to establish itself within the nuclear industry.

Members and officers

As of July 2022, the ANS UPRM boasted 208 local members (referred to as friends of ANS), as well as 15 national members. Of the members, 76 percent are engineering students and 23 percent are students in other STEM disciplines, including agronomy, geology, chemistry, and physics. Of the members pursuing engineering majors, 37 percent are in the chemical engineering curriculum, 27 percent are in mechanical engineering, and the rest are in other engineering curricula.



Cancelos

The ANS UPRM’s faculty advisor since its founding has been Silvina Cancelos, a professor in the university’s mechanical engineering department. Cancelos supervises the student section’s board and serves as a consultant on section management

and graduate-level opportunities. The guidance from Cancelos has been instrumental in the success of the student section, although she is quick to dismiss such praise: “The success of the Puerto Rico ANS chapter is giving me a totally undeserved credit. Many colleagues ask me, ‘What do you do to engage so many talented students?’ My honest answer is, ‘Nothing.’ It is remarkable how many bright UPRM students have realized that in nuclear,

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you find the solutions to some of the most urgent climate and medical challenges.”

Rivera Borges noted that while UPRM does not have a nuclear engineering department, “some relevant research is conducted by our advisor, Dr. Cancelos, in the Bubble Dynamics Laboratory.” The BDL, headed by Cancelos, conducts research into the detection, characterization, generation, and manipulation of microbubbles and nanobubbles. This research—much of it performed with state-of-the-art particle image velocimetry, shadow-sizing techniques, and imaging process methods—has potential applications in the nuclear industry. For example, Cancelos’s research group uses advanced experimental techniques for visualization of multiphase flows to improve the designs, efficiencies, and safety of current water-based reactors, as well as Generation IV molten salt technologies.

The ANS UPRM board of directors, which helps to guide the student section in its mission and services, comprised a team of accomplished students during the 2021–22 academic year. Board president Xaymara



Medina García

Medina García, a fifth-year mechanical engineering student, has held a number of internships and co-op positions with various companies, including Collins Aerospace, Boston Scientific, Medtronic, and Pratt



Diaz Acevedo

& Whitney. Vice president Rivera Borges has gained biomaterial, biomedical, and engineering research experience with several institutions, including Cell Manufacturing Technologies, Eli Lilly, and the University of Illinois and is also the vice president of Come Colegial, a local poverty-alleviation organization. Treasurer Calleb Diaz Acevedo is a fourth-year chemical engineering student with internship experience from Mondelez

International. Harry Colón Sánchez, board secretary, studies industrial engineering and has participated in nanoparticle research to create eco-friendly fertilizers.

The board is rounded out by and officer of social media and web design Roberto F. Suarez García, social activities officer Edgeliz Ramos, professional outreach officers Alondra González and Adriana Ramos, and fundraising officer Joshua Acosta.

Four committees

The main responsibilities of the ANS UPRM are divided into four committees, which are chaired by board members. Each committee has as many as 16 members, who coordinate, manage, and promote the group’s activities.

The Professional Development and Nuclear Outreach Committee focuses on educational workshops, seminars, webinars, recruitment sessions, and community programs related to nuclear science and technologies. The Funding and Benefitting Activities Committee supports the efforts of the section by organizing fundraising activities, securing donations, handling grant applications, and managing expenses and budgeting. The Social Activities Committee recruits new members, arranges fun social activities, builds relationships with other student organizations, and coordinates community services. The Social Media and Web Design Committee works to promote the ANS UPRM and to provide other information online, including over the social media platforms Facebook, Instagram, Twitter, LinkedIn, and YouTube.

Educational activities

In April 2022, the student section participated in its first in-person ANS Student Conference, held at the University of Illinois–Urbana-Champaign. Four students represented UPRM at the conference, where Rivera Borges led the group’s presentation and received a Commendation for Student Service and Leadership. The section members also had an opportunity to tour Constellation Energy’s Dresden nuclear power plant.

The ANS UPRM also hosts and participates in numerous webinars, workshops, scientific panels, university info sessions, and other educational events. Their webinars



Members of ANS UPRM attended the 2022 ANS Student Conference and toured Constellation's Dresden plant.

are mostly related to the science of nuclear energy and its potential applications in Puerto Rico. Offered in English and Spanish for anyone who wishes to participate, these free online events have featured a wide range of guest speakers, from the UPRM faculty as well as experts from General Electric, Exelon, Constellation Energy, the Naval Nuclear Laboratory, and other companies and labs. In addition, these and other institutions have collaborated with the ANS UPRM in meet-and-greets, recruitment sessions, and other networking events. The group's workshops have covered such topics as resume preparation, good lab practices, and cybersecurity.

The Nuclear Alternative Project (NAP), a nonprofit organization of Puerto Rican engineers dedicated to educating the people of the island about the benefits of nuclear energy, especially advanced nuclear reactors, has also hosted several webinars and activities, which have drawn heavy participation from the student section. Rivera Borges noted that NAP "has led most of the efforts

for the future implementation of small modular reactors in Puerto Rico" and has been a major supporter of the student section. In addition to inviting students to webinars, NAP has provided expert speakers for events and promoted the section to a larger audience in Puerto Rico.

Together, the ANS UPRM and NAP are tackling the difficulties of "educating a community that has already made up its mind and believes that nuclear sciences are dangerous," as stated in the student section's annual report. It adds, "We have identified that a primary fear is that a natural disaster could cause a nuclear disaster in Puerto Rico, so we have recently prioritized webinars and events [for the public] that concern this topic."

Unfortunately, due to these strong anti-nuclear sentiments, some student groups at the university have banned the ANS UPRM from participating in certain educational activities, such as those related to environmental sciences and sustainability.

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A poster for an *Among Us* game night hosted by the ANS UPRM.



The student section, with help from NAP, is constantly seeking new ways to combat this culturally rooted antinuclear fear, stigmatization, and discrimination. It remains a major challenge.

One way in which the ANS UPRM is trying to reverse the antinuclear feelings in Puerto Rico is through its K-12 School Visitation Program. Volunteers from the group's Professional Development and Nuclear Outreach Committee present interactive workshops in which K-12 students can perform hands-on experiments and obtain basic knowledge about nuclear sciences. Through this program, which is partially funded by Nuclear Engineering Education for the Disadvantaged funds provided by the Diversity and Inclusion in ANS Committee, 238 students in Puerto Rico have been educated about nuclear sciences as of April 2022.

Social events and fundraisers

Membership with the ANS UPRM is not restricted to only educational activities; there are plenty of opportunities for play and fun. During team building nights, members get together for games and competitions that foster the development of teamwork, problem solving, and leadership skills. There are also *Among Us* game nights (also with such digital games as *Kahoot!* and *Jackbox*), murder mystery nights, and watch parties with live-streamed movies.

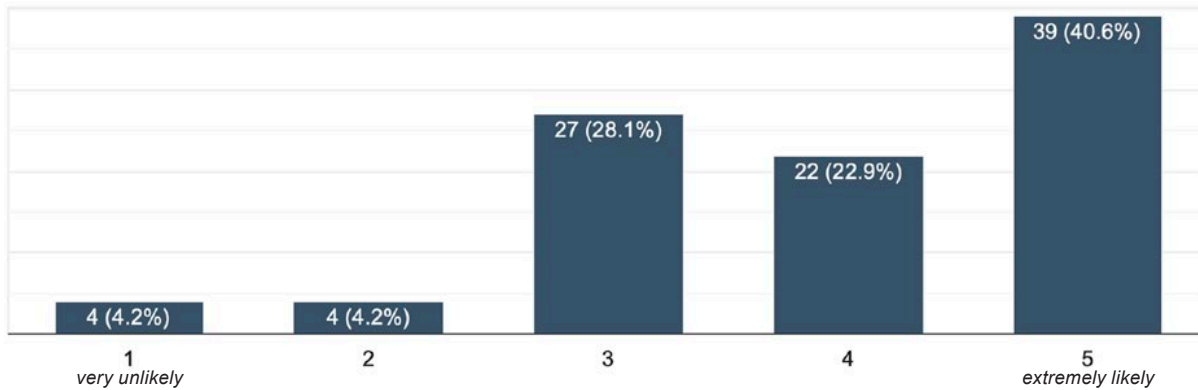
Section members also participate in benefits and fundraisers for various causes. In April, which is Earth Month, members sold plants and secondhand clothing in a collaborative activity with other student organizations—Hope for a Rescue and College Students Against Pollution—to promote environmental awareness on the UPRM campus. They also coordinated a picnic and a dog show with the Hope for a Rescue and Triple C student groups to raise funds for an environmental charity.

Achieving goals, meeting challenges

As part of the goal to overturn current antinuclear attitudes in Puerto Rico, the ANS UPRM “aims to expand all K-12 outreach efforts during the next two years and to promote the implementation of a nuclear



Calleb Diaz Acevedo at a fundraising t-shirt and brownie sale.



A survey of 96 active undergraduates at UPRM revealed that almost 64% of the respondents would be likely to enroll in a nuclear engineering curriculum. (Source: ANS UPRM 2022 annual report)

engineering minor at our campus during the next five years,” said Rivera Borges. The 2022 annual report describes the effort to create a nuclear engineering minor:

Our Student Section has identified over 95 students interested in pursuing some sort of nuclear science or engineering studies within our community, and we believe that these students deserve an opportunity to pursue these dreams. For these reasons, the primary project of the ANS UPRM Student Section is the development of a Nuclear Engineering Curricular Sequence in the University of Puerto Rico at Mayagüez. This project is known as INNU for its acronym in Spanish, Ingeniería Nuclear.

The proposed courses for the INNU curricular sequence cover seven areas: introduction to nuclear science and engineering, radiological safety and radioactive waste management, nuclear power plant engineering, nuclear power plant simulator, materials and heat transfer applications in nuclear reactor systems, reliability and safety analysis, and introduction to the analysis and design of nuclear plant structures. To support its proposal for a nuclear engineering minor, the student section is working to obtain a reactor simulator from NuScale Power.

While the effort to implement a nuclear

engineering minor and curriculum is gaining traction among UPRM faculty and students, graduates from the university are already having an impact in the nuclear industry. Rivera Borges observed that although “no students have graduated from nuclear engineering in the last few decades . . . some students that study chemical, mechanical, computer, electrical, or civil engineering have moved on to pursue careers within the nuclear industry.”

Some of these engineering graduates are currently working with NAP to get nuclear power back to Puerto Rico. NAP engineers have identified at least two sites on the island with potential for small modular reactor deployment: one on the north coast near an industrial hub, and the other on the east coast at the former Roosevelt Roads Naval Station. Evaluations of additional potential sites are ongoing.

Another project of the ANS UPRM to promote nuclear sciences in Puerto Rico is the creation of a high school nuclear engineering research opportunities program. To achieve this goal, the student section is collaborating with Science Coach, a program in which science teachers are paid to coach students in the completion of advanced science research projects.

Nuclear power may yet have a bright future in Puerto Rico thanks to the award-winning ANS student section at UPRM. ☒