



IHCC

Solving problems that exist at, and along, the interdependencies between humans, community, and infrastructure to ultimately improve quality of life.

Vol. 2 No. 3 *April 2019*

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4/02 | Transdisciplinary Research Symposium

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4/17 | Building Transdisciplinary Communities Lecture

4/27 | Collaboration Incubator Workshop (postponed until August 2019)

If you have any questions, comments, or concerns, please contact us:

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For more information about IHCC, visit our website

CLUSTER HIRE SPOTLIGHT



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**Energy
Infrastructure**

Electrification

Sustainability

**High-density
Integration**

**Electronics
Packaging**

How do you see your work contributing to the goals and vision of IIHCC?

The goal of the Energy Theme within IIHCC is to improve energy infrastructure for the 21st-century world. The ways energy is generated and consumed are changing dramatically—we are going from large-scale, centralized power plants, to distributed, variable, renewable energy sources. There is also a significant increase in electrification—from all forms of transportation (cars, planes, trains, and ships) to buildings and industry. While these are exciting changes, they present significant challenges for our current energy infrastructure. Our power grid must become more flexible to accommodate these changes. Power electronics can achieve this by providing active, instantaneous power flow—they will send the power where it needs to be, when it needs to be there, in the form that is needed (e.g., AC or DC). This is not new. Power electronics have already revolutionized our portable electronics. They have dramatically increased the power management of the devices we use every day so that our batteries can be smaller and lighter and last longer. Now, we are scaling this up (significantly) to the higher voltages and power levels seen at the grid scale. We are going from tens of volts to tens and hundreds of kilovolts—a mere 1,000 times increase. My work will facilitate the adoption of high-voltage wide-bandgap power semiconductors, which will be a key piece in creating high-voltage, high-power converters that will increase the flexibility and sustainability of our power grid. Additionally, this work will dramatically reduce the size and weight of high-power conversion systems, resulting in smaller power substations, and more efficient electric ships and large-scale renewable energy systems.

What other areas outside of your discipline would you entertain for future research and proposal work?

Successful integration of advanced power semiconductors, which are at the heart of switching power converters, requires an optimization of electrical, thermal, mechanical, and thermomechanical characteristics. Accordingly, electronics packaging and high-density integration crosses many engineering and science fields. Bringing together expertise in these areas allows us to apply advanced methods and materials to improve performance and reliability, resulting in lower power consumption and longer product lifetimes, which are especially critical in grid, transportation, and off-shore wind applications. For the high-voltage wide-bandgap semiconductor devices, a major challenge is the high electric field strengths, which can result in corona discharge. A combination of new electrical, geometrical, and materials methods are being explored to grade the electric fields, thereby allowing us to create smaller, lighter, high-voltage power converters. In line with the IIHCC mission, my colleagues and I have also started collaborating with faculty in the College of Architecture and Urban Studies to explore how energy and design can create sustainable and human-centered buildings and communities. A prime example of what can be achieved with this type of collaboration is the FutureHAUS, which redefines conventional practices of modern home building through prefabricated structures and scalable renewable energy systems. We are also working with the Washington Alexandria Architecture Center to explore how to apply these concepts on the fusion of energy and design at the community level.

ICTAS JUNIOR FACULTY AWARD AWARDEES

Following the review process for the ICTAS Junior Faculty Award, three proposals were selected to be funded \$80,000 over the course of two years. These three proposals include:

High-Density, High-Speed 10 kV Power Module for Future Sustainable Grid and Transportation Systems

Principal Investigator | Christina DiMarino, COE **Co-Principal Investigator** | G.-Q. Lu, COE

Connecting and Improving the Energy Efficient Building Design Process

Principal Investigator | Freddy Paige, COE **Co-Principal Investigator** | Quinton J. Nottingham, PCoB
Co-Principal Investigator | Farrokh Jazizadeh Karimi, COE

Multi-model Data Fusion for Infrastructure Monitoring in Noisy, Unstructured & Variable (NUV) Environments

Principal Investigator | Rodrigo Sarlo, COE **Co-Principal Investigator** | Xiaowei Yue, COE

Sixty-three proposals were submitted and reviewed by panels representing selected Destination Areas or Strategic Growth Areas. Reviews were based on the announcement criteria with emphasis on the potential for external funding, cutting edge science and technology, alignment with the destination area or strategic growth area, clarity of research objectives and plan and the quality of interdisciplinary collaboration. Eleven proposals (17%) were selected for funding in this year's competition.

SCIENCE, ENGINEERING, ART, AND DESIGN (SEAD) GRANT AWARDEES

After review, IIHCC, in collaboration with the Creativity + Innovation (C+I) Destination Area and the Institute for Creativity, Arts, and Technology (ICAT), is excited to announce the selected proposal for the Science, Engineering, Art, and Design (SEAD) Grant:

Smart Cross-Laminated Bamboo

Program Manager | Katie MacDonald, CAUS
Co-Principal Investigator | Jonas Hauptman, CAUS
Co-Principal Investigator | Kyle Schumann, CAUS
Co-Principal Investigator | Daniel Hindman, CNRE
Co-Principal Investigator | Tom Hammett, CNRE

IIHCC, Creativity + Innovation (C+I), and the Institute for Creativity, Arts, and Technology (ICAT) partnered together on the \$25,000 research grant. All proposals were expected to align with one or more of the IIHCC thematic areas, support the transdisciplinary mission of ICAT, and have a focus on human-centered interactions to support the missions of IIHCC, C+I, and ICAT. In addition to these requirements, awardees are expected to present at an IIHCC TRAIN Talk in the fall of 2019 and ICAT Creativity and Innovation Day in the spring of 2020.





CHOICES AND CHALLENGES FORUM HIGHLIGHTS

We would like to thank all those who helped organize the [Choices and Challenges Forum](#) and those who attended and participated in the many engaging discussions. The forum hosted a wide array of stakeholders, who offered their knowledge and opinions to the discussion of automated vehicles in the New River Valley. The highlight of the event was the main panel, which elicited a vigorous debate. In addition to the lively conversations, new connections were made between individuals and organizations, driving forward Virginia Tech's goal for transdisciplinary research and collaboration. Furthermore, the University continues its long-standing tradition of engaging and collaborating with the town of Blacksburg for the betterment of the community and its residents.

IN THE NEWS

[Rwandan Design Company Develops Sustainable Recycled Tiles](#) | Rwandan designers, in collaboration with professors and students from Rwanda Polytechnic (IPRC) in Kigali, Rwanda, have developed an innovative use for recycled plastics.

[Toward adaptive robotic sampling of phytoplankton in coastal ocean](#) | A team of Norwegian and Portuguese researchers present results from experiments using an autonomous underwater vehicle to sample and survey oceanic measurements.

IIHCC CALL TO ACTION

IIHCC is looking for people to assist in the development of the IIHCC mission and goals. Roles are available in IIHCC working groups, including Curriculum, Human-Centered Communities, Research, and Facilities. For more information about these roles and how you can support the Destination Area and associated Beyond Boundaries initiatives, contact us at IIHCC@vti.vt.edu.