



JOHNS HOPKINS UNIVERSITY

Exploring the Universe. Saving Millions of Lives. Expanding Human Knowledge.



5:00 - 7:30 p.m. June 13, 2017 The Kennedy Caucus Room Russell Senate Office Building

The Johns Hopkins University is proud to be America's first research university.

Founded in 1876, we were the first university in the Western Hemisphere based on the European research institution model and our establishment revolutionized U.S. higher education.

Johns Hopkins was established on the principle that by pursuing big ideas and sharing what we learn, we **make the world a better place**. For more than 140 years, we haven't strayed from that vision.

Our researchers and students have worked side by side in pursuit of **discoveries that improve lives**.

What kinds of discoveries? We made water purification possible, launched the field of genetic engineering, completed a flyby of Pluto with the *New Horizons* space probe, invented the first implantable and rechargeable pacemaker, and authenticated the Dead Sea Scrolls.

We invented saccharine, CPR, and the supersonic ramjet engine. Our efforts have resulted in child safety restraint laws; the creation of Dramamine, Mercurochrome, and rubber surgical gloves; and the development of a revolutionary surgical procedure to correct heart defects in infants.



Johns Hopkins has led the nation in research and development expenditures *since* 1979.

Research isn't just something we do it's who we are. Every day, our faculty, clinicians, researchers, students, and staff **collaborate to advance humanity**.

We are conducting research, patient care, training, service, and education at **more than 1,300 sites in more than 155 countries**. Through these programs on every continent, we are continuing our founding mission to bring knowledge to the world through a proud tradition of leadership around the globe.

We continue to seek out new and innovative ideas from all across the globe and as we look ahead, it's clear that Johns Hopkins University research programs and academics will continue to produce **pioneering investigations and world-class results**.

We are thrilled to share this progress and excitement with you by bringing

HOPKINS

Presenters

Early career researchers and practitioners from across the Johns Hopkins community are presenting their federally-funded work at this inaugural event.

From the Ebola Suit developed to protect healthcare workers to biomaterials for drug delivery to a virtual training environment for upper extremity prosthetics to a music program designed to create social change and nurture promising futures for youth, their work is advancing our society and global competitiveness.



Kamila Alexander, School of Nursing National Institutes of Health: National Institute of Nursing Research & National Institute of Mental Health

Young Americans in abusive dating and intimate relationships are at far greater risk for unplanned pregnancies and sexually transmitted infections, including HIV/AIDS. The danger is particularly acute among 16- to 24-year-olds in disadvantaged communities, whether the relationships are heterosexual or same-sex. In this innovative research, Dr. Alexander defines unique social and behavioral influences on violent, sexual, and reproductive behaviors. She also describes consequences to mental, reproductive, and sexual health of poverty-related trauma and experiences of violence. Finally, in order to translate this information to useful community strategies, she explores the acceptability of Pre-exposure prophylaxis (PrEP) as a potentially effective intervention to decrease HIV/AIDS risks with youth experiencing or using violence in dating/intimate relationships.

Xin Chen, Krieger School of Arts and Sciences



National Institutes of Health: National Institute of General Medical Sciences & The Eunice Kennedy Shriver National Institute of Child Health and Human Development

An adult human being has approximately 100,000 billion cells comprised of more than 200 cell types, which all originate from a single cell—a fertilized egg. Therefore, a fundamental question to understanding any complex living organism is how cells become different while faithfully maintaining the same genetic material. Dr. Xin's lab systematically studies how epigenetic information is established and partitioned into daughter cells, which will have broad impact on stem cell biology, developmental biology, chromatin biology, and regenerative medicine.

"Our history shows that our commitment to bold experimentation did not pass with our founding. It's at the core of who we are." President Ronald J. Daniels......

FY 2015 Johns Hopkins Sources of R&D Funding



\$1.993B Federal Government
 \$136.3M Nonprofit Organizations
 \$97.9M Institution Funds
 \$66.2M Business
 \$6.4M All Other Sources
 \$6M State & Local Government



Deidra Crews, School of Medicine

Centers for Disease Control and Prevention; Health Resources and Services Administration; National Institutes of Health: National Institute of Diabetes and Digestive and Kidney Diseases & National Institute on Minority Health and Health Disparities Research in the Deidra Crews Lab focuses on health disparities in chronic kidney disease. Dr. Crews has studied how social determinants of health, such as poverty and healthful food access, affect disparities in kidney disease outcomes. Her research on end-stage renal disease includes studies of the best timing and environment to initiate dialysis among vulnerable populations. Recent research is determining the longitudinal association of food insecurity with risk of kidney function decline, incident reduced kidney function and incident albuminuria; and determining the extent to which dietary patterns over time mediate the association of food insecurity with adverse kidney outcomes.

Research Milestones

A look at just a few of the important discoveries we have made since 1876

Discovered the sweetening agent saccharin (1879) Introduced the **rubber glove** for use during surgery (1889) Published the first modern edition of the "The Epic of Gilgamesh," making available to the world the most significant extra-biblical work of ancient Near Eastern literature (1891) Developed the "blue baby" operation to correct congenital heart defects, ushering in a new era in open heart surgery (1944) Developed the first supersonic ramjet engine (1944) Took the first images of Earth's curvature, from a V-2 rocket (1946) Confirmed the authenticity of the

Dead Sea Scrolls, speeding acceptance as genuine of these earliest biblical manuscripts (1948) Conducted the first major, large-scale research study of **conditions of inequality in American schools**, which resulted in the landmark report Equality of Educational Opportunity (1960)

Took the **first color photograph of the whole earth** from space (1967)

Identified high rates of infant deaths in motor vehicle accidents, leading to the **passage of child safety restraint laws** throughout the United States (1979) Helped develop the first effective **treatment for sickle cell anemia** (1995)

Built the world's most advanced prosthetic arm, the **thought-controlled Modular Prosthetic Limb** (2011)

Engineered **New Horizons**, an interplanetary space probe, and successfully completed a flyby study of Pluto in collaboration with NASA and the Southwest Research Institute (2015-Present)



Kostas Gerasopoulos, Applied Physics Laboratory Office of Naval Research

Dr. Gerasopoulos and his team are engineering surfaces with different wettability for applications in water recovery, distillation, and dehumidification. Nucleation and growth theory predicts a large advantage for hydrophilic surfaces, while low contact angles favor droplet shedding from hydrophobic surfaces. Plants and animals in coastal desert environments appear to overcome this tradeoff through biphilic surfaces with patterned wettability. The team is investigating the effects of such millimeter-scale wettability patterns on the rate of water collection from humid air. These novel surfaces can be used for water harvesting (e.g. to capture water from fog in an arid coastal environment), water purification and desalination (i.e. making drinking water from sea water), power generation, and thermal management.

Jordan Green, School of Medicine



Department of Defense; National Institutes of Health: National Cancer Institute, National Eye Institute & National Institute of Biomedical Imaging and Bioengineering; National Science Foundation

Dr. Green's bioengineering lab is especially interested in the design of biotechnologies and therapeutics. They design and synthesize new biological materials and particle systems that can deliver new types of biological medicines such as peptides, proteins, nucleic acids, sugars, and small molecules specifically to various cell types, including cancer cells. Through collaborations across the Johns Hopkins research community and beyond, his lab is committed to the development of enabling nanotechnologybased medicines including the development of targeted anticancer therapeutics, regenerative medicine cellular therapies, immunotherapies, and ocular therapies.





Jeff Leek, Bloomberg School of Public Health

National Institutes of Health: National Cancer Institute, National Institute of Mental Health & National Institute of General Medical Sciences

Dr. Leek's research group is focused on improving the way people analyze data. He builds software and resources to make it easier for scientists to share and use publicly funded data. His group also does experiments to study the way that scientists analyze data and try to figure out how to improve the process. As hundreds of millions of dollars have been spent on generating genomic data sets, he also applies his expertise to public health genomics by organizing and curating these genomic data, overcoming technical biases, and assessing how they can be used for public health.

Lindsay Litwin, Jhpiego





The ePartogram is a tablet-based application developed to improve care for women in labor by addressing documented challenges in partograph use. The application is designed to provide real-time decision support, improve data entry, and increase access to information for appropriate labor management. The innovation behind the ePartogram is two-fold: 1) it uses validated clinical algorithms based on WHO guidelines to alert frontline skilled birth attendants when critical observations need to be made and if clinical observations are abnormal so that providers can make timely management decisions; 2: data entered in the ePartogram is transmitted in real time to remote higher level providers, connecting peripheral and referral facilities and allowing more experienced providers to support frontline decisions.



Tara MacDowell, Jhpiego

Centers for Disease Control and Prevention; Department of Defense; United States Agency for International Development; White House Office of Science and Technology

A 65-person team developed a breakaway personal protection suit that reduces the risks of exposure to infectious diseases. Funded under the Fighting Ebola Grand Challenge, the redesigned coverall suit allows for faster and more efficient removal, and features increased visibility and cooling features to allow for increased comfort and time inside the suit. Healthcare workers can remove these suits in a fraction of the time needed for existing suits. The new features can quickly be implemented due to close attention to manufacturability, scalability, usability, and cost during the design process. Johns Hopkins and DuPont subsequently signed license and collaboration agreements allowing DuPont to commercialize this garment to help protect people on the front lines of the Ebola crisis and future deadly infectious disease outbreaks.

Johns Hopkins is based in Baltimore, but our 10 divisions are spread out across 10 campuses on three continents. Below are the locations of our campuses, study abroad and Fulbright programs, and research, education and training sites:



OUR RESEARCHERS WORK IN ALL 24 TIME ZONES

Johns Hopkins researchers have collaborations world-wide in areas of focus such as:

- HIV/AIDS
- Cardiology
- Malaria
- Immunology
- Hepatitis
- Cancer
- Meningitis
- Family Planning

- Geology
- Autism
- Vaccines
- Astronomy
- Sociology
 - Influenza
 Maternal Health

TOP 5 COUNTRIES RECEIVING SUB-AWARDS FROM JHU IN FY2015 Kenva

> Tanzania Mozambique Malawi Uganda



Victor Nakano, Whiting School of Engineering Army Research Office; Department of Defense

The U.S. Army established the Materials in Extreme Dynamic Environments (MEDE) program to design, develop and test improved protection materials. Johns Hopkins University leads the MEDE collaborative research alliance, which includes 15 university and research centers across nine states, the United Kingdom and Germany. Together these partners, in close collaboration with the Army Research Laboratory are developing a materials-by-design capability which integrates experimental, computational modeling and processing activities. Four classes of materials are under investigation: metals, ceramics, composites and polymers. The impact of this research will be improved protection materials for soldiers and vehicles against blast and ballistic threats.

FastForward, FastForward East, and FastForward 1812 are the university's **three innovation hubs**, created to drive more economic development in Baltimore by supporting local startups as they head to market. There were more than 100 startups at FastForward in FY2016.













Daniel Trahey, Peabody Institute National Endowment for the Arts

Daniel Trahey directs Tuned-In, a community development program of the Peabody Preparatory which offers full scholarships to promising public school music students. Students receive a variety of musical options including weekly private lessons, the opportunity to work with accompanists, ensemble playing, and invitations to attend concerts and other cultural events around Baltimore. Tuned-In was conceived and implemented by Mr. Trahey to connect with interested students from lower income families who could benefit from the Preparatory's offerings. Tuned-in has increased from 6 students to approximately 75 students in 10 years and has a 100% college placement rate when students spend more than 3 years in the program.



Brock Wester, Applied Physics Laboratory Office of Naval Research

The Johns Hopkins Applied Physics Laboratory (APL) is launching CONVEY—Connecting STEM Outreach Now Using VIE Education for Youth—a workshop sponsored by the Office of Naval Research—for children whose loved ones have lost limbs, including civilians as well as wounded service men and women. Children will "play to learn" by using virtual and augmented reality technologies including the Prosthetics-based Virtual Integration Environment (VIE) to gain a deeper understanding of the human body, prosthetics technologies and their control methods, and the healing process. Collaborative virtual and augmented reality games and experiential scenarios will help them visualize and absorb science, technology, engineering, and math (STEM) knowledge in a fun and interactive workshop.

\$4.3M received by startups in NIH small business innovation research funding 22 newly created startup companies in FY2016

\$434m received by startups in follow-on funding in FY2016



Meng Zhu, Carey School of Business

National Institutes of Health: National Institute of Environmental Health Sciences

Despite likely parental awareness that secondhand smoke exposure exacerbates asthma, 67% of inner-city children with asthma reside in a household with at least one smoker. Dr. Meng Zhu's research addresses the rise in pediatric incidence and morbidity due to asthma in the US and globally by reducing the exposure to environmental cigarette smoke using behavioral economic techniques. Dr. Zhu designs financial incentives to motivate maternal caretakers to reduce indoor secondhand smoke exposures generated by themselves or by others in the home setting. By linking the adult-based financial incentives to pediatric health outcomes, the end results are expected to increase the long-term welfare of our communities and society as a whole.

Not just in Baltimore, but *of* Baltimore.

Johns Hopkins is investing in our community through programs to build, hire, buy and invest locally. **HopkinsLocal** represents our commitment to build a stronger Baltimore City. Here are some of the accomplishments of the first year:

\$4.9M more spending in targeted categories with local businesses

119 individuals with criminal records were hired at Johns Hopkins' Baltimore City locations

\$55M in construction spending went to contractors that were minority-owned, women-owned, or disadvantaged business enterprises.

> ""Johns Hopkins continues to attract significant financial support for work that benefits humanity, makes the world a better place, and grows our understanding of our cosmos and ourselves. That funding also provides added strength for the economies of Baltimore and Maryland, where the university and Johns Hopkins Medicine constitute our largest private employer." VP for Research Denis Wirtz

For more information about federally-funded research at Johns Hopkins, please contact us:

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