A NEW TAKE ON TRAUMA

BIG DATA, SMALL DEVICES

THE NEXT WALL TO FALL

HUMAN-MACHINE INTERACTION

THE PRINTED FUTURE

ANNUAL REPORT 2016
Over the last six years, the Deutsche Akademische Austauschdienst (German Academic Exchange Service, DAAD) and the Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) have jointly led the German Center for Research and Innovation New York (GCRI). Together with our partners from German universities, universities of applied sciences and the non-university research sector, we have benefited greatly from the GCRI – as have German and other researchers in the vibrant academic hub of New York and across North America. It is with pleasure and pride that we have witnessed the GCRI emerge into a focal point of German-American academic and scientific dialogue and collaboration. Science mixed with diplomacy is an important asset for any country; it is certainly alive and well at the GCRI with every podium and panel discussion, and every workshop organized throughout the year.

Germany is well-known for its wealth of research institutions and also for the breadth of its industrial research. It is known for its century-old tradition of academic rigor, as well as for its vigor in innovation and thought-leadership. Our friends in the US and Canada value these strengths, on which rest the manifold and strong transatlantic bonds that bind us together. Through the work of the GCRI, the German research landscape is able to present a detailed picture of itself to the North American research community, with individual events highlighting topical and thought-provoking research projects, bringing together scholars from their respective fields, and sparking new collaboration across the Atlantic.

Academic and scholarly exchange on a global scale, the mobility of ideas and people, is at the heart of science. Germany believes in open, unrestricted scientific discourse and the meeting of great minds around the globe without borders. Germany invests in this belief – not only by funding the five “Deutsche Wissenschafts- und Innovationshäuser (DWIH)” across the globe, but also by providing generous budgets for international research and scholarships.

The GCRI – or DWIH – New York translates the ideal of global science into a concrete program of events. As the two organizations that lead the GCRI in New York, we are very grateful to the German Federal Foreign Office for its unwavering support, without which this important work could not be done. We would like to thank all our partners in Germany, the US and Canada for their active engagement over the past year; and we acknowledge especially the support of the GCRI Foundation and its new initiatives. Last, but certainly not least, such accomplishments are based on the hard work performed by the GCRI staff in New York; their dedication to the ideal of a GCRI is the bedrock of this institution’s success!

Dr. Dorothea Rüland
Secretary General of DAAD
Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

Dorothee Dzwonnek
Secretary General of the DFG
Deutsche Forschungsgemeinschaft
German Research Foundation
The German Federal Foreign Office is a proud sponsor of the German Center for Research and Innovation (GCRI) New York. The GCRI, one of five German Houses of Research and Innovation worldwide has, since its opening in 2010, become a strategic component of our foreign science policy and has successfully established itself as a cornerstone of our internationalization strategy.

The GCRI enhances transatlantic collaboration in science and technology. It reaches out to industry representatives and fosters interdisciplinary collaboration by presenting and discussing cutting-edge research and innovation to a diverse audience.

With panel discussions, symposia, and workshops not only in New York, but throughout the United States and Canada, the GCRI provides a platform for researchers, scientists, and businesses from both sides of the Atlantic to exchange ideas, resulting in extensive collaboration between diverse institutions.

The highlights in 2016 included conferences and panel discussions on robotics and artificial intelligence, big data, smart cities, neuroscience, and clean technology. In addition, GCRI’s monthly newsletter, E-NNOVATION Germany covered topics, such as translational medicine, the digital future, entrepreneurship, nutrition, mental health, memory, and the future of the oceans.

The Consulate General of Germany in New York has cooperated closely with the GCRI and its consortium leaders, the German Academic Exchange Service, and the German Research Foundation. I am looking forward to continuing this fruitful collaboration.

Since its launch in 2010, the German Center for Research and Innovation (GCRI) has become a multidisciplinary forum, convening leaders in academia, industry, and government to foster strong public-private partnerships, facilitate the authorship of new publications, and address the global challenges of the 21st century. The GCRI, with its robust online presence and its extensive network in North America and Germany, is uniquely positioned to help Germany maximize leverage of its intellectual capital and entrepreneurial creativity.

Our 2016 Annual Report provides an overview of GCRI’s activities during the past year and includes articles on cutting-edge developments in German research and innovation. The report also highlights the role of the GCRI in science communication, an area that has grown in importance over the past decade.

One of the highlights of 2016 was New York City’s first Falling Walls Lab, which was hosted by the GCRI. Young scientists and entrepreneurs from different parts of the United States pitched their innovative ideas to a distinguished panel of experts at the German House. The first-place winner received a travel grant from the GCRI to compete in Berlin against the finalists from other labs around the world.

In 2016 the GCRI Foundation was able to support university sophomores from the United States and Canada to conduct research in laboratories throughout Germany during the summer. The GCRI Foundation-RISE Scholarship program for sophomores in science and engineering is designed to foster academic relationships in Germany for promising students early in their careers and, ideally, encourage future scientific engagement. In addition, the GCRI Foundation Engineering Prize was awarded for the first time to outstanding engineering students at universities in the United States and Canada. Both of these initiatives aim to further enhance engagement in STEM fields between North American and German organizations.

I would like to acknowledge the unremitting and generous support of Germany’s Federal Foreign Office, the Federal Ministry of Education and Research, the German Academic Exchange Service, and the German Research Foundation. I would also like to thank my colleagues at the GCRI for their relentless commitment and devotion to making our programs the success they have become. Further, I would like to express my sincerest gratitude to the GCRI Advisory Board for its expert guidance and to the GCRI Foundation as well as our partners in North America and Germany for their thoughtful input into our governance and programming.

Dr. Joann Halpern
Director of the German Center for Research and Innovation
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The German Center for Research and Innovation (GCRI) is a joint initiative of Germany’s Federal Foreign Office and its Federal Ministry of Education and Research. Established as an information and networking platform, the GCRI provides information and support for the realization of cooperative and collaborative projects between North America and Germany.

Since its opening in February 2010, the GCRI has organized more than 180 events in the US and Canada with leading experts from science and industry, including three Nobel Prize laureates, 19 Gottfried Wilhelm Leibniz Prize recipients, and two Kavli Prize laureates.

To date, the GCRI has participated in 158 conferences, published 90 editions of its newsletter E-NNOVATION GERMANY, significantly enhanced its website reach and social media presence, and appeared over 1,080 times in the media.

GCRI’s areas of focus mirror those of Germany’s High-Tech Strategy and include climate and energy, health and nutrition, mobility, security, and communication. The GCRI has also led the transatlantic dialogue in emerging and evolving areas, such as digital health, smart cities, artificial intelligence, and medical technologies.

The center was created as a cornerstone of the German government’s initiative to internationalize science and research and is one of five German Houses of Research and Innovation (Deutsche Wissenschafts- und Innovationshäuser, DWIH) worldwide. It is under the joint leadership of the German Academic Exchange Service (DAAD) and the German Research Foundation (DFG) and receives its funding from the German Federal Foreign Office.

With the goal of strengthening transatlantic communication on the critical challenges of the 21st century, the GCRI:

- **Presents** Germany to the North American market as a land of ideas and innovation
- **Enhances** dialogue between academia and industry
- **Creates** a forum for the initiation and enhancement of transatlantic projects
- **Acts** as an information platform for the German research landscape
Speaking of Science

Science is such an integral part of 21st century life, it is all but impossible to report the happenings of the world while ignoring the context of science. For those in the scientific community, there has never been a more important time to get the message out — and to get it right.

The past decade alone has seen the introduction of innovations that stand to radically reshape the future of the planet and its inhabitants. Technologies like CRISPR-Cas9 and gene drives, which grant the power to irreversibly alter or even abolish species or attributes, or leaps in machine learning that bring a future of truly intelligent systems into view, are just a few examples of innovations too consequential for scientists to grapple with alone. Debates and decisions about the role of such transformative technologies should arguably engage the public, yet reporting complex issues to lay audiences is no simple feat. For journalists, it is a balancing act between accessibility and accuracy, a struggle to emphasize real-world applicability and human interest while doing justice to the science itself. Misinformation can linger dangerously in the public consciousness, and, conversely, great science stories can inspire and transform.

Yet the work of science communication isn’t entirely the purview of journalists. Science news often begins with scientists themselves, many of whom view discussing their work — both with other scientists as well as with media and the public — as an increasingly essential part of their job. Ellis Rubinstein, president of the New York Academy of Sciences, believes that part of what draws thousands of people to Academy events and conferences each year are the many opportunities for connection and communication. “Since the Academy’s founding 200 years ago, it has been a place where scientists and government and industry leaders from around the world could exchange ideas and learn from one another,” he said. “Today, bringing the scientific community and other stakeholders together is still one of the most important things we do, but just as critical is that we report on the insights and ideas that come from these conversations so that the public, media, other scientists, and policymakers understand how science and technology are being used to address the most consequential issues of our time.”
The ease of self-publishing, whether in print or through digital media, has further expanded the channels through which scientists and science journalists may communicate. Germany has long prized the efforts of scientists who take advantage of such opportunities to share their work – in 2000, the German Research Foundation (DFG) created the annual Communicator Award to honor scientists who make extraordinary contributions in this area.

An appetite for science information is not universal, and the public cannot be expected to apply scientific rigor when evaluating information in the media. Indeed, Marcia McNutt, former editor in chief of Science and current president of the National Academy of Sciences, told National Geographic magazine that “scientific thinking must be taught, and sometimes it isn’t taught all that well.” Yet evidence abounds that young people in particular view science literacy as an essential skill for navigating the future. The enormous success of citizen science projects like Fold It!, Galaxy Zoo, the Monarch Joint Venture, and hundreds of others affirm that those with no qualifications beyond their curiosity can be meaningful partners in scientific dialogue.

In an increasingly globalized world, fostering international science communication and collaboration is good for the innovation pipeline as well as for diplomacy. In 2009, the German Federal Foreign Office launched the Research and Academic Relations Initiative, creating five German Houses of Research and Innovation around the globe to promote interdisciplinary partnerships and increase scientific dialogue. The German Center for Research and Innovation (GCRI) in New York contributes to this mission in part by convening dozens of workshops and symposia each year, bringing researchers and industry representatives from Germany and North America together to devise science and technology solutions to address global challenges. In 2016, GCRI events tackled diverse topics ranging from aging and digital health to additive manufacturing, zero-carbon cities, and space robotics. “Creating opportunities for scientific exchange is one of the most valuable aspects of our work,” said GCRI director Dr. Joann Halpern. “When scientists, business leaders, politicians, and the public come together to talk about science, it brings us closer to solutions, but it also teaches us about the process of solving problems,” she said. “Science teaches the fundamental skills for global cooperation: dreaming up ideas, testing them, learning from what doesn’t work, and trying again.”

by Hallie Kapner, Science Writer
“The German Center for Research and Innovation’s events have been instrumental in helping me build and enhance collaborations with German researchers.”

– Dr. John-Paul Clarke, College of Engineering Dean’s Professor, Georgia Institute of Technology
2016 Calendar of Events

January 27 – 29
Alberta-Germany eHealth Symposium
Co-Sponsors:
University of Alberta
German-Canadian Centre for Innovation and Research

February 17
Rethinking Trauma as a Global Challenge
Co-Sponsors:
Ulm University
German Research Foundation (DFG)

February 23
The International Criminal Court and the Crime of Aggression
Co-Sponsors:
University of Cologne
Columbia University

March 7
Big Data - Small Devices
Co-Sponsors:
University Alliance Ruhr (UA Ruhr)
German Research Foundation (DFG)

March 10
EU-USA Research Collaboration and Funding Opportunities in Horizon 2020, the European Framework Programme for Research and Innovation
Co-Sponsor:
Delegation of the European Union to the United States of America

March 15
Financial Decision-Making and Aging: Perspectives from Neuroscience
Co-Sponsor:
WZB Berlin Social Science Center

April 9
International Perspectives on School Governance at Annual Meeting of the American Educational Research Association
Co-Sponsor:
German Institute for International Educational Research (DIPF)

April 28
Bridging the U.S. Skills Gap - A Transatlantic Discussion on Vocational Training and Best Practices
Sponsors:
UAS7 German Universities of Applied Sciences
Consulate General of the Federal Republic of Germany in New York

May 3
Networking Breakfast on Aging and Demographic Change
Co-Sponsors:
University of Cologne
German Research Foundation (DFG)

May 10
Co-Sponsor:
German Research Foundation (DFG)

June 2
Urban Energy Systems – Challenges and Solutions for Zero Carbon Cities
Co-Sponsor:
Hochschule für Technik Stuttgart

August 30
Falling Walls Lab New York
Co-Sponsors:
German Federal Foreign Office
German Academic Exchange Service (DAAD)

September 7
The Excellence Initiative as an Instrument to Further University-Industry Collaboration
Co-Sponsor:
German Rectors’ Conference
2016 Calendar of Events

**September 14**
Leibniz Lecture: Photonic Technologies in Human-Machine Interaction
Co-Sponsors: German Research Foundation (DFG)
Friedrich-Schiller-University Jena
Fraunhofer Institute for Applied Optics and Precision Engineering (IOF)

**September 21**
Up There & Way Up There: Robotics in Air and Space
Co-Sponsors: German American Chamber of Commerce, Pittsburgh Chapter
Astrobotic
The Webb Law Firm

**October 6**
Digital Health: A Catalyst for Behavioral Change
Sponsors: European-American Chamber of Commerce New Jersey
Transatlantic ICT Forum - DISCOVERY Project
UNC Center of European Studies

**October 10**
Smart Data and Digital Health
Co-Sponsor: German Research Center for Artificial Intelligence (DFKI)

**October 13**
Understanding Others: The Person Model Theory
Co-Sponsors: University Alliance Ruhr (UA Ruhr)
German Research Foundation (DFG)

**October 21**
Additive Manufacturing: New Horizons in Research and Industry
Co-Sponsors: University of Bremen, ISIS Sensorial Materials Scientific Centre and MAPEX Center for Materials and Processes
NYU Tandon School of Engineering

**October 24**
Negotiating Security in Europe and the United States
Co-Sponsor: University Alliance Ruhr (UA Ruhr)

**October 26**
Energy Democracy – Germany’s Energiewende
Sponsors: Consulate General of the Federal Republic of Germany in New York
German American Chamber of Commerce, Inc. (GACC)

**November 2**
FOCUS: Smart Grid 2016
Co-Sponsors: German American Chamber of Commerce, Inc. (GACC)
Consulate General of the Federal Republic of Germany in New York
Transatlantic Climate Bridge

**November 17**
Booming Populism - On the Practice and Language of Political Polarization
Co-Sponsors: German Research Foundation (DFG)
Bremen International Graduate School of Social Sciences (BIGSSS)

**December 5**
Learning to Learn – How the Brain Creates Memory
Co-Sponsor: University Alliance Ruhr (UA Ruhr)

**December 6**
Meet and Greet Roundtable Discussion: BIO CITY Leipzig - The Future of Biotechnological Innovation in Germany
Co-Sponsors: Hodgson Russ LLP
BIO CITY Leipzig
Invest Region Leipzig GmbH
Selection of 2016 Event Participants

The following is a selection of 2016 event participants who attended GCRI events in New York and other locations.

Albert Einstein College of Medicine
American Museum of Natural History
Barnard College
BASF Corporation
Bayer Corporation
Bloomberg
BMW Manufacturing Co., LLC
Boehringer Ingelheim
Bosch
Boston Consulting Group
Brookhaven National Laboratory
Carl Zeiss Microscopy, LLC
Carnegie Mellon University
CERN, the European Organization for Nuclear Research
Citigroup Inc.
Cold Spring Harbor Laboratory
College Board
Columbia University
Consolidated Edison, Inc.
Cornell NYC Tech
Council on Foreign Relations
Daimler AG
Dana-Farber Cancer Institute
Dartmouth College
DB Schenker, Inc.
Delegation of the European Union to the United States of America
Deloitte & Touche LLP
Department of Health and Human Services
Deutsche Bank AG
Deutsche Presse-Agentur
Deutsche Telekom Group
Die Zeit
EADS North America
Ernst & Young
Federal Emergency Management Agency
Federal Ministry of Economics and Technology
Federal Reserve Bank of New York
Federal Trade Commission
Food and Agriculture Organization of the United Nations
General Electric
German Academic Exchange Service
German Aerospace Center
German Research Foundation
Goldman Sachs
Google
Handelsblatt
Harlem Biospace
Harvard University
Howard Hughes Medical Institute
IBM
Institute of Electrical and Electronics Engineers
Intel Corporation
International Monetary Fund
Johns Hopkins University
Johnson & Johnson
JPMorgan Chase & Co.
Lufthansa
Massachusetts General Hospital
Massachusetts Institute of Technology
Memorial Sloan-Kettering Cancer Center
Merck
Microsoft
Mount Sinai Hospital
National Academy of Engineering
National Cancer Institute
National Institute of Standards and Technology
National Institutes of Health
Selection of 2016 Event Participants

National Oceanic and Atmospheric Administration
National Science Foundation
Nature Publishing Group
New York City Department of City Planning
New York City Department of Education
New York City Department of Transportation
New York City Economic Development Corporation
New York University
Nokia
Novartis Corporation
Office of Science and Technology Policy, The White House
Office of the Mayor, The City of New York
Pfizer Inc.
Princeton University
Public Broadcasting Service
Reuters
Rutgers University
Samsung
SAP
Science Friday – NPR
Scientific American
Siemens Corporation
Social Sciences and Humanities Research Council of Canada
Spiegel Online
Stanford University
Süddeutsche Zeitung
The Andrew W. Mellon Foundation
The Aspen Institute
The Brookings Institution
The Chronicle of Higher Education
The Earth Institute, Columbia University
The Economist
The Henry Luce Foundation
The Huffington Post
The New York Academy of Sciences
The New York Times
The Rockefeller University
The Wall Street Journal
The World Bank Group
thyssenkrupp AG
U.S. Agency for International Development
U.S. Department of Commerce
U.S. Department of Energy
U.S. Department of Health and Human Services
U.S. Department of State
U.S. House of Representatives
United Nations
University of California, Berkeley
WABC-TV
Weill Cornell Medical College
Wharton School of Business, University of Pennsylvania
World Economic Forum
WQXR – New York Public Radio
Yale University
Zweites Deutsches Fernsehen
2016 Selected Conferences & Symposia

January 11 – 12
Poverty, Inequality, and Global Conflict Conference
Location: United Nations, New York, NY

January 14
Virtual Enterprises 2016 NYC Business Plan Competition
Location: New York, NY

February 6
2016 European Career Fair
Location: Cambridge, MA

February 11 – 15
AAAS 2016 Annual Meeting
Location: Washington, D.C.

February 26
Columbia University Spring Career Fair
Location: Columbia University, New York, NY

March 12 - 13
2016 NYC FIRST Regional Competition & Expo
Location: Javits Convention Center, New York, NY

April 2 – 6
Experimental Biology Annual Meeting
Location: San Diego, CA

April 8 – 12
AERA Annual Meeting and Conference
Location: Washington, D.C.

April 9
Career Fair for Scientists in Collaboration with INet NYC
Location: New York Academy of Sciences, New York, NY

May 13
The Future of Bilingual Education in the U.S. Symposium
Location: Goethe-Institut, New York, NY

May 26 – 27
9th Charité Entrepreneurship Summit
Location: Berlin, Germany

June 5
World Science Festival 2016
Location: New York, NY
## 2016 Selected Conferences & Symposia

### June 10
**Second Digital Economy and Cyber Politics Conference**
**Location:** Berlin, Germany

### June 28
**German American Smart Cities Symposium**
**Location:** New York, NY

### September 9 – 11
**16th Annual German Academic International Network (GAIN) Conference**
**Location:** Washington, D.C.

### September 11
**GCRI – Eucor workshop “Entrepreneurship – Career Opportunities in Germany” at German Academic International Network (GAIN)**
**Location:** Washington, D.C.

### October 14
**Engineering Consortium Career Fair**
**Location:** Columbia University, New York, NY

### October 14
**Career Day**
**Location:** Goethe-Institut, Washington, D.C.

### October 21
**Career Booster German(y)**
**Location:** Goethe-Institut, New York, NY

### November 3
**Cleantech Conference New York - Berlin**
**Location:** New York, NY

### November 12 -16
**Society for Neuroscience (SfN) Annual Meeting**
**Location:** San Diego, CA

### November 16
**Research Opportunities Outside of the US**
**Location:** New York University, New York, NY
Speakers & Guests at GCRI Events
…in New York and other locations
Former professional football player Sean James remembers the day when, at age ten, he realized that the sport he loved was as much about talent as it was about toughness. As young James was praised for using his head to cut a path through blocking players and staying strong after taking a hit, he learned that grit, as much as speed or agility, defined a football player’s career prospects. “I knew that if I didn’t have that toughness they were looking for, I wasn’t going to be able to play,” James said. “And as you move up the ladder through high school and college football, people start to drop off.” James made it to the pros, and retired at age 25. Today, at age 47, the youth advocate and anti-bullying crusader worries about the long-term physical and mental health effects he may yet face as a result of his years on the field. Seven surgeries, countless hits to the head, and multiple concussions make James, like so many athletes who play contact sports, more vulnerable to chronic traumatic encephalopathy, depression, suicide, and even early-onset Alzheimer’s and dementia.

Professional athletes, combat veterans, and celebrities who suffer injuries in accidents are those likeliest to make headlines simply for getting hurt, but the prevalence of everyday trauma worldwide is both astonishing and underestimated. Trauma is the number one cause of death of people under the age of 45 in the United States, and more than 5.8 million people worldwide die each year following traumatic injuries – nearly one-third more than malaria, HIV, and tuberculosis combined. Injuries and trauma are on track to become the largest global healthcare expenditure by the year 2020, and in the United States, trauma spending already surpasses both cancer and cardiovascular disease.

“A New Take on Trauma

Hospitals and universities across Germany are part of a global movement to change the way traumatic injuries are evaluated and treated.

Around the world, medical professionals on the front lines of trauma – primarily emergency physicians, general surgeons, and orthopedic surgeons – are teaming up with engineers, data analytics experts and mental health providers to create a new paradigm for trauma research and treatment.

Germany is a leader in these efforts, said Prof. Dr. Florian Gebhard of Ulm University, as he explained the registry founded nearly 20 years ago by the German Society of Trauma Surgery to capture treatment and outcome data for seriously injured patients in hospitals throughout the country. The TraumaRegister DGU® includes information from more than 200,000 patients, and has provided a wealth of clinical data for researchers to plumb in service of a better understanding of how injury patterns influence outcomes and how to improve treatment decisions.

Critical to this work is an appreciation of the interplay of physical trauma and emotional distress, an aspect of injury that is often overlooked, said Prof. Dr. med. vet. Anita Ignatius, also of Ulm University. “Excessive psychological stress negatively influences the neuroendocrine, cardiovascular and..."
immune systems, and can influence a patient’s ability to heal,” she said. “We now know that physical trauma can induce post-traumatic stress disorder (PTSD), and conversely, PTSD from psychological stress can influence how a patient responds to a physical injury.” Gebhard and Ignatius are part of Germany’s first Collaborative Trauma Research Center, which was founded at Ulm University through a grant from the German Research Foundation to promote interdisciplinary partnerships and attract more young scientists to the growing field of trauma research.

Trauma research is also being bolstered by advances in nanotechnology and microelectronics that stand to transform the way physicians treat and monitor injuries. Ed Harvey, Chief of Orthopedic Trauma Research and Professor of Surgery at McGill University in Montreal, Canada, believes the field is poised for a rush of disruptive technologies that could permanently alter the way healthcare is delivered. He describes a future where the sensors that are now ubiquitous in activity trackers and smart watches are used in orthopedic implants to monitor healing status or detect infection, and nanoscale materials are deployed to facilitate bone and tissue repair. Already, sensor technologies are being used in football and hockey players’ helmets and mouth guards to study the force of impacts during play.

“The today’s trauma research goes well beyond just looking at physical injuries – we have to take a holistic approach.”

The confluence of interdisciplinary trauma research and treatment approaches and the acknowledgment of the lasting dangers stemming from the culture of toughness Sean James and other professional athletes have described, have ushered in a new era for tackling a major global health problem. As Florian Gebhard stated, “Trauma is not about having pain or a broken bone, it’s a disease that influences the body and the mind. Today’s trauma research goes well beyond just looking at physical injuries – we have to take a holistic approach.”

by Hallie Kapner, Science Writer
What are the main types of trauma and how can they be avoided?
The main type of trauma worldwide is still caused by vehicle and traffic-related injuries. The WHO addresses the UN Decade of Action for Road Safety (2011-2020). Their aim is to reduce accident-related injuries and deaths, and to improve road safety. In general, trauma is a life-related event that cannot always be foreseen.

In both situations, the brain is fully involved in the trauma. So any traumatic effects will affect both the physical and the psychological side of the victim. Individuals will react and respond differently to each of the aforementioned situations. These different situations have not been addressed so far in trauma research and are currently the main focus areas of the Centre for Trauma Research at Ulm University.

What are the main types of trauma and how can they be avoided?

The main type of trauma worldwide is still caused by vehicle and traffic-related injuries. The WHO addresses the UN Decade of Action for Road Safety (2011-2020). Their aim is to reduce accident-related injuries and deaths, and to improve road safety. In general, trauma is a life-related event that cannot always be foreseen.

When humans or animals are affected by a trauma, there are basically two different situations. One is the completely unexpected trauma that comes out of the blue. In this case, the body has an alarm mode on and will have a completely different reaction to trauma coming from the outside.

The other situation is being “in action,” like a policeman, fireman, or soldier. In this case, the body has an alarm mode on and will have a completely different reaction to trauma coming from the outside.

In both situations, the brain is fully involved in the trauma. So any traumatic effects will affect both the physical and the psychological side of the victim. Individuals will react and respond differently to each of the aforementioned situations. These different situations have not been addressed so far in trauma research and are currently the main focus areas of the Centre for Trauma Research at Ulm University.

What are some of the most successful strategies you and your colleagues have developed to treat trauma patients with life-threatening injuries?

There is no magic bullet to treat trauma patients. Treating trauma patients is like attempting to solve a puzzle with hundreds of pieces that fit together. One of the highlights of our research is that patients with chest injuries have completely different inflammatory reactions than patients with other types of injuries. The inflammatory response can disturb bone healing and should be regarded as a very dangerous type of injury.
Dr. Kristian Kersting spends a lot of time stuck in traffic. Commuting from his home in Bonn to the Technische Universität (TU) Dortmund, where he is professor of computer science, Kersting has stretches of idle time during which he may call a colleague, send an email, or browse a social media or news website. In those moments, Kersting is just one of more than six billion mobile phone users worldwide contributing information about their location, personal interests, and even health and purchasing habits, to the largest cache of data ever collected about people and their behavior.

“Big data allows scientists to model feedback effects between environment and lifestyle factors like diet, smoking or secondhand smoke, and exercise.”

“Smartphones are human sensors, if you think about it,” said Prof. Dr. Katharina Morik, head of the Collaborative Research Center 876 and professor of computer science at the TU Dortmund University. “Our phones are always with us, and they tell us a lot about human behavior.” The average mobile phone user generates 2,000 data points per day and about 60 GB of data per year – huge volumes of information with little utility unless analyzed correctly. “How you use data to derive insight is everything,” said Morik, explaining how a seemingly straightforward data set – the frequency with which common smartphone apps are accessed – can yield very specific information, such as the gender of the phone’s user, when properly filtered.

For Claudia Perlich, chief scientist at
Dstillery, a New York City-based digital media company, such details are key to building predictive models of consumer behavior. Virtually every website has advertising space, and each time a user accesses a page, an invisible action that takes place faster than the blink of an eye determines which ads they see. Behind the scenes, predictive models based on app usage, URL history, and up to one million additional factors guide the decision about whether to show an ad, and if so, which one. More than 50 billion of these bidding opportunities hit Perlich’s system each day, and decisions and delivery take place in just 100 milliseconds.

Perlich and her team tap troves of big data to build more than 3,000 predictive models each day – models that fuel sophisticated machine learning algorithms that have grown uncannily deft at deriving correlations between mobile data points and likely purchasing behavior. These models are agnostic and anonymous and highlight correlations that are often missed through traditional behavioral or demographic analysis. Perlich noted that these analyses can be used to great effect in advertising, but also in more globally impactful fields, such as public health, where big data allows scientists to model feedback effects between environment and lifestyle factors like diet, smoking or secondhand smoke, and exercise.

As the potential applications of big data rise, and devices for data capture diversify and proliferate, one major limiting factor emerges: energy consumption. As Katharina Morik explained, big data insights about mobile app usage patterns, for example, can help make smartphones even smarter. “If we know which apps are being used most often, we can perform file prefetching, which conserves energy,” she said. Additionally, Morik and her collaborators are devising strategies that bring big data analytics capabilities into devices themselves. Envision traffic or smart-container sensors bombarding already-taxied mobile networks with streams of data, most of which is likely irrelevant to the task at hand, be it rerouting commuters or improving a shipping route. “By integrating smart analytics capable of performing data analysis in real-time,” said Morik, “we reduce the amount of data so we keep only the good signal, and not all the noise.”

Dr. Kersting, who uses real-time data to close gaps in models of everything from traffic patterns to the spread of viral videos on the internet, believes researchers are just beginning to tap the full potential of big data. “I compare these advances to the early breakthroughs of microscopes and telescopes – innovations that allowed us to look at places we’d never seen,” said Kersting. “This is the dream of humankind – to catch a glimpse of what wasn’t known before. We are bringing light to dark data.”

“In public health, smart analysis of mobile phone data is transforming efforts to detect and monitor disease outbreaks and improve disaster preparedness by studying human travel patterns.”

by Hallie Kapner, Science Writer
What are the key issues related to big data and privacy today? How are these issues being addressed?

Privacy-preserving data mining has a long tradition and many algorithms preserve privacy by design. Regulations that demand privacy-preserving data mining, particularly from commercial platforms, can now become legal guidelines. For the regulation of data storage, the European Union has decided to broaden users’ rights, which will allow them to have more control over who stores what personal data. A global data protection law does not yet exist.

How can big data that is produced by smart devices be used to save energy?

Saving energy is one of the most important outcomes of big data analytics. Predictions derived from data lead to optimized processes. My first example addresses traffic and logistics. Sensors embedded into streets and messaging from cars or Smartphone navigators allow for precise and timely predictions, as well as intelligent routing, hence, saving energy and emissions. A second example is engineering. Manufacturing processes can be optimized through predictions, such that production saves energy. Computing centers analyze their resource consumption and optimize the energy accordingly. Finally, the analysis itself can be conducted in a manner that consumes less energy by algorithms tailored to ultra-low power devices. Innovative algorithms and models are investigated at the Collaborative Research Center SFB 876 with respect to resource-constrained probabilistic graphical models with guarantees.

How will big data transform society in the future?

Many new business models have emerged as a result of big data analytics, which can enhance virtually everything by opening up a plethora of applications. Big data allows for optimized processing to produce high-quality products with minimal resources and human labor. Thus, it could reduce the number of daily working hours considerably while increasing creative and social activities. However, big data services, such as social networks and online news come with the risk of dependency, misuse, fake news, and even cybercrime. It is challenging to develop methods against those attacks, not only for computer scientists, but also for society as a whole.
The fall of the Berlin Wall in 1989 broke both literal and figurative barriers, and ushered in an era of massive transformation in Germany. Twenty years later, leaders in the fields of science and business, politics and the arts, came together to found the Falling Walls Conference, an annual forum for research and innovation that celebrates openness and collaboration in Germany and around the world. Scientists spanning dozens of fields, along with artists, historians, journalists and sociologists convene each year to present thought-provoking research and spark dialogue about timely issues. Since its founding, the Falling Walls Conference has branched out from a single annual event to include smaller, year-round gatherings in dozens of countries, where some of the world’s most promising young scholars present their work. The question at hand is always the same: Which will be the next wall to fall in science and society?

The first such “Falling Walls Lab” event in New York City convened at the German House in 2016, hosted by the German Center for Research and Innovation. Ten young scientists were invited to present their ideas for creating change in fields ranging from chemistry to cardiac care, tackling issues as diverse as food insufficiency, industrial waste, disaster relief, and refugee assimilation. While the presenters’ backgrounds and strategies were vastly different, all shared a common mission to solve the world’s most pressing problems through science and innovation.

“The question at hand is always: Which will be the next wall to fall in science and society?”

The past decade has placed more strain on systems providing global humanitarian aid than at any other time in human history. This includes the Syrian and Yemeni refugee crises, widespread famine, drought and displacement in South Sudan and Nigeria, Ebola and cholera epidemics in West Africa and Haiti, and the long-term economic and social repercussions from natural disasters including earthquakes and tsunamis. Falling Walls Lab scholars Elisabeth Bahr and Heather Painter proposed surprisingly simple but powerful solutions to improve outcomes for survivors of natural disasters in the developing world, and help refugees fleeing crisis feel truly at home in a new place.

Bahr explained the dismal prognosis for those affected by the most common injuries suffered after natural disasters – limb amputations and spinal cord injuries. In the developed world, patients move from surgery to rehab, regaining strength and learning to navigate the world anew. In low-income countries, however, such rehabilitative services are brief or nonexistent. Bahr envisions a new model for long-term disaster relief rooted in a program that uses foreign aid to train local rehab technicians to deliver hands-on physical and occupational therapy services. “We’re empowering citizens in developing countries to help and heal each other,” Bahr said. Heather Painter is also tapping local citizen power, but this time for emotional and practical support. In her presentation about breaking the walls of intolerance, Painter described her app, CommUNITY, which is already pairing German volunteers with Syrian refugees to practice language skills, as well as navigate employment listings and prepare for job interviews.

Other Falling Walls scholars focused on finding new value in waste, be it industrial waste or ideas tossed aside after an initial failed experiment. Entrepreneur and engineer Bertha Jimenez is transforming the waste stream from the beer brewing industry, working with urban brewers to reclaim spent grain and turn it into protein-rich baking flour. Chemist Philip Adler has digitized
the historical laboratory notebooks from his lab at Haverford College into a publicly available online database of every reaction ever tested – successful and unsuccessful, published and unpublished – with the hope of advancing discovery by breaking the traditional siloes in the chemistry field and encouraging collaboration.

As humans live longer, scientists and physicians are increasingly working to break down the walls of chronic disease and improve quality of life through early detection and intervention. The most common form of cardiac arrhythmia, atrial fibrillation, affects more than 35 million people worldwide and is associated with significant decline in heart function and stroke. A non-invasive heart monitor designed by Falling Walls winner Ya-El Mandel-Portnoy tracks pulse deficits in atrial fibrillation patients – an early sign of clinical decline – to facilitate rapid treatment. Researcher Oren Miron has his eye on breaking the barriers that prevent autism diagnosis before overt behavioral symptoms emerge, often not until age two or three. Using existing data from routine newborn hearing screenings, Miron and a group of collaborators are uncovering the correlation between slow auditory brainstem response in the newborn period and later autism diagnoses. “If we can detect high risk of autism at birth, we can intervene much sooner, rather than waiting until age four, when most children are diagnosed,” said Miron. “Early detection can have a huge impact.”

The destruction of the Berlin Wall began through the sweat and effort of determined citizens, pickaxes and hammers in hand. Twenty-seven years later, young scientists are channeling their own determination, and marshalling their own 21st century tools, to eliminate barriers to knowledge and progress.

by Hallie Kapner, Science Writer
What are the most common causes of heart failure, strokes, and cardiac death? How serious of an issue is this?
Heart disease is the leading cause of death in the United States for both men and women, killing one person every 40 seconds. About 610,000 people die of heart disease in this country every year, and the disease costs the United States about 207 billion dollars per year. This includes the cost of health care services, medication, and lost productivity.

There are different types of heart disease, e.g. heart failure, stroke, and cardiac arrhythmias, such as atrial fibrillation. Heart failure affects 5.7 million adults in the United States and is caused by conditions that damage the heart muscle, including coronary artery disease. Ten percent of the world’s population above the age of 65 suffers from atrial fibrillation. Factors that may increase the risk of developing atrial fibrillation are age, heart disease, high blood pressure, alcohol, obesity, and other chronic conditions. Stroke is the biggest concern when living with atrial fibrillation.

What are the current challenges for treating atrial fibrillation patients? How can Cardea Sciences help overcome these challenges?
One of the greatest challenges cardiologists face when treating atrial fibrillation patients is the inability to determine in advance which atrial fibrillation patients would be able to tolerate the arrhythmia well, with minimal impact on their quality of life, and which patients would not tolerate the arrhythmia well and will suffer from severe symptoms and adverse events. Cardea Sciences is developing a novel, non-invasive heart monitoring device to improve the treatment and quality of life of atrial fibrillation patients. Using an objective metric for characterizing the hemodynamic effect in atrial fibrillation patients (based on physiological phenomena), care providers will be able to identify atrial fibrillation patients who are set on a downward trajectory due to compromised hemodynamics and to optimize their course of treatment.

Cardea Sciences’ product addresses the need to identify atrial fibrillation patients who will suffer from clinical deterioration early in the course of their disease. Early identification of patients who are at a high risk for clinical deterioration can improve patients’ course of treatment and quality of life. In addition, it will save millions of dollars for the health system, hospitals, and patients by reducing costly readmissions.

Tell us about your experience presenting “Breaking the Wall of Atrial Fibrillation Care” at the Falling Walls Lab New York.
The experience of presenting my science and what I am passionate about was outstanding. The concept of pitching your idea in three minutes to complete strangers with different backgrounds was challenging, yet thrilling. You have to make your science approachable so that they can imagine the importance of your work and the magnitude of the problem that you are trying to solve. I competed against very talented, smart investigators and entrepreneurs who are trying to bring value to so many different fields, and I am so grateful for having had the opportunity to do so.
A New Vision for Human-Machine Interaction

Communication is one of the most basic elements of survival. Whether it’s biochemical communication between plants or among bacteria, or the elaborate courtship rituals of birds, some form of information exchange has been observed among all forms of life. At least 80 percent of human communication is conveyed in gestures, facial expressions, and body language – unspoken messages both overt and subtle that are instantaneously processed and interpreted by the brain. Humans can interact with many people at once, analyze complex cues and spatial information, and respond appropriately. Prof. Dr. Andreas Tünnemann, director of the Institute of Applied Physics and Precision Engineering at Friedrich-Schiller-University Jena and director of the Fraunhofer IOF, believes that exporting these exquisitely sensitive human abilities is key to improving human-machine interaction, and to reaping the economic and environmental benefits of what he calls “Industry 4.0.”

The history of industrial production is marked by revolutions. Water and steam, electrical power and mass production, as well as information technology and computing have each transformed production practices and the role of the worker within the value chain. Today, the fourth major industrial revolution hinges on the ability of scientists and researchers to forge collaborations between cyber-physical systems and humans, bridging the communication gap and synergizing the flexibility and creativity of workers with the strength and stamina of automation.

Germany, like many other countries, has benefitted from the advent of 21st century automation technologies. Automation in the automobile industry has allowed for the integration of laser welding processes and new materials, such as high-strength steel that make cars safer, yet lighter and more fuel-efficient. More than 20 percent of Germany’s GDP is derived from production technologies, and novel developments in automation have helped the sector flourish. Similarly, advances in computer vision and machine learning have contributed to the development and continuous refinement of autonomous vehicles, which will dramatically reshape transportation around the world. While the replacement of human workers with automated systems has advantages in some scenarios, experts, including Dr. Tünnemann, argue that greater efficiencies may be gained by reintroducing humans into the automated workplace and bringing the assets of automation into everyday life.

Several key technologies underlie successful human-machine interaction – intelligent systems capable of learning and acting safely in real-time, augmented reality systems that provide haptic feedback, and actuators for motion control and adaptive force, among others. Perhaps the most fundamental technology for human-machine interaction, however, are multimodal sensors that replicate the human sensory system, allowing robotic systems to recognize voices, perceive sensation and pressure through “smart skins,” and to detect 3D spatial information and visual cues.

Researchers around the world are working to address these needs, and Tünnemann leads one such group – an interdisciplinary consortium supported by the German Ministry of Research and Technology – that integrates engineering, neuroscience, and the social sciences to develop robotic and automated solutions designed to work with humans.

Tünnemann’s own work focuses on improving computer vision – specifically, imbuing automated systems with the ability to recognize and interpret...
physical gestures and understand spatial relationships between objects in complex scenarios.

More than three billion miniature cameras for smartphones and other consumer devices are produced each year worldwide. Based on the single-aperture model of the human eye, these ubiquitous cameras are perfect for instant imaging and viewing, yet fall short of the sophisticated optics needed to take human-machine interaction to the next level. According to Tünnermann, “The smartphone cameras we have today are about as good as it gets for this type of application — we can’t make them any smaller or shorter without compromising resolution. If we want to extrapolate these technologies to smart machines, we’ll need to think outside of the box.”

Tünnermann noted that more than two dozen different eye systems exist in nature, many of them fine-tuned over hundreds of millions of years of evolution to perfectly assist the tasks of its owner, be it spider or bee, fly or gecko. Deriving inspiration from common insects and parasites, Tünnermann has adapted the concept of the cluster eye — an array of tiny lenses, each of which transmits a partial image of the field of view — to a next-generation optical device with far greater flexibility than traditional optical sensors. “In an insect, the brain compiles the partial images from each lens into a complete picture, but in a machine, we use image processing technology to stitch them together,” Tünnermann explained. This “facet vision” delivers the same optical resolution as a single-aperture camera with far greater flexibility. Lens arrays may be round, square, or arranged in a straight line with no limitation on shape, and can be produced on a wafer-level approach and connected to CMOS sensors. His approach allows for three-dimensional image capture with a single shot, and any partial image can be further analyzed or refocused to collect additional spatial information.

Machines that can truly see, analyze, and sensitively respond to real-time cues — from human gestures to pedestrians crossing the street against traffic — are a virtual certainty. Interest and investment in automation technologies that synergize with humans is driven as much by economic and environmental pressures as it is by social needs. From the public health field, where responsive, autonomous helpers could assist the elderly with daily tasks, to military, healthcare, construction, and production applications, the work of Tünnermann and others in the field is shaping a vision of the future.

by Hallie Kapner, Science Writer

Leibniz Lecture: Photonic Technologies in Human-Machine Interaction

September 14, 2016

Today, new technologies driven by digitalization and artificial intelligence are changing the way humans interact with machines. In the future, next-generation devices and machines will be more sophisticated, ensuring an even higher degree of collaboration. As a key enabling technology, optics and photonics play a critical role in addressing many of the challenges humans face when interacting with machines. Photonic sensors that measure three-dimensional objects, people, and scenes will empower machines to monitor their environment. Known for his pioneering work in utilizing high power femtosecond lasers for material processing, Prof. Dr. Andreas Tünnermann discussed these novel trends, as well as his groundbreaking experiments in fundamental physics.

Event Speaker:
Prof. Dr. Andreas Tünnermann
Director, Fraunhofer Institute for Applied Optics and Precision Engineering (IOF); Professor and Director of the Institute of Applied Physics, Friedrich-Schiller-University Jena; Leibniz Prize Winner 2005

Co-Sponsors: DFG Deutsche Forschungsgemeinschaft
Fraunhofer IOF

by Hallie Kapner, Science Writer
How did you become interested in human-machine interaction?
My interest in human-machine interaction is directly related to demographic changes that are occurring in Germany and many other countries, specifically, aging societies. As a research alliance, we are addressing this particular challenge, as well as many others. People want to have a self-determined and active life into old age. In order to enhance an individual’s ability to live independently as he/she ages, we are developing robots that serve as useful assistants to people. Considering that over eighty percent of human communication is determined by visual perception, it’s logical that robots should possess the same visual skills and cognitive capabilities that allow for natural and intuitive human-machine interaction. Therefore, the aim of one of our largest projects, 3Dsensation, is to enable machines to be true assistants of humans with the aid of optical technologies.

Describe some of the most significant accomplishments of the 3Dsensation project. 3Dsensation is not only about developing technologies. We also address ethical and usability issues. We established a consortium that consists of over ninety interdisciplinary partners from economics, engineering, the life sciences, and other disciplines as an open innovation platform at the national level. Through 3Dsensation projects, a multitude of advanced technologies have been developed. Highlights include a near-infrared (NIR) 3D scanner that enables irritation-free 3D recordings of individuals and dynamic scenery, as well as ultra-compact insect-inspired multi-aperture camera systems.

How are photonic technologies transforming everyday life?
Light is a key enabling technology that has revolutionized production, communication, and medicine. The invention of the laser is one example. Laser beams can diagnose skin or bowel cancer at an early stage. Even the rapid transmission of large data volumes via the internet would not be possible without light signals.

Another example of the importance of photonic technologies in everyday life is the LED, which is currently revolutionizing the lighting market. With greater energy efficiency and improved color reproduction compared to conventional light sources, the LED enables entirely new lighting scenarios while preserving natural resources. This applies to domestic use and also plays a major role in the automotive industry; for example, by increasing the safety in dark streets through bright headlamps or enabling energy-saving lighting solutions for e-mobility.
What are you planning to achieve with the app project Medical Allround-Care Service Solutions (MACSS)?

The aim of MACSS is the systematic integration of a patient app into the treatment of chronic illnesses. This has never been done before. Our goal is to improve care for patients with chronic diseases, for example, after renal transplantation. Although there are many apps for patients on the market, only a few are connected to a doctor bidirectionally. Specifically, we want to exchange data and communicate with the renal allograft recipient. When the patient provides vital signs, such as blood pressure, weight, and eventually data from other health trackers, the doctor sends the latest lab results and medication plan to the patient’s mobile phone. There is a constant exchange of data and communication since messages can be shared. Patients should update their medication plan and can perform a drug interaction check if they have been prescribed a new medication. Furthermore, we want to exchange data and medical reports with the nephrologist at home, so that in the end, all relevant data is collected in a single platform, where the transplant center, patient, and nephrologist in the hometown are always on the same page. As a result, we want to identify critical situations much earlier to prevent hospitalization and prolong graft survival, which would increase the quality of life, as well as reduce disease burden and costs.

What will be the most significant changes in digital health over the next decade? Which role will patients and hospitals play?

Digital health will become more important due to the increasing use of digital technologies for better patient care. Today we are focusing on better data exchange between hospitals, home doctors, and patients, which will ultimately lead to better treatment and save costs. In addition, data-driven therapeutic assistants will evolve with big data technologies like machine learning and artificial intelligence. Hence, we will adopt modern communication technologies into clinical care. Emails and text messages are not safe in

INTERVIEW WITH:

Prof. Dr. Klemens Budde

Director, Medical Department, Division of Nephrology; Head of the Project Medical Allround-Care Service Solutions (MACSS), Charité - Universitätsmedizin Berlin
In most instances, and video conferences are limited due to technological and cost issues. Modern and safe communication tools are already available today and will revolutionize our communication, both between doctors, as well as between doctors and patients. Lastly, medicine depends on knowledge, and future digital tools will make medical knowledge much more accessible. Online education for patients will create novel possibilities for true empowerment. In summary, digital medicine will ease data exchange, communication, and the accessibility of knowledge to a great extent. It is, however, important to maintain high standards of data protection and control of one’s own patient data.

How will future digital health practices take Germany’s aging population into account?
Aging populations are a huge challenge for all Western societies. Digital health, which includes better risk stratifications, online counseling, video conferences, telemedicine, providing knowledge to patients and doctors, has to provide efficacy gains and cost savings, in order to be able to prevent a financial collapse of the health system. Such cost savings have to be proven in clinical real-life settings and many digital solutions will fail. Successful digital health solutions will create an immediate benefit for patients and doctors, and they are easy to use in daily practice.

Smart Data and Digital Health

October 10, 2016

Over the past 30 years healthcare experts have been developing methods to improve data aggregation for patients. Technology has made it possible for virtually anyone to gather health-related data on themselves and the mechanisms to process and analyze data have been improving as well. This promises more and potentially disruptive technologies to change the healthcare landscape as we know it today. A panel of experts discussed what happens with that data and how it can be used to benefit both the patient and the healthcare provider, as well as how to ensure that new types of technology can further evolve while at times sensitive data must be protected and patients’ privacy guaranteed.

Event Speakers:

Dr. Andreas Goerdeler
Deputy Director General for Information Society, Media at the German Federal Ministry for Economic Affairs and Energy

Prof. Dr. Klemens Budde
Director, Medical Department, Division of Nephrology; Head of the Project Medical Allround-Care Service Solutions (MACSS), Charité - Universitätsmedizin Berlin

Dr. Sean Zhou
Director R&D, Head of Innovation and Software Development, Siemens Medical Solutions

Dr. Ashish Atreja
Scientific Co-founder and Chief Strategy Officer; Advisor Responsive Health

Dr. Joann Halpern
Director, German Center for Research and Innovation (Moderator)

Co-Sponsor: DFK German Research Center for Artificial Intelligence
It took more than 30 years to perfect the systems that allow inkjet printers to lay down controlled droplets without clogging, but even in the earliest days, engineers had visions of someday deploying the technology to deposit something other than ink. By 1992, inkjet technology had been co-opted to produce inexpensive plastic product prototypes. Using computer guidance to build layer upon layer of liquid polymer, the world’s first 3D printers turned out pieces that would be considered crude by today’s standards, but their significance was nothing less than historic.

“The first consumer inkjet printers to hit store shelves in the 1980s were hailed as a revolutionary leap from the low-resolution dot-matrix printers that preceded them.”

Additive manufacturing techniques have expanded to include a range of materials and scales, from production-grade plastics to metals in powdered and even nanoparticle form, making the technique as suitable for prototypes and models as it is for finished products. The production benefits are nothing short of epic. Despite the initial investment in implementation and equipment costs, additive manufacturing allows companies to exponentially decrease design and development costs, speed up production time, and make use of both novel materials and novel arrangements of materials within a product. For example, additive manufacturing techniques can be used to create bone implants or automobile parts that have varying degrees of stiffness or flexibility within a single part, resulting in better performance from products that are lighter, stronger, and more energy-efficient.

The customization possibilities, both for industrial as well as consumer applications, are endless, and 3D printing techniques have been embraced by the public sector for fun as well as function. Most computer users think nothing of downloading a software program or a song, but the novelty of downloading programs to print an iPhone case, model airplane, or musical instrument is still fresh. Some schools and public libraries in the United States have installed Maker Labs complete with consumer-ready 3D printers to help realize such projects.

3D printing isn’t just transforming the production of familiar items – it’s allowing scientists and physicians to create physical representations of
complex objects previously impossible to render. Mathematicians are using 3D printing to create mathematical shapes that exist in four-dimensional space, and surgeons are deploying the technique to translate 3D images of deeply embedded tumors into lifelike models in order to refine a surgical approach before entering the operating room.

Germany is one of the world’s biggest investors in additive manufacturing technologies, outspent only by China and the United States. Research efforts are robust – the Fraunhofer Additive Manufacturing Alliance draws on related research from 17 Fraunhofer institutes — and more companies in Germany use additive manufacturing than anywhere else in the world. Major companies like Siemens, Audi, and Volkswagen are reaping the benefits of 3D printing. In some cases, the technology is even bringing industry back to Germany — an Adidas plant in Bavaria is closing the supply gap in athletic shoes by designing and producing new sneakers on-site, shaving more than a year off traditional processes. EOS, Germany’s leading producer of industrial additive manufacturing technologies, not only uses its machines to produce aerospace and automotive engine parts, dental crowns, and robotic components, but also deploys its printers to create parts that are used, in turn, to build more 3D printers. Even as additive manufacturing has yet to secure a mainstream foothold in most of the world, some scientists are working on the next wave of the concept: 4D printing. The technique, still in its infancy, uses responsive materials to create products that self-assemble, and can change form and function as their environment changes over time. Municipal pipes that can expand to accommodate floods, or bricks that flex to accommodate wall strain, seem like futuristic dreams, but just ten years ago, so did many of the utterly real objects being produced today with additive manufacturing.

Additive Manufacturing: New Horizons in Research and Industry

October 21, 2016

The global symposium brought together researchers, manufacturers, and users of additive manufacturing (3D printing) to discuss their respective interests and insights into future growth trends. The discussion focused on identifying technical areas where future research and development efforts are needed. Topics addressed included the state of the art in additive manufacturing (3D printing) technology research, education, and industrial practice. In addition to a panel discussion, the symposium included a technology demonstration on various 3D printer platforms.

Event Speakers:

Raj Manchanda
Director, Business Development - Manufacturing & Robotics, the American Society of Mechanical Engineers (ASME)

Dr.-Ing. Dirk Lehnhus
Director, ISIS Sensory Materials Scientific Centre, University of Bremen

Khaled Shahin
Senior Lecturer and Coordinator of Engineering Academic Computing, Engineering, NYU Abu Dhabi

Dr.-Ing. Axel von Hehl
Head of Lightweight Materials, IWT Bremen

Dr. Brandon McWilliams
Principal Investigator of Electric Field Assisted Sintering, ARL

Ohad Meyuhas
CEO, Hope Lab

Dr. Gary M. Gladysz
Senior Technical Advisor, Dixie Chemical Company, Inc.

Paulo G. Coelho, DDS, PhD
Leonard I. Linkow Associate Professor - NYUCD; Associate Professor of Plastic Surgery, NYU Langone Medical Center; Associate Professor of Biomaterials and Biomimetics, NYU

Co-Sponsors:
“GCRI’s newsletter provides a wealth of information about cutting-edge developments in German science and innovation as well as engaging interviews with thought leaders from Germany.”

– Selden Blommer, Executive Director, Forbes Custom
The GCRI’s website, a key instrument in fulfilling the organization’s mission, provides an information platform for individuals who are interested in the German science and innovation landscape and wish to conduct research or business. In addition to presenting GCRI events and related media, such as videos, podcasts, and photo galleries, the GCRI website features a wealth of programs, funding opportunities, and first points of contact for academia and industry. As a one-stop shop, the website also offers an overview of German research organizations, current research focus areas as well as the German higher education system.

The Most Popular Pages in 2016:

- Home
- Resources for Postdocs
- German Innovations
- Resources for Graduates & Doctoral Students
- Technology Parks & Centers
- Centers of Innovation in Germany
- Events Calendar
- Careers
- Ph.D. in Germany
- Resources for Undergraduates

Sessions in 2016:

- 15,000 +
- 1,500 – 15,000
- 150 – 1,500
Each month, GCRI’s newsletter, E-INNOVATION GERMANY highlights a different topic from the German science, research, and innovation landscapes. Since its launch in April 2010, E-INNOVATION GERMANY has captured the attention of a growing readership in North America and Germany. During the past year, the number of readers increased by 23%.

GCRI newsletter articles and interviews have also been published on the Innovation Daily blog by Innovation America, which reaches over 1,000,000 unique visitors in over 185 countries and was voted fourth Best Blogger in the World by Blogging Innovation.
Each issue of E-NOVATION GERMANY presents a “German Innovation of the Month,” which is also listed on the GCRI website.

January 2016
Semper – A Micro-learning Memory App
UnlockYourBrain GmbH

February 2016
L2TOR: Using Robots to Help Immigrant Children Learn German
CITEC/Bielefeld University

March 2016
Siemens’ Forecasting Model for Data-Driven Rail Systems
Siemens

April 2016
Evonik Amino Acids for Eco-Friendly Animal Feed
Evonik Industries AG

May 2016
iManageCancer – A Mobile Platform to Empower Patients & Relatives in Cancer Self-Management
iManageCancer

June 2016
ParkHere – Searching for the Perfect Parking Spot Just Got a Little Easier
ParkHere

July 2016
Pay with a Tweet – Leveraging the Power of Viral Marketing
Firal GmbH

August 2016
Clockwork Ocean – A Unique Marine Research Expedition Utilizing a Zeppelin
Helmholtz-Zentrum Geesthacht

September 2016
Kenkodo Helps You Know Your Body Better
Metabolomic Discoveries GmbH

October 2016
KINEXON – Helping Coaches Measure, Analyze, and Improve Athletic Performance
KINEXON

November 2016
MyTherapy – The App that Improves Medication Adherence
smartpatient gmbh
Each newsletter features an interview with a leading German expert to highlight the month’s topic. In 2016, the GCRI conducted interviews with authorities from academia, industry, and government.

Prof. Dr. Dr. h.c. Konrad Beyreuther
Founding Director, Network Aging Research (NAR), Heidelberg University

Memory
Issue 70, January 2016

Reinhard Karger
Corporate Spokesperson, German Research Center for Artificial Intelligence (DFKI)

Artificial Intelligence
Issue 71, February 2016

Prof. Dr. Katharina Morik
Head of the Collaborative Research Center SFB 876, TU Dortmund University

Big Data
Issue 72, March 2016

Prof. Dr. Hans Hauner
Director of the Else Kröner Fresenius Center for Nutritional Medicine, Technical University of Munich (TUM)

Nutrition
Issue 73, April 2016

Prof. Dr. Hans-Georg Rammensee
Director, Department of Immunology, Interfaculty Institute for Cell Biology, University of Tübingen

Cancer
Issue 74, May 2016

Burkhard Horn
Head of the Transport Division, Senate Department for Urban Development and the Environment in Berlin

Smart Sustainable Cities
Issue 75, June 2016

Verena Pausder
Co-Founder & CEO, Fox & Sheep

Digital Future
Issue 76, July 2016

Prof. Dr. Martin Visbeck
Head of the Research Unit, Physical Oceanography, GEOMAR - Helmholtz Centre for Ocean Research Kiel

The Future of the Ocean
Issue 77, August 2016

Prof. Dr. med. Erwin Böttinger
CEO, Berlin Institute of Health (BIH)

Translational Medicine
Issue 78, September 2016

Prof. Dr. Günter Faltin
Co-Founder, Foundation for Entrepreneurship

Entrepreneurship
Issue 79, October 2016

Prof. Dr. Jürgen Margraf
Alexander von Humboldt Professor of Clinical Psychology and Psychotherapy and Director of the Center for the Study and Treatment of Mental Health, Ruhr-Universität Bochum

The Future of Mental Health Care
Issue 80, November 2016
The German Center for Research and Innovation joined the online social networking and microblogging service Twitter on May 31, 2011. By December 31, 2016, the GCRI had sent 15,660 tweets to 3,791 followers. As part of its social media strategy, GCRI’s tweets correspond to the monthly newsletter topics of E-INNOVATION GERMANY. In addition to these topics, GCRI tweets about funding opportunities for research as well as jobs and internships in Germany.

*As calculated via the measuring tool TweetStats*
GCRI Twitter

Twitter Statistics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Tweets Sent in 2016</td>
<td>2,358</td>
</tr>
<tr>
<td>Increase in Number of Followers</td>
<td>16.8%</td>
</tr>
<tr>
<td>in 2016</td>
<td></td>
</tr>
<tr>
<td>Number of Followers Dec. 31, 2016</td>
<td>3,791</td>
</tr>
<tr>
<td>Number of Followers Gained in 2016</td>
<td>609</td>
</tr>
<tr>
<td>Average Accounts Reached per Month*</td>
<td>96,600</td>
</tr>
</tbody>
</table>

*Estimated accounts reached as calculated via the measuring tool TweetReach using the @gcri_ny handle

Most Successful Tweets

Most Successful Tweets

GCRI Follower Development in 2016

<table>
<thead>
<tr>
<th>Month</th>
<th>Followers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>2,164</td>
</tr>
<tr>
<td>Feb</td>
<td>2,447</td>
</tr>
<tr>
<td>Mar</td>
<td>2,517</td>
</tr>
<tr>
<td>Apr</td>
<td>2,644</td>
</tr>
<tr>
<td>May</td>
<td>2,760</td>
</tr>
<tr>
<td>Jun</td>
<td>2,795</td>
</tr>
<tr>
<td>Jul</td>
<td>2,865</td>
</tr>
<tr>
<td>Aug</td>
<td>2,936</td>
</tr>
<tr>
<td>Sep</td>
<td>2,994</td>
</tr>
<tr>
<td>Oct</td>
<td>3,075</td>
</tr>
<tr>
<td>Nov</td>
<td>3,128</td>
</tr>
<tr>
<td>Dec</td>
<td>3,128</td>
</tr>
</tbody>
</table>
“The German Center for Research and Innovation offers an excellent platform for transatlantic dialogue in science and is also a vibrant marketplace where new cooperation partners can find each other, thus strengthening and sustaining German-US collaboration in science and technology. These days this is more relevant than ever.”

– Dr. Berthold Neizert, Head of the Department of Research Policy and International Relations, Max-Planck-Gesellschaft
The German Houses of Research and Innovation (DWIH) are part of the Internationalization Strategy of the German federal government and the German Federal Foreign Office’s Research and Academic Relations Initiative. Located in Moscow, New Delhi, New York, São Paulo, and Tokyo, the DWIH facilitate collaboration with Germany by bringing together leaders in science, the humanities, technology, and industry and providing a platform to foster creativity and enhance innovation.

The houses were created to:

- Promote Germany as a research location
- Provide a forum for international dialogue and scientific exchange
- Offer support and services (advising for international researchers; organizing educational events; facilitating collaboration)

The German Federal Foreign Office has implemented this project in cooperation with the Federal Ministry of Education and Research (BMBF) and in close collaboration with the Alliance of German Science Organizations, which includes the Alexander von Humboldt Foundation (AvHF), Fraunhofer-Gesellschaft, German Academic Exchange Service (DAAD), German Council of Science and Humanities (WR), German National Academy of Sciences Leopoldina, German Rectors’ Conference (HRK), German Research Foundation (DFG), Helmholtz Association, Leibniz Association, Max-Planck-Gesellschaft as well as the Association of German Chambers of Commerce and Industry (DIHK).
Deutsche Wissenschafts- und Innovationshäuser (DWIH)

New York
German Center for Research and Innovation
Deutsches Wissenschafts- und Innovationshaus
New York
General Questions:
info@germaninnovation.org
www.germaninnovation.org

São Paulo
Deutsches Wissenschafts- und Innovationshaus
São Paulo
Centro Alemão de Ciência e Inovação São Paulo
General Questions:
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www.dwih.com.br

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General Questions:
info@dwih-tokyo.jp
www.dwih-tokyo.jp

New Dehli
German House for Research and Innovation New Delhi
General Questions:
info@dwih.in
www.dwih.in
Under the leadership of its chair, Dr. Kurt Becker, the Advisory Council strongly supports the GCRI’s activities and outreach as it presents Germany to the North American market.

The Advisory Council works collaboratively to help the GCRI achieve its mission. The council members’ expertise and leadership ensure that the GCRI is well connected to key stakeholders in the United States and Germany across the business, government, academic, and nonprofit sectors.

**Dr. Annette Doll-Sellen**
Director, DFG Office
North America/New York

**Dr. Kurt H. Becker**
Vice Dean for Research, Innovation, & Entrepreneurship
Professor of Applied Physics; Professor of Mechanical & Aerospace Engineering,
NYU Tandon School of Engineering

**Dr. Cathleen S. Fisher**
President, American Friends of the Alexander von Humboldt Foundation

**Dr. Nina Lemmens**
Director, DAAD North America

**Dr. Robin Mishra**
Head of the Science & Technology Section, Embassy of the Federal Republic of Germany

**Dr. Jeffrey Peck**
Director, Europe, AKA|Strategy

**Irmintraud Jost**
Executive Director, Heidelberg University Association
Representative of the German Universities Liaison Offices in New York

**Dietmar Rieg**
President & CEO, German American Chamber of Commerce, Inc. New York

**Brita Wagener**
Consul General, Consulate General of the Federal Republic of Germany in New York
GCRI Team

**Dr. Joann Halpern**
Director

Main Responsibilities:
- Strategic Planning
- Strategic Outreach
- Program Development

**Edwin Linderkamp**
Communications Officer (since September 2016)

Main Responsibilities:
- GCRI Web & Social Media Presence
- E-NNOVATION GERMANY GCRI’s Monthly Newsletter
- Public Relations & Marketing

**Jennifer Audet**
Communications Officer (until August 2016)

Main Responsibilities:
- GCRI Web & Social Media Presence
- E-NNOVATION GERMANY GCRI’s Monthly Newsletter
- Public Relations & Marketing

**Julia John-Scheder**
Program Officer

Main Responsibilities:
- Program Planning & Coordination
- Event Logistics
- Office Administration
The GCRI Foundation, Inc. was incorporated in 2012 and held its inaugural board meeting on August 14, 2012, at the German House in New York City. The Foundation supports the mission and work of the German Center for Research and Innovation through activities to expand the center’s funding base and enhance the sustainability of GCRI’s operations, including its public events, workshops, publications, website, and other relevant projects.
In 2016, for the first time, the GCRI Foundation funded five summer internships for highly qualified sophomores from North American universities to work in a laboratory at a German university through the RISE (Research Internships in Science and Engineering) program of the German Academic Exchange Service (DAAD). The sophomores were sent to a host university or research institute based on their area of interest (biology, chemistry, physics, earth sciences, engineering, or a closely related STEM field). The GCRI Foundation provided the students with a stipend for three months to help cover living expenses. The scholarship enabled the North American students to learn more about Germany and German research, and to develop international networks in their field.

In 2016, the following individuals received scholarships:

<table>
<thead>
<tr>
<th>Name</th>
<th>Home University</th>
<th>German University/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katarina Crystal Bohaichuk</td>
<td>University of Alberta</td>
<td>Ruhr-Universität Bochum</td>
</tr>
<tr>
<td>Elena Busch</td>
<td>Rice University</td>
<td>Ruhr-Universität Bochum</td>
</tr>
<tr>
<td>Mu-Hsun (Theresa) Chen</td>
<td>Amherst College</td>
<td>Max Planck Institute for Ornithology</td>
</tr>
<tr>
<td>Nisrit Pandey</td>
<td>University of Wisconsin</td>
<td>Technische Universität Ilmenau</td>
</tr>
<tr>
<td>Clara Wolfe</td>
<td>University of Rochester</td>
<td>Otto-von-Guericke-Universität Magdeburg</td>
</tr>
</tbody>
</table>
GCRI Foundation Activities

GCRI Foundation Engineering Prize 2016

The GCRI Foundation Engineering Prize was created to recognize outstanding engineering students at universities in the United States and Canada. In 2016, three seniors received the award: Sofia Hernandez, Rutgers University; Jacob Flood, McGill University; and Kathleen Coleman, University of Connecticut. These students each received $1,500. The prize is an opportunity to celebrate student engineering achievement and enhance the visibility of German research and innovation on North American college campuses.

GCRI Ambassadors

GCRI Ambassadors are selected students in North America who have studied or conducted research in Germany.

The main responsibility of GCRI Ambassadors is to promote research, scholarship, and internship opportunities in Germany in their professional community, university or organization. GCRI Ambassadors inspire and inform others about the rich and varied opportunities to conduct research, receive funding, and launch collaborative initiatives with colleagues in Germany.
GCRI Partner Institutions

GCRI is under the joint leadership of the German Academic Exchange Service (DAAD) and the German Research Foundation (DFG), and is funded by the German Federal Foreign Office. Additional designated partners are the Association of German Chambers of Commerce and Industry and the Alliance of German Science Organizations, which in addition to DAAD and DFG, also includes the Alexander von Humboldt Foundation, the Fraunhofer-Gesellschaft, the Helmholtz Association, the German Rectors’ Conference, the Max-Planck-Gesellschaft, the Leibniz Association, the German National Academy of Sciences Leopoldina, and the German Council of Science and Humanities.

The GCRI works closely with the following organizations, which are also located in the German House New York: the Consulate General of the Federal Republic of Germany in New York, the German Academic International Network (GAIN), and the German Universities Liaison Offices in New York. These include Bucerius Law School, German University Alliance, Heidelberg University Association, UAS7 German Universities of Applied Sciences, University Alliance Ruhr, University of Cologne, University of Freiburg, and Eucor - The European Campus.
The German Center for Research and Innovation is a cornerstone of the German government’s Internationalization Strategy and its Research and Academic Relations Initiative.

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