

Peering Into Nuclei

BY ELISE TAKEHANA

When you are interested in the behaviors and properties of subatomic particles, you are getting into the details, the 10^{-8} details. Jared Vanasse, a theoretical physicist, researches atomic nuclei at low energies. However, the quarks and gluons that constitute protons and neutrons are strongly bound at low-energy and the theory that describes quarks and gluons, quantum chromodynamics (QCD), is very difficult to use at low energies. "At 'high' energies, it turns out QCD is a lot easier to use to calculate and predict things. At low energies, it's a lot harder to use QCD to describe what is going on in the nucleus of an atom." So how then does one learn more about quarks and gluons?

Vanasse uses field theory and a computer to predict potential observables for experimental physicists to measure or to create generalizable predictions based on experimental findings. While there are many phenomena one might want to measure in particle physics, Vanasse is chiefly interested in parity violations and electric dipole moments (EDMs).

QCD describes interactions among quarks and gluons through three color charges red, green, and blue, but at low energy quarks and gluons bind to form protons and neutrons. Although at these low energies QCD can be used to describe protons and neutrons, it is very difficult and effective field theories (EFTs) offer a more natural approach since they automatically include neutrons and protons. "Our [effective field] theory is easier to use to describe neutrons and protons and how they interact, and when you match it to the harder theory of QCD, you can use it

as a bridge to connect QCD to properties of neutrons and protons."

In his predictions, Vanasse uses few-body nuclear systems like helium to investigate symmetry violation, especially parity violation. Symmetry violation presents scenarios where the laws of physics differ slightly under symmetry transformations. For example, parity violations are instances when the fundamental laws of physics are slightly different in a "mirror" image of our world. The effects of asymmetries are profound. For instance, without charge symmetry violation, there would be no matter in the universe. "While the Standard Model [of particle physics] accounts for a combination of charge and parity violations, there's not enough to explain the amount of matter versus antimatter we see in the universe, which makes people think there's new physics."

Vanasse's second area of interest, EDM, is a measure of separation of electrical charges. "Fundamental particles should have an electric dipole, so neutrons and protons should have an electric dipole moment. But the Standard Model predicts a value that is really really really tiny and we can't measure it right now. The hope is that some new physics comes in that will make that value larger, and we'll be able to measure it. If it's larger than the Standard Model prediction, we just found new physics." His recent work with his collaborators determined the electric dipole moments of nuclei containing three nucleons



(neutrons or protons) in terms of seven unknown parameters. By measuring the electric dipole moments of these nuclei in future experiments, he and his collaborators can determine the values of these constants and further understand the nature of physics beyond the Standard Model.

Currently, Vanasse is working on two projects, the first on building predictions of four-body nuclear systems spurred on by recent

experimental measurements and the second an exploration of how often neutrons and deuterons bond to form tritons and of how parity violation effects their creation. For instance, in the formation of a triton from a neutron and deuteron, a photon is released to conserve energy and momentum. If that photon is released in the direction of neutron spin or opposite direction at unequal rates, there is a parity violation. Measuring

this is a significant challenge to experimental physicists – you're talking about counting hundreds of millions of photons where only one more escapes upward rather than downward – but that asymmetry could give physicists insight into QCD.

For Vanasse, physics is fundamental, not just for the universe but himself. "I always wanted to do physics. There is no reason why."

An Interview with Jeanette Robichaud, Director-Corporate, Foundation, and Government Grant Relations in the Grant Center

BY ERIC BUDD

If a faculty member wanted to find out about different funding possibilities to support their research and scholarship, where should they begin?

The place to start would be the Grant Center's webpage, <https://www.fitchburgstate.edu/resources/faculty-staff/grant-center>. It provides a lot of information on how to get started, the process for applying for grants, and information about managing grants once received. For example, there are special tabs devoted to "Services We Offer," "General Rules for External Funding," along with "Policies, Procedures, and Compliance." In addition, there is a link to the Institutional Review Board, as well as a list of Grant Opportunities and Sources.

Where do you recommend that faculty search to find out about funding opportunities?

Our website is a good place to start their search. At the website, they can click on the tab "Funding Sources and Fast Links to Comprehensive Directories." That will bring up a list of funding sources ranging

from Federal, State, College/University Associations, and Foundations. For federal grants, an excellent source is <https://www.grants.gov/>. However, while the national organizations are great sources of funds, the challenge is that they are so big, and you will be competing with huge universities, R1 schools, etc. As a result, I often advise faculty members to look more locally. One place to start would be a related government department. For example, check out the Department of Education's website, or the local office of the EPA.

Within Massachusetts, a very good place to look is <https://www.commbuys.com/bsol/>. If a faculty member is interested in accessing that site, they should send me an email and then I can get them access. It can be a little clunky to navigate, so I'd be happy to help walk them through it as well. Another excellent resource is a contract we have with Hanover

Research. They have grant resources, statistical data bases, and an extensive library of webinars on topics like "How to Apply for an NSF Grant," etc. If interested in accessing their site, just send me an email so I can grant you access.

There are also a number of local foundations that have been very supportive of Fitchburg State, such as the Community

Foundation of North Central Massachusetts (<https://cfncm.org/>).

The George I. Alden Trust funds capital projects. The Nursing Department received funds to work on their Sim Lab, and before that

they supported the renovation of the IDEA Lab and Game Design Studio.

Once a faculty member has identified a grant they are interested in applying for, how can the Grant Center help them?

The faculty member should complete the "Intent to Apply for External Funding" and get



approval from their department chair and Dean to move forward. That form then goes to the Grant Center. We can help with reviewing the project and making sure it fits with the funding source they have identified. We assist with editing and making sure that all components of the grant are in place. We also look to see that the application has addressed all the questions or review criteria stated in the Request for Funding Proposal (RFP) or Notice of Funding Opportunity (NOFO). The Grant Center is also the one that actually submits the grant, as we are the authorized representative to do that for the University.

In applying for a grant, are there any red flags or common mistakes that faculty should know to avoid?

Before you apply for a grant, it is a good idea to check in with the funding source to make sure that you meet all of their criteria. For example, if they are looking to fund projects in the Boston area, would that include Fitchburg? Once you find a Foundation, we can look through our directory

to see who and what they have funded in the past, to get a sense of whether your proposal would be a good fit.

With grants, one of the fundamental pieces is does the project match the intention of the grant? It's really important to read the information on what the funder is interested in supporting, and how they want to support it. Trying to make a project fit, when it really doesn't, is not a great recipe for success! Also, often the people reviewing the grant proposals are not necessarily familiar with the jargon and the acronyms used in the field. Faculty should write the proposal with the idea that a lay person will be reading it. It is helpful to have a third party review the grant to see if they can understand it without any help from the writer.

What makes for a strong grant application?

A clearly stated need or statement of the problem helps set the tone for the grant. Following that up with how your project will address that need or problem is the next step. Having clear and

measurable outcomes and objectives is also important. The budget also plays a big role, and needs to tie directly to what you are doing. It should also be reasonable and not extravagant. Ask for what you need but don't embellish it, as funders want to know their money is being used wisely and responsibly.

Is there anything else you'd like to tell faculty?

The Grant Center has lots of books on how to write a strong grant proposal, and we are happy to lend them out. We are here to help throughout the process, and are happy to meet to answer and questions and discuss any concerns. Our work also includes corporate engagement, so if you are interested in reaching out to a specific industry or company we can help with that process, providing information on past or current involvement with FSU. Just reach out to me at jrobic15@fitchburgstate.edu, or to Megan Boyd, the Assistant Director, Corporate, Foundation, and Government Grant Relations, at mboyd3@fitchburgstate.edu.

Campus News

\$441K GRANT FOR OER DEVELOPMENT

Fitchburg State University is part of a six campus consortium that has received grant funding for the U.S. Department of Education for their project "Remixing Open Textbooks through an Equity Lens." Read more about the project at <https://bit.ly/3tD6liJ>. The application period is now open until October 19. To apply, go to <https://sites.google.com/view/rotelgrant/>.

SHARING YOUR RECENT PUBLICATIONS OR CREATIVE WORK

The library records book publications and creative works such as films, exhibits, or musical compositions. You can report your own recent work at <https://forms.gle/BKpGXfzYs6LbH9H19> so that the Center for Faculty Scholarship and Amelia V. Gallucci-Cirio library can celebrate and archive your work.



From Italy to Fitchburg and Back

BY ERIC BUDD

With four grandparents who emigrated from northern Italy, you might have predicted that Teresa Fava Thomas would focus her research on Italian immigration. But, that actually wasn't one of her areas of interest initially while pursuing her doctorate in History at Clark University. However, when she got the opportunity to work closely with a new faculty member at Clark, Dr. Janette Greenwood, on her course Race and Ethnicity in the United States, her interest in the topic grew. During her 2006 FSU sabbatical she began to study the Venetian dialect her family spoke and explored archives in Venice where she researched her book *The Reluctant Migrants: Migration from the Italian Veneto to Central Massachusetts*.

In her research on Italian migration, Dr. Thomas adopted a comparative approach, comparing the similarities and differences between Italian migrants from Northern and Southern Italy, as well as between Italian and German immigrants. Interestingly, Italian emigration from Northern and Southern Italy was very different. Most Italian immigrants came

from Southern Italy, with those from Northern Italy (the Veneto region and beyond) representing just 10% of the total. As a result, the immigration experience of Northern Italians has received less attention. Migrants from the Veneto region did what was called "circular migration," where they came to the US to do seasonal work, would return home in the winter, and then return to the US the following year. Dr.

Thomas was interested in how they maintained that "trans-national" lifestyle, and discovered that no one did it for more than a decade. Either they ended up returning to Italy permanently, or they settled in the US. Some, like one of her grandfathers, set up businesses right away, and never returned to Italy. The migrants from the Veneto region were "reluctant migrants" because they were driven to leave by

poverty and starvation, with this "circular migration" taking place between 1880-1920.

Italian migrants from Southern Italy, on the other hand, came to this country in the 1910's and 1920's. These migrants were contract workers, recruited for large scale labor projects. The recruitment of young men to work on these projects had a devastating impact on many southern Italian communities because all

of the young men left for good. Unlike the Italian immigrants who came to the Fitchburg area, the Germans arrived much earlier, with the first German immigrants coming to the New World in the 1700s, and German immigrants being well established in the Fitchburg area by the 1800s. They weren't contract workers like the Southern Italians, instead tending to go into technical positions in industry. German immigrants also were more welcomed than their Italian



peers, as they were seen as Anglo-Saxon.

Dr. Thomas has also researched the American response to Italian immigration. Not surprisingly, that response ranged from warm and welcoming to those who wanted to close the door completely. She wrote a book chapter about Sarah Wool Moore who set up the Society for the Protection of Italian Immigrants. Moore saw the abuse of Italian contract workers and sought to teach them English, and make their work environments safer. Many Italians were getting killed at their job sites because they didn't know how to handle the machinery. She wrote and illustrated an Italian-English Dictionary, and came up with what is known as "Job English" which explained how to work safely. The work of Moore and others who sought to help the immigrants was countered by the Immigration Restriction League, which was based here in Massachusetts.

After publishing her book on Italian migration, Dr. Thomas's focus shifted both geographically and thematically. Her recent work has been on the impact of the World Wars on Italian society. During the Great War, the Austro-Hungarian Empire occupied the Veneto in northeast Italy. While searching through the archives in Venice, Dr. Thomas found a diary written by an Italian nun who wrote about her efforts to protect women and children in the occupied areas.

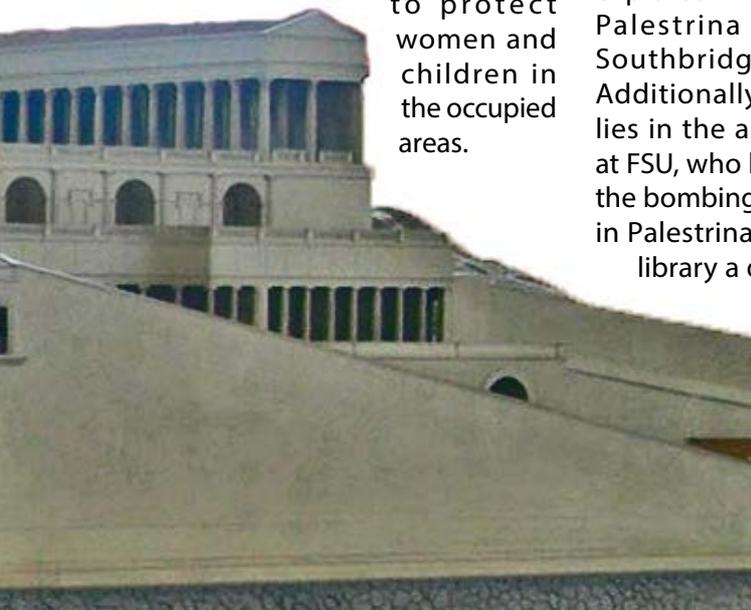


Dr. Thomas' current research is on the impact of the strategic bombing campaign by the US and UK on Rome, Italy and the nearby mountain town of Palestrina. Unlike in Dresden or Tokyo, the bombing did not involve the use of incendiaries, because most of the buildings were made of stone not wood. According to Arthur "Bomber" Harris, the goal of the bombing campaign in Italy was to destroy housing, in order to drive the civilians from their villages so that they would overthrow the government and end Italian fascism.

In her research, Dr. Thomas explored immigration between Palestrina and the town of Southbridge, Massachusetts. Additionally, there were families in the area, and even here at FSU, who had a connection to the bombing of Palestrina. While in Palestrina, she found in their library a dozen booklets that were oral histories about WW II. To commemorate the 50th anniversary of the

war, Palestrina began a Progetto Memoria (Memory Project) where they encouraged people to write down their memories from the war, and they reprinted several diaries that had been written during the war by residents of Palestrina.

While the strategic bombing campaign in Palestrina and elsewhere caused a great deal of pain and suffering for the Italian people, in Palestrina, at least, one positive came about. The bombing of the city unearthed an ancient pagan temple, the Temple of Fortuna, the Goddess of Divination. While the residents of Palestrina always knew a temple was there, it wasn't uncovered until after WW II. In restoring the temple, the Nile Mosaic, a beautiful 20'X15' image of the Nile valley, was restored, and is now displayed in a national museum on the grounds of the ancient temple. From "reluctant migrants" to pagan temples, and from Fitchburg to Southbridge to the Veneto and Palestrina, Dr. Thomas's interests add a lot to her classes and our historical knowledge.



Museo archeologico prenestino's reconstruction of the Sanctuary of Fortuna Primigenia.

When Seconds Save Lives

BY ELISE TAKEHANA

Dr. Hong Yu prides himself on his investment in students. When I came to visit him in the Electronics Lab, he was so humbled and touched by the trophy his students purchased and personalized for him at the end of spring 2021. And it is no wonder that they are grateful. Yu has focused much of his recent research efforts to support student participation in his research in preparation for their careers.

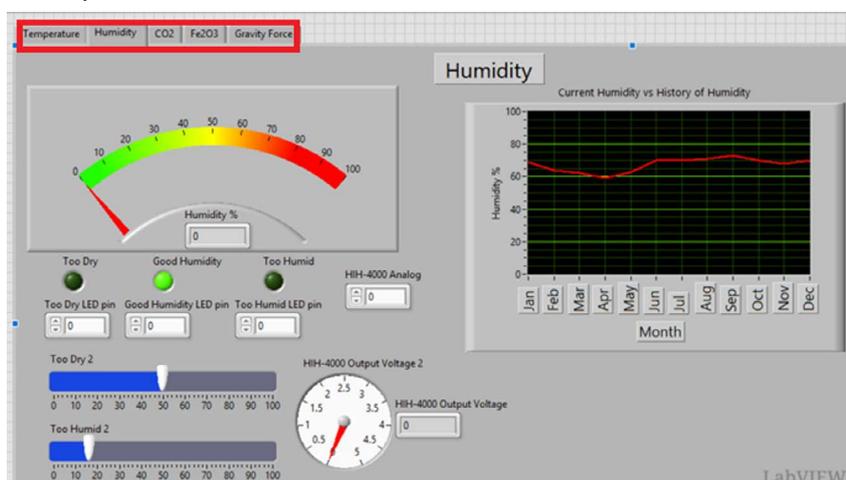
Yu, a senior member of IEEE and the vice-chairs of ASEE and Robot chapters, has been working on Nowcast systems for earthquakes because every second counts during an earthquake. Unlike forecasts that predict in periods of years, Nowcasts use satellites to detect gravity signals caused by neutron decay in Earth's core, identifying p-wave vibrations that precede an earthquake. P-waves are compression waves that appear before traverse waves occur and then generate the surface wave of an earthquake. To preserve life, detecting and immediately broadcasting the existence of these p-waves to those near the source can give people time to secure a safe position before the earthquake hits.

With the foundational work of researchers such as Prof. Richard Allen in early-alert earthquake systems, Yu and his students are conducting a big data analysis on seismic waves using NASA's satellite data on gravity stress measurements caused by thermal convection in the Earth's iron core and combining that with the seismic ground measurement data from the United States Geological Survey's (USGS) library. He is also working on an inertial measurement unit (IMU) for smartphones that include a piezoelectric soft crystal that can generate voltage changes. If the IMU is made sensitive enough, it could detect earthquakes and their projected magnitude minutes before the earthquake could be felt and deliver near-instantaneous alerts via smartphone to everyone. The IMU would use the difference of the matrix products between two instant measurement data-vector products. If the resulting difference reaches

a certain threshold, the IMU issues an alert.

Currently, Yu and his students, Sean-Paul Tomer and Elijah Perron are working on multiple embedded sensors to create an environmental monitoring system that synchronizes with smartphone data. In addition to the gravity force sensor, they are also developing sensors and a user interface for the Solar Decathlon that includes indicators for temperature, humidity, CO₂ ppm, and Oxygen density. The students' coursework in ENGT 1000, 2055, 3900, and 4050 built towards developing such embedded sensors and circuits, however, some sensors such as Fe₂O₃ sensor will cost thousands of dollars to develop. Beyond funding, another challenge is getting devices to connect via Bluetooth with sensors to build this Internet of Things required of such immediate environmental measures.

In his future work on nowcasting, Yu would like to consider what biological detection systems animals already have which humans might mimic in their technologies. Could we put a sensor on animals that can send information to humans? How can humans adapt to sense our environment? And in exploring those questions, he will include students so their potential employers can see how his students can problem solve through building.



Library Liaisons Are Here for You

BY ERIC BUDD

With a global pandemic raging, a presidential election taking place, and having to change all of your courses from live to remote, you probably missed an exciting new development at the Amelia V. Gallucci-Cirio Library. Last year, the librarians dramatically revised the Library's Liaison Program with renewed emphasis on faculty research and scholarship.

The Library Liaison Program's core mission is to build collaborative partnerships in order to foster innovations in teaching, research, and student learning. The program's co-coordinators, Connie Strittmatter and Renée Fratantonio, also want to build the Library's relationship with the academic departments, create partnerships with faculty, and share their expertise on the research process.

Each academic department now has a faculty liaison who serves as the link between the departments and the library. There are six librarians who serve as liaisons with the different

departments, and each has their own area of specialization. The following librarians serve as liaisons, with their areas of specialization:

- Linda LeBlanc - Nursing
- Lori Steckervetz - Natural Sciences
- Olivia Rossetti - Behavioral Sciences
- Connie Strittmatter - Business and Technology
- Sherry Packard - Communications Media, Game Design, and Computer Science
- Renée Fratantonio - Education, Humanities, EHPS, and English

Faculty members who require assistance in their research can reach out to their department's liaison for help. Either the liaison will be able to assist the faculty member directly, or they will put them in contact with one of the eight specialized teams that the library has created. "We think that incorporating library staff into our functional teams is the right

approach for a library of our size so we can cross-train, ease channels of communication, and foster a collaborative community" says co-coordinator, Renée Fratantonio. The library created the following teams to assist faculty in their research: Archives and Special Collections, Open Educational Resources, Teaching, Online Learning, Research Help, Outreach and Social Media, Collections, and Digital Humanities.

The eight teams listed above consist of at least two librarians, along with library staff and student workers. Team members are tasked with developing expertise and sharing their knowledge with liaisons and faculty in each content area. Co-coordinator, Connie Strittmatter is optimistic about the changes to the program. "We hope that by raising awareness of how the liaison program works for faculty, in addition to students, our approach will have a broader impact on the campus community."

From the Co-Coordinators, Eric Budd and Elise Takehana



Welcome back to campus for what appears only a slightly less unnerving fall semester than last year! While many of us are glad to be back with colleagues, it's not quite the semester we were expecting this past summer. Even though we have decided to keep our programming slim with the delta

variant still active, we're happy to continue with the Faculty Speaker Series. We will be adding those talks to the Falcon Connect calendar so FYE students are made aware of these talks. We are also planning a summer research workshop in

collaboration with the Amelia V. Gallucci-Cirio library and the Grants Center.

We would also like to congratulate the winners of Special Project Grants approved late last academic year. See the last page of this issue for a list of our grant winners. We'll also be hosting our first book talk of the year featuring DeMisty Bellinger-Delfeld, Katy Covino, Kyle Moody, and Ben Railton. While COVID has certainly put a strain on us all, it is a source of joy that we continue to be able to support research on campus.

From semester to semester, we are sometimes better teachers, sometimes researchers, sometimes parents or community members. Wherever you are this semester, know that we support you. If ever we can be helpful to you, we're just an email away.

Events

Please send details of events related to faculty research or intellectual life to etakehan@fitchburgstate.edu for inclusion on the Center for Faculty Scholarship's calendar and newsletter.

09 30 21

3:30 President's Hall

Prof. Jon Krasner shares his Harrod Lecture "Pure Perception: Raising Aesthetic Awareness."

10 04 21

12:30 PERC 208

Prof. Adem Elveren shares his talk "The Impact of Militarization on Gender Inequality" as part of the Faculty Speaker Series.

10 08 21

3:30 Virtual

Profs. Karina Bautista and Diego Ubiera host a discussion "Tracing the Term Latinx: Cultural Politics and Representations in the U.S." <https://meet.google.com/tgr-hnvf-met?authuser=0>

10 13 21

3:30 TBA

Profs. DeMisty Bellinger-Delfeld, Katharine Covino, Kyle Moody, and Benjamin Railton speak on their recently published books.

10 15 21

7:00pm Weston Auditorium

Award-winning journalist Maria Hinojosa presents "At the Root of Things: Breaking the Invisibility of Latinos/as/xs in Our Society." She is the anchor and executive producer of Latino USA on NPR. Tickets required. Free.

11 08 21

12:30 PERC 208

Prof. Lilian Bobea shares her talk "Police Reform in the Dominican Republic: Challenges and Opportunities" as part of the Faculty Speaker Series.

11 08 21

3:30 PERC 208

Jeanette Robichaud, Director of Corporate, Foundation, and Government Grant Relations hosts a workshop for PIs new to the role.

12 06 21

12:30 PERC 208

Prof. Amanda Suzzi shares her talk "How Do You Teach Environmental Justice to High School Students?" as part of the Faculty Speaker Series.

2021-2022 Special Projects Grant Winners

RESEARCH ASSISTANT

- EB Caron - Psychological Science
- Elyse Clark - Earth and Geographical Sciences
- Nellipher Lewis Mchenga - Nursing
- Daniel Welsh - Biology and Chemistry
- Eric Williams - Biology and Chemistry

MAJOR GRANTS

- Jessica Alsup - Exercise and Sport Science
- Dennis Awasabisah - Biology and Chemistry
- Elyse Clark - Earth and Geographic Sciences
- Michael Hove - Psychological Science
- Ben Lieberman - Economics, History, and Political Science

MINOR GRANTS

- Katharine Covino - English Studies
- Lisa Grimm - Biology and Chemistry
- Kyle Moody - Communications Media
- Jason Talanian - Exercise and Sport Science

ANTI-RACISM

- Lydnsey Benharris - Education
- Zachary Miner - Sociology

COURSE RELEASES

- DeMisty Bellinger-Delfeld - English Studies
- Steven Fiedler - Biology and Chemistry
- Nellipher Lewis Mchenga - Nursing
- Elise Takehana - English Studies

Research Live

The Center for Faculty Scholarship

Co-Coordinators: Eric Budd and Elise Takehana

If you are interested in having your work featured in *Research Live*, contact Elise Takehana at etakehan@fitchburgstate.edu