



HEMI

HOPKINS EXTREME  
MATERIALS INSTITUTE

PROTECTING PEOPLE,  
STRUCTURES, AND THE PLANET



JOHNS HOPKINS  
UNIVERSITY

# SOMETIMES, THE BEST WAY TO MAKE SOMETHING BETTER IS TO BREAK IT.

The Hopkins Extreme Materials Institute provides global intellectual leadership to advance the fundamental science associated with materials and structures under extreme conditions, and demonstrating extreme performance.

Image credit: Tila Assgari, MICA

## **ABOUT HEMI**

Our research has a powerful impact on humanity—from predicting the effects of a cataclysmic asteroid impact to protecting the human body in an increasingly kinetic world.

We believe that such complex problems can only be addressed by sophisticated teams. We partner with academic, government, and private organizations on a wide range of projects, leveraging key strengths across Johns Hopkins—including the Whiting School of Engineering, the Krieger School of Arts and Sciences, and the Applied Physics Laboratory.

The largest research center in HEMI is the Center for Materials in Extreme Dynamic Environments, a multi-institutional collaborative research alliance funded by the U.S. Army Research Laboratory. Through the design of materials for high-stress and high-strain-rate regimes, CMEDE aims to build the basic science needed to protect those who protect us.

## **OUR COLLABORATIVE RESEARCH APPROACH**

Our team of world-class researchers embraces the challenge of solving complex and compelling problems. This allows us not only to develop and provide the tools needed to address today's problems, but also to do the basic science needed to address future challenges.

We view collaboration as the key to transformational science. We look across the world to incorporate discoveries, facilities, capabilities, and expertise into our efforts.

We are dedicated to improving the human condition by providing science-based tools to industry and government organizations, including NASA and the U.S. Department of Defense, as well as academic centers both within the United States and throughout the world. We also partner with industry to develop and share research and resources, allowing our work to impact society in exciting new ways.

**At HEMI, collaboration happens at every level.**

We offer research and collaboration opportunities to the following:

- > Government personnel
- > Industrial engineers and scientists
- > International researchers
- > Researchers at national laboratories
- > Faculty on sabbatical



**PRIMARY RESEARCH AREAS**

**Dynamic Materials and Structures**

HEMI researchers examine the design of materials and structures that can provide protection to people during potentially destructive events where extreme pressures and strain rates develop (e.g., plane and car crashes, bullet impacts, and explosions).

**Extreme Visualization**

We develop novel techniques that allow scientists to see what has never been seen. Our efforts take advantage of beamline facilities across the world to create new in situ visualization capabilities.

**Injury Biomechanics**

Our research develops experimental, theoretical and computational models for impact-induced injury, providing the foundation for creating technologies to better protect people.

**Multiscale Materials Modeling and Design**

HEMI researchers are at the forefront of the design of new materials through multiscale materials modeling coupled with advanced 3D characterization and experiments over a wide range of length and time scales.

**Planetary Science & Engineering**

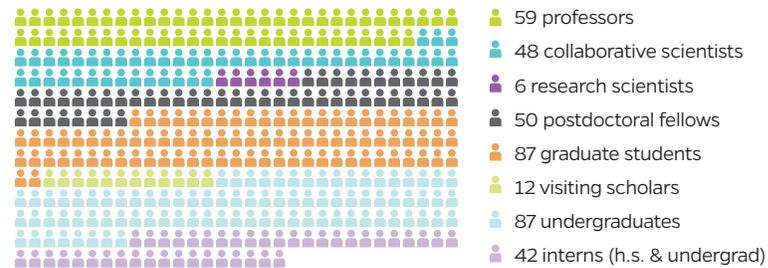
From large-scale impact cratering to asteroid hazard mitigation, we are working to not only understand impacts and collisions in the solar system, but to develop the core technologies to explore deep space and the asteroids.

**HEMI IMPACTS THE ADVANCEMENT OF EXTREME MATERIALS RESEARCH AT JHU & BEYOND**

**\$35m** in funding since 2012 has supported research by and for:

**27+** events in the 2015-16 academic year

**391** researchers, students & interns



**653** publications & presentations



**31** partnerships



Each year, HEMI offers a variety of educational and collaborative opportunities including the following:

- > HEMI/MICA Extreme Arts Program
- > Seminars & Workshops
- > Research in Engineering Apprenticeship Program (REAP)
- > Mach Conference
- > Short Courses
- > HEMI Boot Camp

For more details on our academic programs and events, visit [hemi.jhu.edu](http://hemi.jhu.edu).

**“WE TAKE APART THE VERY FIRST INSTANTS OF DESTRUCTION AND USE THEM TO MAKE THE WORLD A SAFER PLACE.”**

**LEADERSHIP**



**Director**  
**K.T. Ramesh**  
Alonzo G. Decker Jr.  
Professor of Science & Engineering



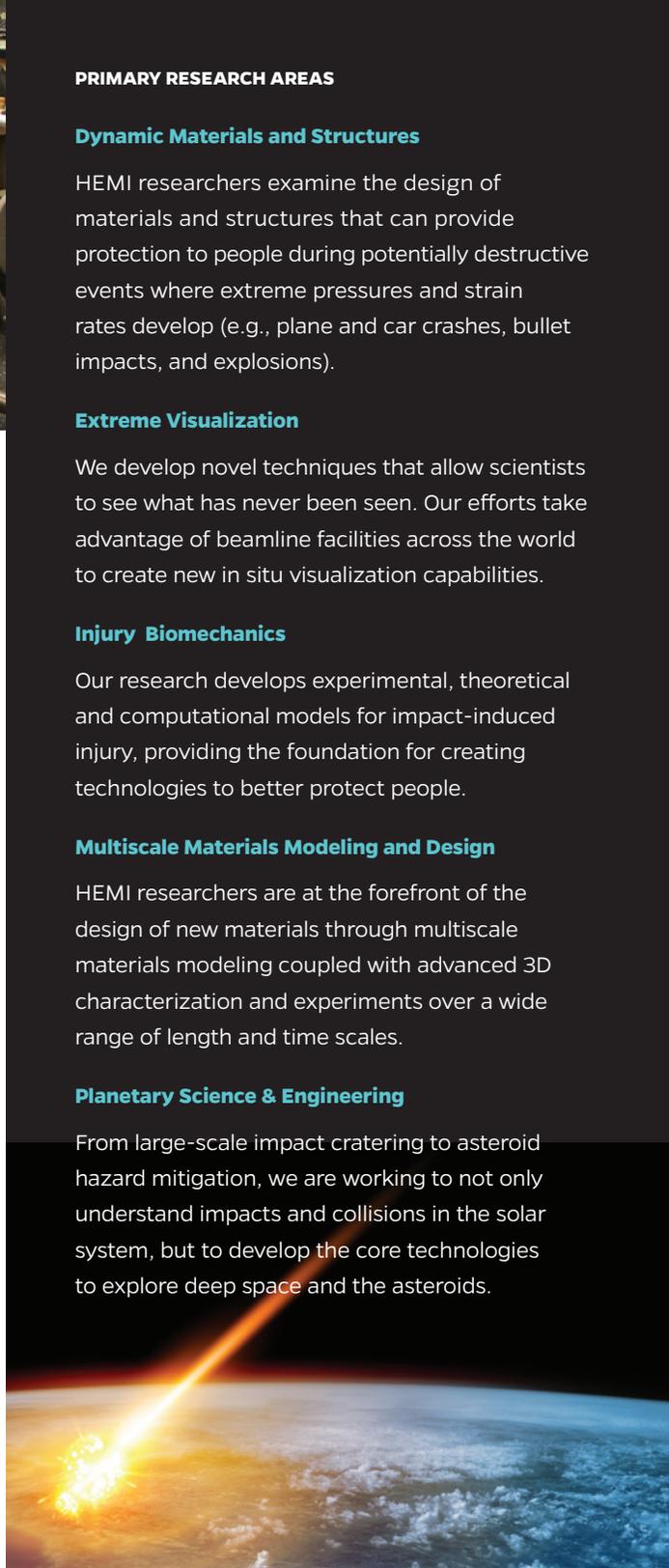
**Associate Director**  
**Lori Graham-Brady**  
Professor and Chair,  
Department of Civil Engineering



**Executive Program Director**  
**Victor Nakano**

**READY TO COLLABORATE & DISCOVER?**

Visit us at [hemi.jhu.edu](http://hemi.jhu.edu) and click on 'Join HEMI' or 'Work with Us' to learn more about joining our team.



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## HEMI IS MADE POSSIBLE BY PARTNERSHIPS BETWEEN JOHNS HOPKINS UNIVERSITY & THE FOLLOWING ORGANIZATIONS:

|  |  |
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| Army Educational Outreach Program                                      | National Institute of Standards & Technology                 |
| California Institute of Technology                                     | National Institutes of Health                                |
| Defence Science and Technology Laboratory (UK)                         | New Mexico Institute of Mining & Technology                  |
| Defense Threat Reduction Agency  | North Carolina A&T State University                          |
| Drexel University  | Purdue University  |
| Ernst Mach Institut  | Rutgers University   |
| Goddard Space Flight Center  | Solar System Exploration Research Virtual Institute (SSERVI) |
| Johns Hopkins Applied Physics Laboratory                               | Southwest Research Institute                                 |
| Johns Hopkins Applied Physics Laboratory - Planetary Impact Laboratory | University of California, Santa Barbara                      |
| Johns Hopkins Wilmer Eye Institute                                     | University of Delaware                                       |
| Lawrence Livermore National Laboratory                                 | University of North Carolina at Charlotte                    |
| Lightweight Innovations for Tomorrow (LIFT)                            | University of Texas at San Antonio                           |
| Maryland Advanced Research Computing Center                            | U.S. Army Aberdeen Test Center                               |
| Maryland Institute College of Art (MICA)                               | U.S. Army Research Laboratory                                |
| Morgan State University  | Washington State University                                  |
| NASA   | Washington University in St. Louis                           |

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