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# International research collaboration highlights benefits of partnerships

by Courtney Van Hoosen | Office of Global Strategies



*Courtesy Photo*

*The Nebraska-Brazil team exploring low-energy laser pulses for high-energy electron acceleration reunited in Brazil in February 2020 as part of an exchange visit funded by a SPRINT award. Dr. Sudeep Banerjee (blue shirt) and graduate student Dan Haden (far right) represented Nebraska's team.*

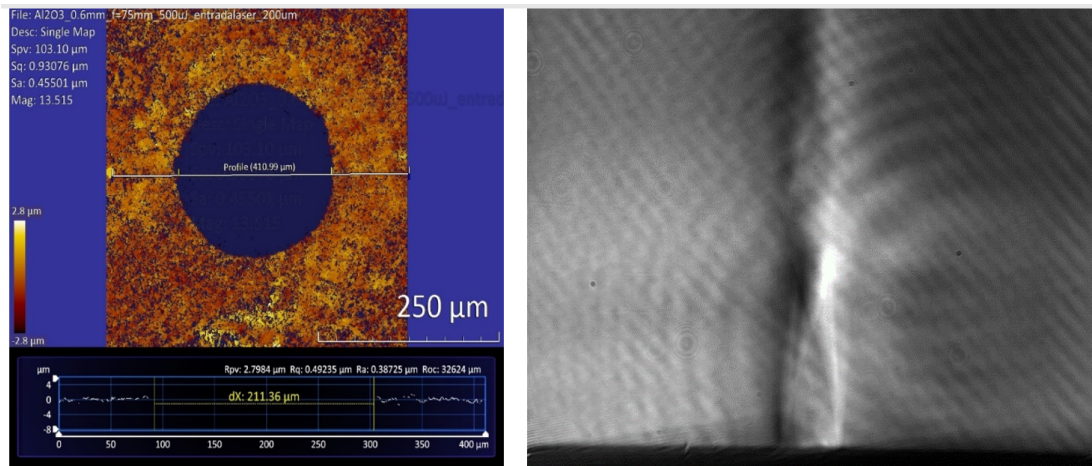
## **In 2019, Chancellor Ronnie Green charged the University of Nebraska-Lincoln to become a transformative, world-leading university.**

Nebraska continues to take meaningful steps towards this bold vision through multiple aims outlined in the N2025 Strategic Plan, including increasing the impact of research activity and broadening its global partnerships. Dr. Sudeep Banerjee's collaboration with Dr. Nilson Vieira [<https://newsroom.unl.edu/announce/globalnebraska/9102/53686>] of the Nuclear and Energy Research Institute (IPEN) in São Paulo, Brazil is one such example of an international collaboration creating benefits for Nebraska and Brazil.

“Our partnership is complimentary,” Banerjee said. “They have a lot of expertise in things like laser machining, which we don’t have. On the other hand, we have some of the best laser systems, which they don’t have. So you can tie the two areas together and try to get something more from it.”

Banerjee, a research associate professor in the Department of Physics and Astronomy and Nebraska’s Extreme Light Laboratory, has been working with the team at IPEN since January 2019 [<https://newsroom.unl.edu/announce/globalnebraska/9102/53686>] through a São Paulo Researchers in International Collaboration (SPRINT) award [<http://www.fapesp.br/10964#2018>]. His award is co-funded by the university and the São Paulo Research Foundation [<http://www.fapesp.br/en/>] (FAPESP).

“The overall goal of this project is to generate high-energy electron beams using very low energy laser pulses,” Banerjee explained. IPEN’s lasers are low-power systems that aren’t typically used to create high-energy electron beams. However, through the design of novel supersonic nozzles and a series of low-energy laser pulses, the teams hope to achieve high-energy acceleration for lower-cost alternatives to laser-driven medical therapy.



*At left is an optical micrograph of the laser-machined gas jet nozzles for the electron acceleration experiments developed at IPEN. At right is a Schlieren image of supersonic flow from the same nozzle that uses a code to analyze the measurement and flow patterns of electron beams.*

Unfortunately, the spread of COVID-19 and the global pandemic have put parts of Banerjee's and Haden's research on hold. Although the Nebraska team was able to bring back some gas jet nozzles to test pulse operation with the low-energy Archimedes laser at UNL, the final design of the new supersonic nozzle array is pending the reopening of labs in Brazil and Nebraska.

Still, both sides look forward to resuming collaboration hopefully in the fall, as restrictions put in place during the pandemic begin to ease up. Next steps in the joint proposal include testing the final nozzle array and preparing papers summarizing the results of the experiments for future publication and conferences. IPEN also hopes to send a team to Nebraska to conduct experiments on electron acceleration using UNL's Archimedes laser and a visiting graduate researcher to work on additional collaborative projects.

Both Banerjee and Haden agree the international collaboration has been exciting and beneficial for the project, as well as the cultural exchange. Banerjee, who's originally from India, believes the visit to Brazil highlighted the importance of diverse perspectives.

"If you have a person from a different culture, it brings a very new perspective into how you do things. And sometimes, they'll change my approach," Banerjee said.

Haden, who's originally from Aurora, Nebraska, is grateful he had a chance to participate in the research trip and project to become more exposed to the world.

“Coming from a small town, you don’t really get to experience what the world is like,” Haden explained. “But science is pretty universal. Even though it’s a large world, we’ve got people working towards a common cause and that unites us all, no matter where we’re from.”

*Dr. Sudeep Banerjee is a 2019 SPRINT awardee funded by Nebraska’s Office of Research and Economic Development, the Department of Physics and Astronomy, and the São Paulo Research Foundation [<http://www.fapesp.br/en/>] (FAPESP). Proposals for the next round of SPRINT funding [<https://globalnebraska.unl.edu/global-grants>] are due June 15, 2020.*

*For more information about the SPRINT awards or upcoming deadlines, please contact Liana Calegare, IANR Global Engagement Senior Global Programs Manager, at [lcalegare2@unl.edu](mailto:lcalegare2@unl.edu) (<mailto:lcalegare2@unl.edu>).*

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