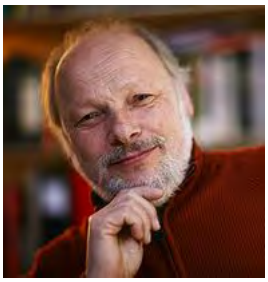
Special Issue
Fall 2013

Joint Institute for Nuclear Astrophysics
An NSF Physics Frontier Center

Outreach Edition



A note from the Director, Michael Wiescher

In this special Outreach Edition of the JINA newsletter, we highlight our two most popular summer programs for students at the University of Notre Dame and Michigan State University. Outreach at all levels is an important aspect of JINA as a Physics Frontier Center, to both share the results of our research with the public and recruit new young minds to the field. Performing outreach is also a valuable teaching exercise for young researchers such as graduate students and post-docs.

The driving idea behind the JINA collaboration is that communication between different voices can expedite scientific breakthroughs. For this reason, we are committed to diversity not only within our membership, but also within participation in our outreach programs. This edition presents external views of two camps as well as information about the gender im/balance in all of our extended programs.

In This Issue

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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

PAN: A Visitor's Perspective

Sudha Swaminathan

I attended the Physics of Atomic Nuclei Program at the University of Notre Dame from June 24th – 28th , 2013. My official commitments included giving a lecture on the first day, providing assistance with the experiments and activities throughout the week and presenting a poster on the last day.

The goals of my talk titled Physics in Art: a course and a museum tour were two-fold, (i) to inform the participants of the role played by physics in the scientific examination of objects which are part of our cultural heritage, and (ii) to introduce topics that the students would encounter during the week, such as optics, multispectral imaging, x-ray fluorescence, nuclear isotopes, and neutron activation analysis.

Group photo of students and facilitators at PAN @ ND 2013

In my talk, I described an interdisciplinary lab course for non-science majors which we teach at Worcester State University. At the end of the course our students take a live tour of the Worcester Art Museum. They see how paintings and pieces of great historic and artistic value are analyzed using physical techniques similar to those discussed in the lecture and in the lab.

This was my first time giving a talk on this subject to high-school students. It was clear from their questions both during and after the talk, that they had comprehended the main ideas and had paid attention to the details. I was very impressed that instead of being overwhelmed with so many new concepts and ideas, they took it in stride, supplementing their lack of knowledge by searching on the internet and keeping up with the pace of the presentation. I observed this motivation and enthusiasm all week long. The coordinators of the program had undoubtedly chosen the participants with great care.

Five experiments had been chosen for the week. Every experiment required some understanding of radioactive decay, a study of the chart of nuclides and practice with calibration. I believe that this repetition of important skills is valuable. I was told that the experiments were modifications of those typically performed by graduate physics students. I was pleased to see that it is possible to set the standard high and watched the students strive to reach it. The twenty participants had been carefully put into five groups. Again, the forethought of the program coordinators was apparent. I saw the confident ones encourage the "I dare not" ones. In addition, any mistakes by the overconfident ones were dealt with good humor and the atmosphere in the lab was one of youthful exuberance and optimism. I would not have expected the group dynamics of twenty

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Would you like to write a feature science article about your recent results? Do you know a young researcher who would like to be interviewed? Do you have other ideas or tidbits you'd like to share? Contact the newsletter editor for more information.

PAN Perspective (continued from page 2)

teenagers taken from all over the United States to be so positive.

I learned that they lived in the dorms during the week and noticed that pairs of roommates seemed to take responsibility for one another during the activities. One participant remarked how she felt more comfortable talking to this group that she had known for a week
than the school friends she had known for many years.

Each day during lunch time, I tried to sit with a different group of students and learn about their plans for college as well as their non-academic interests. Anytime I mentioned a book or article which I had read, they would immediately look it up on the internet and record it.
Some of them had a definite idea of where they would apply for college and what area of physics they would study. Some of the young women asked about juggling research careers in physics and raising children.

On the last day, the students presented posters on one of the experiments they had done and the best poster was awarded a prize. At the poster session, I presented a poster titled X-ray Fluorescence Study of 18th and 19th Century Silver Coins on work done with my colleague Frank Lamelas and Worcester State undergraduate Matthew Fiorentino. In this project the elemental compositions of seven coins dating from the 1770s to the 1830s were studied using x-ray fluorescence. We aimed to answer the following questions. Do coins from a similar time period, but from different parts of the world have different elemental compositions? What elements in addition to silver are typically found in a silver coin? What is the elemental composition of a coin that looks like it is made of silver, but is known to be an imitation? Since all the groups at the workshop had done an experiment on x-ray fluorescence, they were familiar with the set-up and analysis.

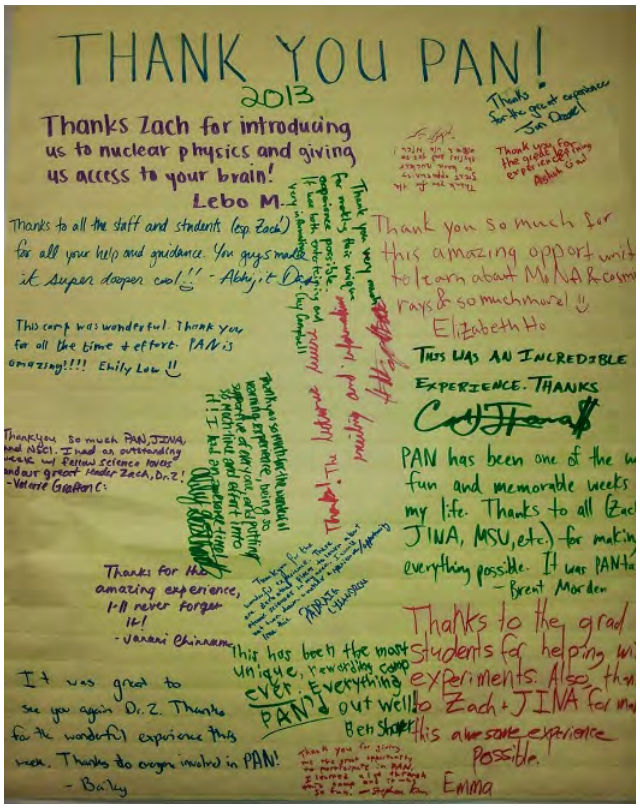
Upon completion of the poster session, Kevin Johnston, Will Zech and I discussed a research project which Kevin Johnston would conduct with one of his students from Jimtown High School during July and August of 2013. Kevin and his student planned to conduct neutron activation analysis experiments on the coins studied at Worcester State. They would also determine the elemental composition of the coins. Results of the x-ray fluorescence study and the neutron activation analysis experiments will be incorporated into the Worcester State Physics in Art course.

The Physics of Atomic Nuclei workshop was efficiently organized. The students learned the basics of nuclear physics during classroom activities as well as in the lab. The lectures on nuclear theory, astronomy, and nuclear astrophysics complemented each other since there was some overlap in the subject matter. The importance of a talk on nuclear careers to the scientists of the future is self-evident. It is astonishing how much can be accomplished in one week with a young audience determined to learn. I left South Bend a little envious of these students but definitely hopeful for the future of nuclear science.

Sudha, Will, and Kevin analyzed coins via XRF after the students had left for the day

PAN @ MSU Student Perspective

This camp was absolutely incredible. I can't imagine it going any better than it did. From the fellow PANers to the leaders and graduate students everyone was extremely helpful and friendly. I'm so fortunate that I was chosen to come here and I think down the road it will have a clear significant impact on my life. I'm planning on staying friends with the people I've met and hopefully collaborating in the future for our quest of scientific knowledge. This camp has drastically improved my self confidence when it comes to my intellectual capabilities and the opportunities I can see myself achieving. I hope you continuing having PAN for the foreseeable future and I will definitely help out with it when I become distinguished in my field. I also want to thank JINA, NSCL, PAN, Zach Constan, Mr. McCreight, the graduate students, and Micha Kilburn.



Students surprised Zach Constan with a large post-it "thank you" note at the end of PAN @ MSU

Up and Coming JINA Researcher Spotlight

Name: Anna Simon

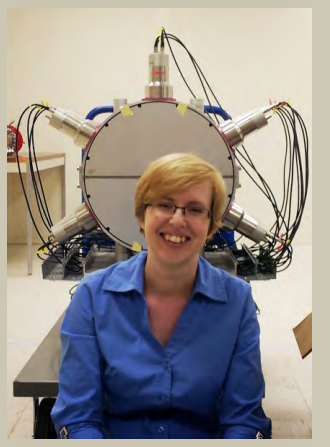
Hometown: Wodzislaw Slaski, Poland

Education: Ph.D. Jagiellonian University, Krakow

Previous Position: Post-doctoral Research Associate at Michigan State University

Current Position: Post-doctoral Research Associate at University of Richmond

Favorite beverage: Mojito, and I know how to make one.



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

A: I wanted to be a physicist. I always wanted to do something with math, and when I learned about physics, it seemed more interesting because it had an interpretation for the numbers.

Q: Do you remember when you learned about physics and decided it was what you wanted to pursue?

A: It was 6th or 7th grade, and I had a really great physics teacher. I had a hard time with Pascal's Law, and from there I decided that "I have to figure it out".

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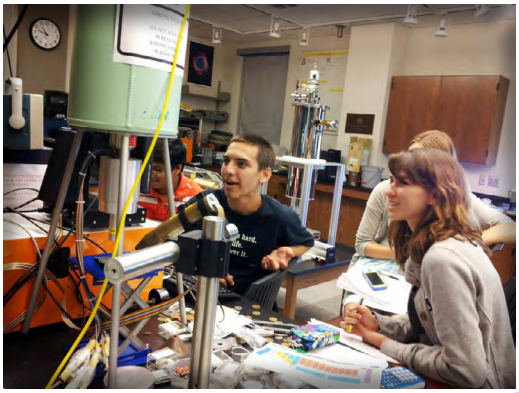
PAN @ ND Student Perspective

I want to thank you for the opportunity to let me see the work that real scientists accomplish firsthand and for me being able to meet such exceptionally bright students from all over the country. The experiments were superb and I left the camp with the desire to do more. I was so excited about the work that we were doing that I've already made plans to find ways to further research nuclear physics in school next year. It means a lot that a scientific organization like JINA would contribute some of its budget into performing outreach services like this one, which I think definitively accomplishes its mission of recruiting minds towards science and towards research and reaching for their dreams. Thanks again to you, to JINA, and to Notre Dame for giving me an experience of a lifetime and for further growing my desire to study science in college.
From Wyatt Travis

Above: Students tour the Nuclear Science Laboratory at Notre Dame on the first day of PAN
Below: Students analyze the composition of a variety of materials using X-ray Fluorescence



Up and Coming

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Q: What was your favorite aspect of working at NSCL?

A: All of the hands-on work, working with the electronics and the detectors, and being able to run here instead of traveling to another lab. Just doing things, and the variety of things. I was never stuck doing data analysis for a year, and was always working on several things in parallel, so it was never boring.

Q: Which detector system did you work on?

A: The SuN (Summing NaI) detector.

Q: How did being a member of JINA benefit you as a post-doc?

A: It provided me a lot of opportunities to become involved with nuclear astrophysics that I wouldn't have done otherwise. At one of the JINA schools, I learned how to use the network calculations, and then I could train our students to use the code. Also, organizing the Frontier Workshop was a great networking opportunity.

Q: Where do you see yourself in 5 years?

A: Hopefully a tenure track position at a nice university.

Q: 20 years?

A: Hopefully tenured at that same university. I would like a position where I do both research and teaching.

Q: Is there anything else you'd like the readers to know?

A: In my free time I walk my Siberian Husky and teach my cat tricks (or the other way round).

From a Photographer's Lens: The Art 2 Science Camp

Samantha Noll

I photographed the 120 students, ages 8-13, and the Junior Counselors, age 14-18, at the Art 2 Science Camp at Notre Dame. Throughout the week, I captured pictures of students spray-painting colorful images of solar systems, using liquid nitrogen to make ice cream, working in teams to design flying kites, and paying homage to past scientists with prose and dance. Throughout the week, the students were divided into six groups, by age, and rotated through 20 different interdisciplinary activities. The groups were named after simple machines: Corkscrews, Inclined Planes, Levers, Wedges, Pulleys, and Wheels & Axles. They discovered simple machines in toys and everyday objects through Gadget Anatomy in the first part of a two-day activity "Da Vinci Workshop." In the second day, they applied the knowledge to design mechanical setups that performed a task such as pouring cereal and milk into a bowl and an automated hair straightener. The works of Da Vinci provided inspiration throughout the week because of his success in both science and art.

The camp theme was to "See the World Differently" in

Students show their da Vinci designs

an attempt to guide students towards viewing science and the world around them from a different perspective. With this goal in mind, a new activity was added this year, led by Dr. van der Veen from UCSB and the NASA Planck Mission. She choreographed dances based on the life and work of scientists who faced a variety of barriers in their careers. Each group was assigned a different scientist and practiced the performances (including narration) daily. During this activity, I captured portraits of students embodying scientists, as if it was a dress rehearsal, at least for some, of their future as a peer in the scientific community, be that in physics, chemistry, biology, or engineering. The dances

Students practice a dance about Kent Cullers with Dr. van der Veen

from each group were the finale of the art show at the end of the program. The goals were to show students that anyone can become a scientist and to highlight potential role models they may not be aware of.

Activities with a physical science focus included making paper, exploring light with diffraction grating glasses, making guitars and flying fish from household objects and experiments with liquid nitrogen. Activities with an artistic focus included tie-dying camp T-shirts, creating artwork for the upcoming Michiana Comet Festival, and drawing 3D images. In a fusion of art and science, students used clay to create dioramas of the solar system, crafted 3D models of comets and planets, and created whimsical paintings of comets passing around the sun and shooting back out into space. While some groups were shy, others enjoyed posing for the camera and showing off both their projects and what they learned in the previous lessons. Each day there was also

Gender Disparties in K-12 Outreach

The lack of women and underrepresented minorities in physics is a well documented problem. There are a variety of nationwide efforts to target underrepresented groups through specific outreach avenues as well as efforts to slow the "leak" after students have declared Physics as a college major.

While all of our programs are inclusive and aim to ensure diversity, we often suffer from a lack of applications from underrepresented groups. The percentages of female participants in 2013 are given in tables below. It should be noted that we increased the percentage of female applicants to the Art 2 Science from 38% in 2012 through targeted advertising.

To better understand the lack of female participation in middle and high school programs, we are collaborating with education specialists and sociologists on two research projects. The first assesses differences in attitudes towards science and scientists from the Art 2 Science Camp pre-surveys. In the second project, we are evaluating recommendation letters for high school students to assess if there is a gender bias, such as that which been documented at higher levels in academia.

Art 2 Science Applications

Ages 8-14
Number of applicants: 219
Female applicants: 45%
Number accepted: 60 male, 60 female

PAN Applications

Ages: 14-18
Number of applicants: 216
Female applicants: 27%
Number accepted: 22 male, 22 female

Above: When selecting for participation, we ensure a gender balance despite the imbalance in applications
Right: Many programs use registrations instead of applications, and are dominated by male participation

Photographer's Lens

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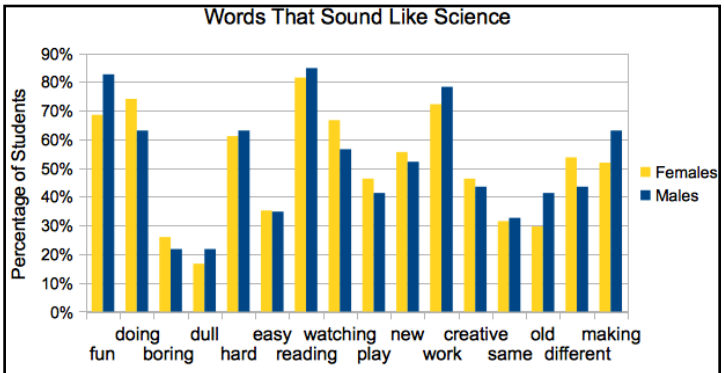
a math based activity, including the students' favorite, a scavenger hunt with math clues. Each day ended with a conceptual "True/False Challenge" which served as an incentive to learn while having fun.

JINA provided the students with observation notebooks for their use during week. They were encouraged to record their thoughts and impressions throughout the day, and some activities made explicit use of the notebooks. We also asked them to write responses to da Vinci quotes about the connections between art and science. I often caught the students working on their notebooks and showing them off to counselors and other students. They were proud of their accomplishments and engaged in their learning. The energy was contagious and the wonder of discovery illuminated the images of the Art 2 Science Camp that I captured that week. Hopefully, these experiences will shine through their memories and guide them towards bright futures in the sciences.



Pre-Survey results from the Art 2 Science Camp analyzed by gender.

Registration-based Programs

Program	Ages	# Students	% Female
Mad Scientist Camp	9-11	16	20%
MST @ MSU	13-15	10	20%
PAN @ IMSA	15-18	10	10%

Member Institutions

NSL / University of Notre Dame
NSCL / Michigan State University
ASC / University of Chicago

Associated Institutions

Arizona State University
EMMI-GSI, Helmholtz Gemeinschaft, Germany
INPP, Ohio University
LANSCE-3 / Los Alamos National Laboratory
MoCA/Monash University, Australia
Physics Division / Argonne National Laboratory
Princeton University
SESE, Arizona State University
The Cluster of Excellence "Origin and Structure of the Universe
Theoretical Astrophysics (T-2) / LANL
University of Minnesota
University of Sao Paulo
University of Victoria, Canada
VISTARS, Helmholtz Society, Germany
Western Michigan University

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
Xavier University, LS

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