



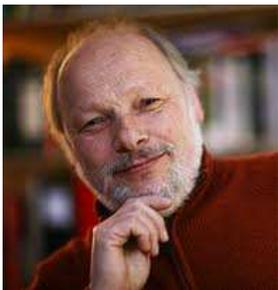
Joint Institute for Nuclear Astrophysics

An NSF Physics Frontier Center

JINA Laboratory Portrait: St. ANA at Notre Dame

Formally named the 5MV Stable beam Accelerator for Nuclear Astrophysics (St. ANA), it is fondly referred to as the 5U by researchers at the Nuclear Science Laboratory.

Page 2



A note from the Director, Michael Wiescher

Welcome to the first JINA newsletter. JINA, the Joint Institute for Nuclear Astrophysics, has grown tremendously over the eight years of its existence. Funded initially through the NSF Physics Frontier Center program as a small collaborative research center between the University of Notre Dame, Michigan State University, and the University of Chicago, it has developed into a multinational center with strong research and collaboration links to universities and research institutions in the US and Canada, in South America, Europe, Asia, and Australia. Even in South Africa, JINA groups are involved in active research. This newsletter will be published quarterly and will present highlights from JINA research in nuclear physics, astrophysics, and astronomy. We plan to feature developments or results obtained at one or two institutions, starting with a facility upgrade at Notre Dame and an upcoming workshop at Michigan State University. This will be complemented by announcements of upcoming JINA sponsored conferences, workshops, and schools. We will also report on JINA outreach and educational activities throughout the year. I hope this newsletter will provide an impression about the multitude of scientific and educational activities JINA is presently involved in.

In this Issue

- Page 2 JINA Laboratory Portrait: St. ANA at Notre Dame by Ed Stech
- Page 2 Upcoming meetings, workshops, conferences, and outreach events
- Page 3 Outreach Update: Summer camps in East Lansing and South Bend
- Page 4 Up and Coming JINA Researcher Spotlight with Daniel Robertson
- Page 5 JINA Frontiers Meeting at MSU by Zach Meisel
- Page 6 JINA Crossword
- Page 6 Contact Information

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Providing an intellectual center with the goal of enabling swift communication and stimulating collaborations across field boundaries, while at the same time providing a focus point in a rapidly growing and diversifying field

JINA Laboratory Portrait: St. ANA at Notre Dame

What can the 5U do for you?

by Ed Stech

Over the last year, the Nuclear Science Laboratory at the University of Notre Dame has undergone a fairly significant upgrade. During the spring and summer of 2011, the aging KN accelerator was decommissioned and removed making way for a new 5MV pelletron. The new vertical single ended accelerator built by National Electrostatics Corporation comes with an ECR source in the terminal. The main purpose of the new accelerator is to deliver the heavier beams up to mass 40 to the HIPPO gas target (NIM A, **664**, 1, 2012, 272-281). The induced (alpha, gamma) reaction products will then be separated from the unreacted beam particles by the St. George separator (NIM A, **587**, 2008, 35-45). Both the gas target and separator are JINA funded projects while the accelerator project was funded through an NSF MRI grant.

While the primary purpose of the new accelerator is for use with HIPPO and St. George, the capabilities to deliver intense proton and alpha beams will also be preserved. The building, gas storage tank and pressure vessel for the accelerator were completed at the end of 2011. The inner components of the accelerator along with the analyzing magnet and some beam line components were installed beginning in early 2012.



A large crane moves the accelerator tank into place.

The accelerator is almost thirty feet tall, about eight feet in diameter, and weighs almost 18,000 pounds. After the tank was in place a high density concrete tower was built around the accelerator as a radiation shield. It stands forty feet high.



Continued on page 4

Upcoming Events

Sept. 30 - Oct. 3, 2012

A JINA sponsored workshop on "[Outstanding Problems in Massive Star Research --the Final Stages](#)" will be held in St. Paul, Minnesota.

Oct. 7 - 8, 2012

[JINA Frontiers 2012 Workshop](#) will take place in NSCL/MSU, Michigan.

Oct. 9 - 10, 2012

JINA sponsored [Nuclear Astrophysics Town Meeting](#) in Detroit, MI.

Oct. 13 - 17, 2012

An international EMMI-JINA workshop on "[Nuclear Physics Processes in Dynamic High Energy Density \(HED\) Plasmas](#)" will be organized in Germany and UK.

Oct. 24-27, 2012

The [2012 Fall Meeting of the APS Division of Nuclear Physics](#) will be held in Newport Beach, CA. Register before October 18.



Oct. 6, 2012

[Celebrate Science Indiana](#) in Indianapolis, IN

Oct. 26-27

Science Spectacular in Elkhart, IN

Nov. 1, 2012

5U Dedication at Notre Dame

JINA Outreach: Summer Camps



JINA Outreach swung into high gear this past summer, with seven weeks of camps in South Bend and East Lansing. From Art 2 Science to Physics of Atomic Nuclei (PAN) we held camps for teachers and children of all ages. Over 230 people participated in a JINA sponsored camp during the summer of 2012.

“Sara had a wonderful experience. Every day she came back energized by what she did and learned, and exhausted from the stimulation. I'd rate that an excellent outcome!”

Physics of Atomic Nuclei (PAN)

PAN@ND kicked off the summer in June and PAN@MSU rounded it out in August. A week-long immersive experience for high school students and teachers (MSU only), participants delve into the world of nuclear astrophysics research with lectures and experiments, culminating with a poster session.

After the experience, 80% of students said the program would affect their career path and teachers saw a dramatic increase in their comfort teaching nuclear astrophysics in the classroom.



“Fantastic all-around program. It's the best summer camp I've ever attended. It is a real treat to be around people who want to chat about math and science and who are smarter than I am. It is in some ways a small taste of college.”

PAN@MSU for students is highly competitive, with only 10% of applicants accepted into the program. Next summer, PAN@ND will become residential as it has been at MSU, and a common application will be used for both locations. A longitudinal study on past student participants is also underway.

Math, Science and Technology (MST)

MST is a two-week residential camp for middle school students through the MSU Honors College. JINA offers a course on nuclear astrophysics and scholarships for students enrolling in that course.

MST has served as a feeder program for PAN the last few years; some students even take the MST course twice before applying to PAN.

At the beginning of MST, only 6 out of 13 students were interested in a career in nuclear astrophysics. That interest increased to 12 out of 13 students after two weeks of interactive lectures and experiments.

Art 2 Science

In its 2nd year, the Art 2 Science camp at Notre Dame hosted over 130 students, ages 8-13, for a week of activities that integrated math, science, and art. According to surveys, boys thought science was more fun and easy after the camp, and girls thought science was more interesting and were more likely to pursue a career in science after the camp.

“JINA is THE CAMP to attend, according to all the FB posts!”

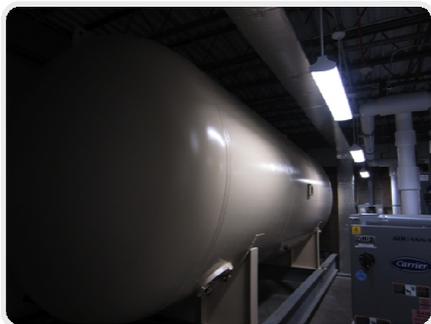
“Fabulous -- my children LOVE science and the opportunity to be in the lab at ND!!! Also having graduate students and faculty as a part of the experience is a great introduction to the world of academia for my children.”

JINA also continued a partnership with St. Joseph County Parks for an art camp with an astronomy theme. We will partner again in 2013 for a “Mad Scientist” camp at St. Patrick's park.



The 5U and you (continued from page 2)

Currently, the commissioning process is ongoing but analyzed beams of several species have been delivered to the post analyzing magnet faraday cup and the maximum terminal voltage of 5 MV has been achieved successfully. During the next several weeks, tests will be performed to study beam characteristics such as intensity, emittance and energy spread. Based upon these findings, the rest of the beam line to the HIPPO gas target will be constructed and the commissioning of St. George with beam will commence soon after that. Other beam lines will likely be constructed in parallel. Together with the 10 MV FN tandem accelerator and the 1 MV JN, the 5U will continue the long history of accelerated beams at Notre Dame and will provide the beams necessary to continue the experimental programs of the NSL for decades to come.



The gas handling system uses SF₆ to provide insulation between the accelerator and the tank walls during operation. The gas is held in this storage tank when the accelerator is opened for maintenance.

A video slideshow featuring the accelerator (created for general public) can be found at www.youtube.com/JINAMedia

Up and Coming JINA Researcher Spotlight

Name: Daniel Robertson

Age: 31

Hometown: Cheltenham, England

Education: University of Surrey – Undergraduate,
University of Notre Dame - Graduate

Current Position: Post-Doc at UND, in transition to become research faculty



Q: When you were young, what did you want to be when you grew up?

A: I wanted to be an RAF (Royal Air Force) pilot, which is a little far away from where I am now.

Q: When did you decide to pursue physics?

A: I was actually training for the army for about a year until I had a horrific motorbike accident and I had to leave due to the knee injury. So then I had to find something better to do. Initially, I wanted to do mathematics, but a lot of universities in the UK said that pure mathematics would be better if I mixed it with physics. As it turns out, when you start doing physics, you get to like it and actually enjoy it.

Q: What is your favorite aspect of your current position?

A: I get to break things. You get to tear things apart, and put them back together, but the goal is to get them working better than they were, or to get them to do something unique. We have all of this new equipment here, recoil separator, gas target, and accelerator, and we have to tweak them to get them to work together in the right way to get the best experiment that we're after. At a teaching lab, such as this one, you get to work with equipment on a fundamental level. For anyone who tore things apart when they were little, and couldn't get it back together, this is the point where you *have* to be able to put it back together.

Continued on next page

2012 Frontiers Meeting

by Zach Meisel

The Frontiers 2012 Workshop is the fourth in a series of conferences on nuclear astrophysics for all JINA institutions taking place October 7-8th at the National Superconducting Cyclotron Laboratory on the campus of Michigan State University. The workshop is unique in that it is organized solely by JINA graduate students and post-docs. The primary purpose of the meeting is to discuss recent and planned research in nuclear astrophysics, particularly focusing on work being performed by early-career JINA scientists. This year the conference will serve as an opening act for JINA researchers to the Nuclear Astrophysics Town Meeting, which is a once in a decade event intended to plan for the next ten years of research in nuclear astrophysics.

JINA Frontiers is a two-day event, complete with oral presentations and a poster session, as well as time to discuss each work. Contributions from participants will be posted on the JINA website after the conclusion of the conference. For more information, visit the [website](#). Questions or concerns regarding the JINA Frontiers meeting should be addressed to frontiers2012@nscl.msu.edu. We hope to see you there!



Up and Coming

(continued)

Q: Why is the 5U important to you?

A: It's the one of the reasons I stayed here for a post-doc, with the recoil separator. ND is a small lab, and a teaching lab, but we are continuously growing little by little thanks to close ties with amazing resources like JINA. With the new accelerator, you can deliver high intensity beams into a gas target and into the St. George, but you can also deliver beams to other areas. The accelerator is opening new options for fun experiments that we couldn't do before.

Q: Where do you see yourself in 5 years?

A: So... that depends, on the research. I actually just turned down a job in the UK because I saw where it was going in 5 years, and the position I was offered here had a lot more diversity to it. For instance, there's a new underground lab with an accelerator being developed for experiments, which is really cool, but my position will evolve completely depending on research. I could see myself heading back to the UK depending on where their program is heading, but I could also see myself staying here if the underground lab takes off. Eventually I'd like to move from research to teaching and research faculty. Working with students is one of those things that I love to do, to have a group of students where I could help them work through ideas. So in 5 years I'd like to move towards a T&R position here, or a research position in the UK.

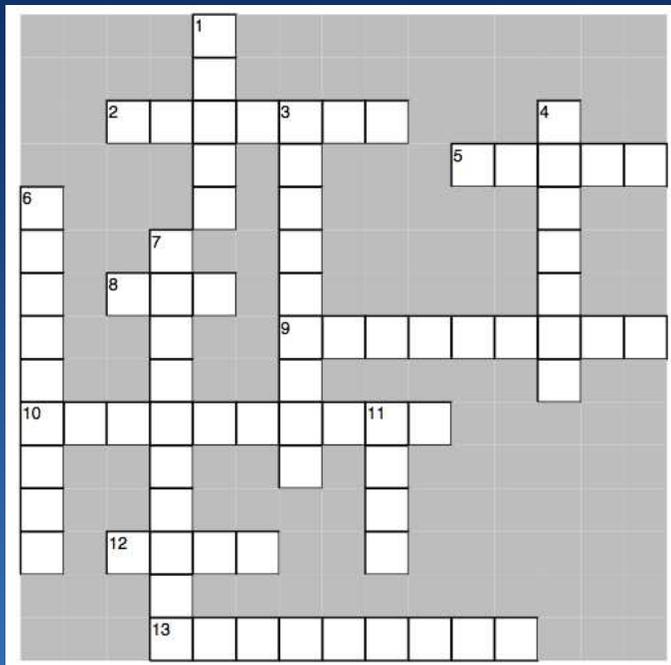
Q: What about 20 years?

A: Depends on where I am in 5 years, but retired on a small island in Barbados wouldn't be bad.

Q: Anything else you'd like the readers to know?

A: A lot of people ask me why I came to the US for graduate school when a Ph.D. in the UK only takes 3-4 years compared to 5-10 years in the US. What it came down to was plunging into a lab here where you're allowed to touch things. A lot of labs in the US are going towards end user facilities where you don't get to do the work, set up the stations, and monitor everything. Which has its advantages because you don't necessarily need to tune the beam every time, but from a first principle basis, knowing how your ion is created to how it's detected, I think knowing every aspect there not only gives you a better understanding of the experiment you're currently doing, but also how you can improve it and how you can make it better next time. So that's why I came here, and while it was a tough decision, I think for the hands-on experience, it was well worth it.

Want to know more? Offer Dan a Stone Arrogant Bastard Ale the next time you see him at a conference for a nice conversation starter



- | | |
|---|---|
| Across | Down |
| 2 Harvard "computer" used by Hubble | 1 Members of this Harry Potter family are named after astronomical bodies |
| 5 JINA webmaster | 3 Nuclear island |
| 8 Robertson childhood dream | 4 Home of 2012 Town Hall Meeting |
| 9 Nuclear valley | 6 JINA Director |
| 10 Spreading nuclear astrophysics from research laboratories to _____ and the community | 7 PAN student featured by Wyoming newspaper (We knew he was awesome first!) |
| 12 Nuclear lines | 11 Secondary cosmic ray most often detected at Earth's surface |
| 13 DUSEL gold mine | |

First 5 people to send the completed (correct) puzzle to mkilburn@nd.edu will win a prize.

Member Institutions

- [NSL / University of Notre Dame](#)
- [NSCL / Michigan State University](#)
- [ASC / University of Chicago](#)

Participating Institutions

- [Ball State University, IN](#)
- [Clark Atlanta University, GA](#)
- [Hope College, MI](#)
- [Indiana University South Bend, IN](#)
- [Southern Indiana University, IN](#)
- [St. Edwards University, TX](#)
- [St. Mary's University, TX](#)
- [SUNY Geneseo, NY](#)
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Associated Institutions

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