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Army Medical Research and Development Infrastructure Planning: A Workshop

Board
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About This Workshop

This workshop will explore how the U.S. Army can improve its strategic medical infrastructure planning. The Army requires fidelity, consistency, and predictability in processes for planning and managing research, development, test, and evaluation (RDT&E) resources for medical infrastructure across all appropriation sources to effectively develop, deliver, and respond to the military medical capability needs. Invited presentations and discussions will be designed to examine:

- The roles, responsibilities, and coordinating mechanisms among the major stakeholders responsible for battlefield medicine readiness and care, including:
    - Investigating Army capability requirements related to a Multi-Domain Operating (MDO) environment in 2035.
    - Discussing how other components can best complement the Army's disproportionate share of battlefield medicine preparedness.
    - Reviewing collaborative funding agreements (or lack of) and barriers to cooperation.
- Case studies of comparably complex enterprise solutions across industry and academia, including:
    - Reviewing and examining what industry and academic models (or aspects of models) could be applied to Army infrastructure planning.
    - Exploring gaps and seams in current Army R&D laboratory infrastructure models.
- The opportunities to link ends, ways, and means to improve enterprise efficiencies, including:
    - Describing enterprise framework components, and
    - Discussing strategic goals, drivers, and current Army medical research and development enterprise gaps.

A proceedings of the presentations and discussions at the workshop will be prepared by a designated rapporteur in accordance with institutional guidelines.

About The Board on Army Research and Development

The National Academies of Sciences, Engineering and Medicine have been called upon by government agencies and the U.S. Congress to provide objective, science-based advice on important issues affecting the nation for more than 150 years. The U.S. military turns to us for independent advice on topics related to research, development, and application of science and technology in support of military matters. We provide a level of independence, quality, and visibility that cannot be matched by other scientific advisory boards. Our board members are widely recognized industry, academic, and former military experts that serve without compensation and are formally appointed by the President of the National Academy of Sciences.

The Board on Army Research and Development (BOARD) provides both classified and unclassified forums to convene leading technical and intelligence experts to evaluate scientific and technology approaches to facilitate threat-informed acquisition decisions.

For more information on the BOARD including our projects and member biographies, please visit our website at [www.nationalacademies.org/board.](www.nationalacademies.org/board)

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Agenda

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Or Telephone: (646) 828 7666

Meeting ID: 160 077 1571

Password: 711520

July 14th, 2020 – Workshop Day 1 Agenda | *times shown Eastern (Pacific)*

1030 (0730) – 1100 (0800) Welcome, Introductions and Overview
BOARD Chair Hon. Katharina McFarland (ret.) and Workshop Co-chairs, Dr. Joan Bienvenue and Dr. John Clements

Morning Session Moderator: Dr. John Clements

1100 (0800) – 1200 (0900) Joint Doctrine and MDO for 2035
Brig Gen Paul Friedrichs, Joint Staff Surgeon, Joint Chiefs of Staff

1200 (0900) – 1215 (0915) Break

1215 (0915) – 1315 (1015) Combat Casualty - A History and Future Implications
Dr. Emily Mayhew, Faculty of Engineering, Department of Bioengineering, Imperial College of London

1315 (1015) – 1345 (1045) Lunch/Long Break

Afternoon Session Moderator: Dr. John Clements

1345 (1045) – 1445 (1145) Perspectives on Process from the Army's Combat Casualty Care R&D Organization
Dr. John Holcomb, (COL, USA, ret), Professor of Surgery at UAB Former USAISR Commander

1445 (1145) – 1500 (1200) Break

1500 (1200) – 1600 (1300) Perspectives from the Defense Health Board and the NIH
Dr. H. Clifford Lane, NIAID Deputy Director for Clinical Research and Special Projects, Defense Health Board and Chair of the DHB Public Health Subcommittee

1600 (1300) – 1615 (1315) Break

1615 (1315) – 1715 (1415) Perspectives from USA MRMC
Dr. Kenneth Bertram, Clinical Product Development Officer for the Wake Forest Institute for Regenerative Medicine, former USA MRMC Principal Assistant for Acquisition

1715 (1415) – 1800 (1500) Day 1 Wrap Up and Committee Discussion Time (Closed Session)
Co-chairs, Dr. Joan Bienvenue and Dr. John Clements and Workshop Committee

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July 15th, 2020 – Workshop Day 2 Agenda | *times shown Eastern (Pacific)*

1030 (0730) – 1100 (0800) Welcome, Introductions and Day 1 Highlights
BOARD Chair Hon. Katharina McFarland (ret.) and Workshop Co-chairs, Dr. Joan Bienvenue and Dr. John Clements

Morning Session Moderator: Dr. Joan Bienvenue

1100 (0800) – 1200 (0900) DARPA's Approach to Military Medical Innovation
Dr. Geoff Ling, (COL retired), Current CEO NED Biosystems, founder, Biological Technologies Office, DARPA

1200 (0900) – 1215 (0915) Break

1215 (0915) – 1315 (1015) Performance Improvement
Dr. Russ S. Kotwal (COL, retired), Strategic Projects, DoD Joint Trauma System

1315 (1015) – 1345 (1045) Lunch/Long Break

Afternoon Session Moderator: Dr. John Clements

1345 (1045) – 1445 (1145) Lessons from Founding Centers and Stakeholder Collaboration
Dr. S. Shankar Sastry, Professor, EECS Dept. UC Berkeley

1445 (1145) – 1500 (1200) Break

1500 (1200) – 1600 (1300) Experiences with Experimental Medicine - Army and Academia
Dr. Chad Roy, Professor Tulane University, Director, Infectious Disease Aerobiology

1600 (1300) – 1615 (1315) Break

1615 (1315) – 1715 (1415) Opportunities in the R&D Labs
Dr. Robert Kaminski, Chief, Department of Diarrheal Disease Research, Bacterial Diseases Branch, Center for Infectious Disease Research Walter Reed Army Institute of Research

1715 (1415) – 1800 (1500) Day 2 Wrap Up and Committee Discussion Time (Closed Session)
Co-chairs, Dr. Joan Bienvenue and Dr. John Clements and Workshop Committee

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July 16th, 2020 – Workshop Day 3 Agenda | *times shown Eastern (Pacific)*

1030 (0730) – 1100 (0800) Welcome, Introductions and Day 2 Highlights
BOARD Chair Hon. Katharina McFarland (ret.) and Workshop Co-chairs, Dr. Joan Bienvenue and Dr. John Clements

Morning Session Moderator: Dr. Joan Bienvenue

1100 (0800) – 1200 (0900) Novel Academic Models for Translational Research
Dr. Stephen Quake, Co-President of the Chan Zuckerberg Biohub, Stanford University

1200 (0900) – 1215 (0915) Break

1215 (0915) – 1315 (1015) Wyss Institute: A New Innovation Model that Spans the Academic Industrial Interface
Dr. Don Ingber Founding Director, Wyss Institute for Biologically Inspired Engineering, Harvard

1315 (1015) – 1345 (1045) Lunch/Long Break

Afternoon Session

1345 (1045) – 1445 (1145) Workshop Highlights and Final Discussion
Workshop Co-Chairs Dr. Joan Bienvenue and Dr. John Clements

1445 (1145) – 1500 (1200) Workshop Adjourn

1500 (1200) – 1700 (1400) Highlights and Path Forward (Closed session)
Workshop Committee and Staff

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Webinar Procedures

Zoom Meeting Sign-on & Q&A Processes, Etiquette and Tips

Primary Meeting Moderator: *Workshop Co-Chairs Dr. Joan Bienvenue and Dr. John Clements*

***Sign On Processes*:**

- Dial in 10 minutes before the meeting starts to confirm connectivity.
- Type in your full name, not just your email address, in participant window.
- At start time, all participants will be muted except the speaker.
- Moderator will take roll 5 minutes before the meeting start.

Q&A Process:

- Participants 'raise hand' and moderator will call on participant for short clarifying questions related to immediate slide, topic, or question from a participant.
- Longer-form questions to be held until Q&A session following the presentation.
    - Please write the question in the chat box so all participants can see it.

For every session:

- Questions will be first come, first served.
- Moderator reserves right to move questions to front if it is relevant to the discussion at hand.
- Moderator will ensure as many participants have a chance to ask questions as possible.
    - Moderator will call on those who haven't asked questions before returning to a participants' second/third questions per session.
- Moderator will have control over time limits and microphones.

During the presentations:

- At the speakers discretion, they will have the option to pause halfway through presentations to field clarification questions for 5 minutes.
- Clarification question example:
    - "What does that acronym stand for?"
    - "On slide 3, do you mean X or Y?"
- Longer questions will be held for the discussion. Examples:
    - "Please elaborate on point X."
    - "What about Y?"

During the Q&A portion:

- If your question has already been answered, please note in the chat box to disregard.
- Once each question has been answered, the session will open to comments.
    - Use the 'hand raise' to comment via microphone to the group.
    - Moderator will do their best to call on raised hands in the order they were received.

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Webinar Procedures

Videoconference Etiquette Tips:

- Arrive early
- Know how to use the meeting technology
- Avoid bandwidth consuming activities such as streaming during conference
- Sit up and keep your microphone close
- Speakers should use web camera if available; all attendees are encouraged to use web cameras as well for a more interactive experience
- Limit background noise (please mute phone or computer notifications)
    - We know many are at home; do the best you can!
    - Mute microphone when not speaking
- Identify yourself
- Avoid multitasking
- Speak clearly
- Be polite
- Make your presence known
- Keep questions short and on-topic

Zoom Shortcuts:

M is for mute. Press Cmd+Ctrl+M (macOS) or Alt+M (Windows) when you are the meeting host and want to mute everyone else on the line.

S is for share. Press Cmd+Shift+S (macOS) or Alt+Shift+S (Windows) to share your screen.

Staff Roles and Responsibilities:

Moderators: Dr. Joan Bienvenue and Dr. John Clements (Mr. Bruno Millonig and Ms. Sarah Juckett as alternates)
Rapporteur: Mr. Norman Haller
Technical Assistance: Mr. Cameron Malcom
Speaker check-in (15-20 min prior): Mr. Cameron Malcom

Additional Notes:

Breaks – We will have scheduled breaks, but feel free to step out just as you would normally in a meeting. Take a quick urgent call, use the restroom, or stretch your legs; no problems, and no need to apologize.

System Crash – we hope this will not be an issue but if the meeting crashes we will send an email to the committee and attendees detailing our plan moving forward.

Resources:

https://www.conferencecalling.com/blog/run-conference-call-question-and-answer-sessions

https://www.sae.org/binaries/content/assets/cm/content/standards/virtual-meetings-best-practice-guide.pdf

Committee Biographies

Dr. Joan Bienvenue, co-chair

Joan Bienvenue is senior executive director of the Applied Research Institute at the University of Virginia. Dr. Beinvenue received a B.S. in chemistry from Rivier University, an M.S. in forensic science at the University of New Haven, a Ph.D. in chemistry from the University of Virginia, and an M.B.A. from the University of Mary Washington. She was a National Institute of Justice Research Fellow while at UVA, where her work focused on the development of microfluidic systems. This work was summarized in over fifteen peer-reviewed papers and book chapters and presented at many conferences; she is an inventor on five U.S. patents. In addition to this academic work, she is creator and conference chair for the annual Commonwealth Conference on National Defense and Intelligence, now entering its sixth year, and co-creator and Inaugural Chair of the Gordon Research Conference on Forensic Analysis of Human DNA. After completion of her graduate studies, Dr. Bienvenue was an ORISE Postdoctoral Research Fellow at the FBI. Following this appointment, she joined the Armed Forces DNA Identification Laboratory (AFDIL), as the Validation and Quality Control Supervisor where she managed a team that provided quality control and oversaw the evaluation, validation, and implementation of new technology for DNA casework analysis in support of remains identification. She joined Lockheed Martin in 2008 and most recently served as chief scientist and program manager, in support of the development of rapid microfluidic DNA analysis systems. In June of 2013, she returned to the UVA as director of the Applied Research Institute (ARI) and was promoted to senior executive director in 2017. ARI serves the university and the defense and intelligence communities as a conduit to facilitate collaboration and innovation between the academia and government. ARI leverages UVA's human and capital assets to support research, education, and training, with a focus on homeland security, national intelligence, and defense missions. Dr. Bienvenue is a fellow of the American Academy of Forensic Sciences. She is nominated because of her industry experience developing technologies for DNA analysis as well as her current expertise leading the Applied Research Institute at the University of Virginia.

Dr. John D. Clements, co-chair

John D. Clements, (co-chair) is Emeritus Professor of Microbiology and Immunology at Tulane University School of Medicine. After receiving his doctorate in 1979 from the University of Texas Health Science Center at Dallas, Dr. Clements completed a National Research Council Associateship at Walter Reed Army Institute of Research in Washington, DC. In 1980, Dr. Clements was appointed as Assistant Professor in the Departments of Microbiology and Medicine at the University of Rochester School of Medicine in Rochester, NY. In 1982, Dr. Clements joined the faculty at Tulane University. Dr. Clements served as Professor and Chair of the Department of Microbiology and Immunology from 1999 - 2018. Dr. Clements served as Vice Dean for Research from 2006 to 2009 and as Director of the Tulane Center for Infectious Diseases from 2009 - 2014. Dr. Clements' research programs focused on development of vaccines against infectious diseases. His research was funded from a variety of Public Health Service, Department of

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Defense, and philanthropic sources. Research in Dr. Clements's laboratory resulted in more than 100 peer reviewed publications and book chapters and thirteen issued patents. Dr. Clements has served on numerous scientific panels and Editorial Boards and was an Editor for Infection and Immunity from 1999 - 2005. In 2002, Dr. Clements chaired the committee to review all Military Infectious Disease Research Programs for the Department of Defense. Dr. Clements trained as a UN Weapons Inspector (UNMOVIC) and in 2003 and again in 2004, Dr. Clements served as a member of the Iraq Survey Group in Baghdad as a Subject Matter Expert in weapons of mass destruction and dual use equipment and programs for the Department of Defense. Dr. Clements was formerly a member of the Armed Forces Epidemiology Board (AFEB) and subsequently the Defense Health Board and is currently a member of the Public Health Subcommittee of the Defense Health Board – a federal advisory committee. In 2009, Dr. Clements was a member of the National Academy of Sciences committee on biosafety and personnel reliability in laboratories that conduct research of biological select agents and toxins. From 2010-2012, he served as a member of the National Vaccine Advisory Committee (NVAC) H1N1 Vaccine Safety Risk Assessment Working Group (VSRAWG). In 2011, Dr. Clements became a member of the National Academy of Sciences committee on developing a framework for an international faculty development project on education about research in the life sciences with dual use potential. He subsequently chaired two international workshops in support of this committee, including the Education Institute for Responsible Research on Infectious Diseases, Aqaba, Jordon (2012) and the Educational Institute of Responsible Science, Kuala Lumpur, Malaysia (2013). In 2013, Dr. Clements also chaired a National Academies of Sciences international workshop on Science Needs for Microbial Forensics: Developing an Initial International Roadmap in Zagreb, Croatia. In 2017, Dr. Clements served as a member of the National Academy of Sciences committee on Strategies for Effective Biologic Detection Systems. Dr. Clements is a veteran of the US Marine Corps. He served on active duty from 1966-1972 and in the US Marine Corps Reserves from 1972-1991. He was Honorably Discharged at the rank of LTCOL from the US Marine Corps Reserves in 1991.

Dr. Ruzena K. Bajcsy

Ruzena K. Bajcsy is the NEC Distinguished Professor of Electrical Engineering and Computer Sciences at the University of California, Berkeley. She was the founding director of the Center for Information Technology Research in the Interest of Society (CITRIS) in 2001, a multi-campus organization comprising four campuses: UC Berkeley, UC Davis, UC Santa Cruz, and UC Merced. As part of her activities in CITRIS, and together with the University of California Center for the Humanities, she played a founding role in establishing a program of Digital Humanities. Before joining UC Berkeley, she headed the Computer and Information Science and Engineering Directorate at the National Science Foundation (1999–2001). From 1972 to 2001 she was a professor in the Computer and Information Science Department at the University of Pennsylvania, where she established in 1978 the General Robotics, Automation, Sensing, and Perception (GRASP) Lab. As director of the GRASP lab she fostered interdisciplinary research activities and attracted faculty from electrical and mechanical engineering as well as psychology/cognitive science and of course computer science. Throughout her 28 years at University of Pennsylvania, she worked on robotics research, including computer vision, tactile perception, and in general the problem of system identification. She also worked on medical imaging, and developed with her

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students a digital anatomy atlas coupled with elastic matching algorithms that made it possible to automatically identify anatomic structures of the brain, first in X-ray tomography, later with MRI and positron image tomography. Use of this technology is now standard in medical practice. Dr. Bajcsy is a member of the National Academy of Engineering (1997) and National Academy of Medicine (1995) as well as a fellow of the Association for Computing Machinery (ACM) and the American Association for Artificial Intelligence (AAAI). In 2001 she received the ACM/AAAI Allen Newell Award, and in November 2002 she was named one of the 50 most important women in *Discover Magazine*. She is the recipient of the Benjamin Franklin Medal for Computer and Cognitive Sciences (2009) and the IEEE Robotics and Automation Award (2013) for her contributions in the field of robotics and automation. Her current research is in the use of robotic technology, namely measuring and extracting noninvasively kinematic and dynamic parameters of individual in order to assess their physical movement capabilities or limitations. If there are limitations, her students have designed assistive devices that can compensate for the lack of kinematic agility and /or physical strength.

Dr. Robert A. Barish

Robert A. Barish, a distinguished physician and academic leader, is vice chancellor for health affairs of the University of Illinois at Chicago. Dr. Barish oversees the University of Illinois Hospital & Health Sciences System (UI Health), which provides comprehensive care, education, and research to train healthcare leaders and foster healthy communities in Illinois and beyond. A part of the University of Illinois at Chicago (UIC), UI Health is a clinical enterprise that includes a 465-bed tertiary care hospital, 21 outpatient clinics, and 11 federally qualified Mile Square Health Center locations. With campuses in Chicago, Peoria, Quad Cities, Rockford, Springfield, and Urbana, the health system includes the academic and research activities of the seven UIC health science colleges: Applied Health Sciences, Dentistry, Medicine, Nursing, Pharmacy; the School of Public Health; and the Jane Addams College of Social Work. UI Health is dedicated to the pursuit of health equity. He served as chancellor of the LSU Health Sciences Center at Shreveport from 2009 to 2015, where he provided leadership for the schools of medicine, allied health, and graduate programs; a major academic medical center; and two affiliated hospitals. Dr. Barish spent 24 years at the University of Maryland School of Medicine. He served as chief of emergency medicine from 1985 to 1996 and built a nationally recognized program. He was named associate dean for clinical affairs in 1998 and vice dean for clinical affairs in 2005. That same year, following the devastation of Hurricane Katrina on the Gulf Coast, Barish helped lead a medical regiment dispatched by the state of Maryland to deliver emergency care to more than 6,000 hurricane victims in Jefferson Parish. In addition to his medical duties at Maryland, Barish earned an M.B.A. from Loyola College in 1995. From 1996 to 1998, he served as the chief executive officer of UniversityCARE, a University of Maryland physician-hospital network of family-oriented health centers located in neighborhoods throughout the Baltimore metropolitan area. A former lieutenant colonel and flight surgeon in the Maryland Air National Guard, Barish was among a select group invited to become a NASA astronaut candidate in the early 1990s.

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Committee Biographies

Dr. Clarion E. Johnson

Clarion E. Johnson is the former global medical director of the Medicine and Occupational Health Department for ExxonMobil Corporation. The department delivers services to more than 88,000 ExxonMobil and affiliate employees worldwide. In addition to traditional work-related health services, the department delivers travel medicine to the many ExxonMobil employees who are engaged in exploration and production in a number of challenging environments in Africa, the CIS, China, and Southeast Asia. Dr. Johnson is co-chair of the Planning Committee for the Forum on Public-Private Partnerships for Global Health and Safety at the National Academies of Sciences, Engineering, and Medicine. He has been a long time member of the Milbank Memorial Fund Board of Directors and has published numerous articles in various fields. Dr. Johnson is the 2012 recipient of the Society of Petroleum Engineers' Health, Safety, Security, Environment, and Social Responsibility Award. Dr. Johnson is board-certified in internal medicine, cardiology, and occupational medicine. He did his undergraduate work at Sarah Lawrence College and studied medicine at the Yale University School of Medicine.

Dr. Kent Kester

Kent Kester is currently Vice President and Head, Translational Science and Biomarkers at Sanofi Pasteur. In this capacity, he leads a team of over 200 research and clinical professionals in the US and France focused on the translational development of new vaccines. During a 24-year career in the US Army, he worked extensively in clinical vaccine development and led multiple research platforms at the Walter Reed Army Institute of Research, the U.S. Department of Defense's largest and most diverse biomedical research laboratory with a major emphasis on emerging infectious diseases, an institution he later led as its Commander/Director. His final military assignment was as the Associate Dean for Clinical Research in the School of Medicine at the Uniformed Services University of the Health Sciences (USUHS). During his military service, Dr. Kester was appointed as the lead policy advisor to the US Army Surgeon General in both Infectious Diseases and in Medical Research & Development. In these capacities, he worked extensively in the interagency environment and developed a variety of Army and DoD medical policies related to infectious diseases, both clinical and research aspects. Dr. Kester holds an undergraduate degree from Bucknell University and an M.D. from Jefferson Medical College, completing his internship and residency in internal medicine at the University of Maryland and a research fellowship in infectious diseases at the Walter Reed Army Medical Center. Currently a member of the US Government Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria (PACCARB) and the Department of Veterans Affairs Health Services Research & Development Service Merit Review Board, he previously chaired the Steering Committee of the NIAID/USUHS Infectious Disease Clinical Research Program, and has served as a member of the FDA Vaccines & Related Biologics Products Advisory Committee (VRBPAC), the NIAID Advisory Council, and the CDC Office of Infectious Diseases Board of Scientific Counselors. He is the Vice Chair of the National Academy of Medicine Forum on Microbial Threats. Board-certified in both internal medicine and infectious diseases, Dr. Kester holds faculty appointments at USUHS and the University of Maryland; and is a fellow of the American College of Physicians, the Royal College of Physicians of Edinburgh, the Infectious Disease Society of America, and the American Society of

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Tropical Medicine and Hygiene. He is a member of the clinical faculty at the University of Maryland Shock Trauma Center in Baltimore.

Ms. Ann B. Salamone

Ann Salamone, Chairman of the Board and co-founder of Rochal Industries LLC, has been a polymer scientist for more than 40 years developing products for flexible circuit boards, integrated chips, personal care and healthcare. She is one of the principal inventors of Rochal's products for skin and wound treatment and is responsible for the development and maintenance of customers. Her products contribute to positive patient outcomes of millions of patients annually. Ann holds 26 U.S. patents and patent applications and is a past Chairman of the American Chemical Society, Division of Polymer Chemistry. In 2009, she was selected as an Inaugural Fellow of the American Chemical Society, in 2011 received a nationally recognized LEAD Award from the Healthcare Businesswomen's Association. She is the recipient of the 2019 Society of Biomaterials Technology Innovation and Development Award. She is Chairman of BioMed SA and a member of the National Academy of Engineering. Additionally, she served as President or Vice President of the Enterprise Development Corporation (EDC), a South Florida science and technology incubator. During her tenure, EDC's clients increased aggregate revenues by more than $98 million, raised more than $74 million in outside funding, created 5,013 jobs, produced annual salaries of $109.5 million, and provided $5.6 million in annual sales tax revenues. During this time, Ann was a Crystal Slipper Awardee, Executive Woman of the Year, 2002, in recognition of accomplishments at EDC and contributions to K-12 science education nationally.

Dr. Martín-Jose Sepúlveda

Martín-Jose Sepúlveda, M.D., FACP, FAAP, FACOEM is an IBM Fellow, elected member of the National Academy of Science, Engineering and Medicine, the Connecticut Academy of Science and Engineering, and the Florida Academy of Science and Technology. He is the CEO and principal of CLARALUZ LLC, a health, data, technology and analytics consulting firm. He is a senior executive advisor to four health technology start-up companies and to IBM Watson Health. He is also the retired IBM Vice President of Health Systems and Policy Research, IBM Research Division. Prior to this post, he served as IBM Vice President of Integrated Health Services and led health policy and strategy, health benefits innovation and purchasing, occupational health and well-being services for IBM globally. He is currently an active board member in the National Academy of Medicine's Board on Children, Youth and Families, the Board of Overseers at the UPENN School of Nursing, the Board of Advisors of the College of Public Health University of Iowa, and the Council for Health Research for Development.

Dr. Philip C. Spinella

Philip Spinella is the Director of the Pediatric Critical Care Translational Research Program at St Louis Children's Hospital and a Professor of Pediatrics at Washington University School of

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Medicine. He is internationally recognized as an expert in transfusion medicine and the resuscitation of hemorrhagic shock. Dr. Spinella served 15 years in the US Army and separated as a Lieutenant Colonel in 2007. He is a veteran of the Iraq War, where he received a Bronze Star and the Combat Medic Badge for providing care under fire. In collaboration with investigators at the US Army Institute of Surgical Research, his groundbreaking work in the area of the treatment of hemorrhagic shock received the US Army's Best Invention Award in 2008 for his role in the development of the concept of "damage control resuscitation". Dr. Spinella is a well-established clinical trialist, who has been funded by the US Department of Defense and the National Institutes of Health. He has published over 200 manuscripts and 16 chapters, and is the editor for a textbook on the topic of trauma resuscitation. Dr. Spinella has also participated in, organized research symposia for, or provided external review of research programs for the FDA, NIH, DoD, Homeland Security, and the Department of Health and Human Services. He has also participated on a committee for the National Academy of Sciences to develop recommendations for a national trauma system in the US. Dr. Spinella co-founded the THOR Network and has been its Co-Director since 2011. The THOR Network over the past 10 years as a public charity has raised over 2 million dollars under Dr. Spinella's leadership. These funds have been used to educate, train, and perform research in the discipline of trauma resuscitation around the world. The THOR network has hosted training and educational programs in over 12 countries in 4 continents. The THOR Network has also performed ground breaking research related to whole blood and platelet transfusion for traumatic bleeding.

Dr. Mary Ann Spott

Mary Ann Spott joined the Joint Trauma System in 2006 to lead the establishment of the DoD's first and only trauma system and trauma patient registry. Dr. Spott was responsible for developing the strategic vision for trauma operations across the DoD and was instrumental in building the trauma system from the ground up. As the Deputy Director, Dr. Spott manages all aspects of the JTS and DoD Trauma Registry and its integrated clinical registries and databases. The U.S. Secretary of Defense awarded Distinguished Civilian Award (DCS) to Dr. Spott in December 2016 for her outstanding work at the JTS. The DCS Award is the highest recognition the DoD can award an employee, and it is presented to a small number of civilian employees whose careers reflect exceptional devotion to duty and significant contributions of broad scope of policy, scientific, technical or administrative fields that increase effectiveness and efficiency. As deputy director, Dr. Spott is the principal Health Informatics Officer. Dr. Spott was awarded the first ever AHIMA e-HIM award for her contributions to the development and implementation of an outcomes and performance improvement software application that is now used in many trauma centers across the United States. Her current responsibilities include coordinating the JTS components across the continuum of care which include prevention, pre-hospital, education, leadership and communication, quality assurance/performance improvement, research and information systems, including the DoD Trauma Registry. She also participates as a subject matter expert for the NATO trauma registry project. Prior to her leadership at the JTS, she was the Associate Director for Management Information Systems and Trauma Registry at Pennsylvania Trauma Systems Foundation and worked at the State Health Data Center, Division of Health Statistics and Research and Pennsylvania Cancer Registry. Dr. Spott received her Bachelor's Degree in Biology from the University of Scranton and a Master's in Business Administration at Pennsylvania State University where she completed her Master of Science in Information Systems. She also received a Master's Degree in Public Administration from Pennsylvania State University

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as well as a certificate in Economic Development. She received her Bachelor's Degree in Health Record Administration from York College. Dr. Spott graduated from the Harvard's John F. Kennedy School of Business Senior Executives Fellows Program in March 2010. In 2015, she earned her doctoral degree in Leadership Studies from Our Lady of the Lake University in San Antonio, Texas.

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Presenter Biographies (in order of appearance)

Brig Gen Paul Friedrichs

Presentation: Joint Doctrine and MDO for 2035

Paul Friedrichs, M.D., is the Joint Staff Surgeon, Joint Chiefs of Staff at the Pentagon, Washington, D.C. He is the Chairman's principal medical advisor, responsible for ensuring that the Joint Force is medically ready to deploy and medically sustained in a deployed environment. He supports Combatant Command requirements as the Global medical integrator for the Joint Force.

Prior to the Joint Staff, he served as the Command Surgeon, Headquarters Air Combat Command at Fort Eustis, Virginia.

General Friedrichs received his commission through the ROTC in 1986 and his Doctor of Medicine degree from the Uniformed Services University in 1990. He has served as a Clinical Assistant Professor of Surgery and published 10 peer-reviewed surgical articles. He has commanded at the squadron and group level, and led joint and interagency teams which earned numerous awards, including "Best Air Force Hospital." He led one of the Air Force surgical teams which responded to the Pentagon on Sept. 11. As the Command Surgeon, U.S. Transportation Command, he rebaselined Defense Department global patient movement requirements, published Base Plan 9008, CONUS Patient Distribution Plan and safely moved thousands of ill and injured worldwide, including from combat operations and during multiple disaster responses.

Dr. Emily Mayhew

Presentation: Combat Casualty - A History and Future Implications

Emily Mayhew is a military medical historian specializing in the study of severe casualty, its infliction, treatment and long-term outcomes in 20th and 21st century warfare. She is historian in residence in the Department of Bioengineering at Imperial College London, working primarily with the researchers and staff of The Royal British Legion Centre for Blast Injury Studies. She is a Research Fellow in the Division of Surgery within the Department of Surgery and Cancer at the Chelsea and Westminster Hospital. She is the author of the *Wounded* trilogy which looks at the continuum of trauma care from point of injury to long term outcomes for the unexpected survivors of World Wars One and Two and of the recent war in Afghanistan. She is the Imperial College Internal Lead on the Paediatric Blast Injury Partnership, and co-edited the Paediatric Blast Injury Field Manual. Her new book, *War, Pestilence, Famine and Death: The Four Horsemen and the Hope of a New Age* will be published in March 2021.

Dr. John Holcomb (COL, ret.)

Presentation: Perspectives on Process from the Army's Combat Casualty Care

John Bradley Holcomb received his M.D. from the University of Arkansas Medical School in 1985. Dr. Holcomb entered the U.S. Army in 1985, and completed his general surgery training in 1991.

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Dr Holcomb then deployed with the Joint Special Operations Command for the next decade. From 2002 to 2008, COL Holcomb was the Commander of the U.S. Army Institute of Surgical Research and Trauma Consultant for the Army Surgeon General. Over the years he has supported multiple combat deployments. He is a three time recipient of the Army's Greatest Invention award. COL Holcomb retired from active duty in 2008 and received the Lifetime Achievement Award in Trauma Resuscitation Science from the American Heart Association, the United States Special Operations Command Medal, and the Service award from the American College of Surgery. He has been a member of the Committee on Tactical Combat Casualty Care since 2001 and two NASEM committees. In 2008, Dr. Holcomb joined the University of Texas Health Science Center at Houston as a Professor of Surgery and in 2019 moved his clinical and research effort to the University of Alabama at Birmingham. In 2016 he received the MAJ Jonathan Letterman award from the National Museum of Civil War Medicine. Dr. Holcomb is actively involved in clinical medicine, education, research, entrepreneurship, serves on multiple boards and is a founder of a small health IT company. He reviews papers for more than 25 journals and has published > 600 peer reviewed articles. Dr. Holcomb and his wife, Dr. Kelly Wirfel, were married in 1998 and have 2 children.

Dr. H. Clifford Lane

Presentation: Perspectives from the Defense Health Board and the NIH

H. Clifford Lane is Clinical Director and Deputy Director for Clinical Research and Special Projects for the National Institute of Allergy and Infectious Diseases at the U.S. National Institutes of Health (NIH) in Bethesda, Maryland. In this capacity he oversees an array of clinical and research activities, including a BSL-4 laboratory at Ft. Detrick, Maryland.

A native of Detroit, Michigan, Dr. Lane received his undergraduate education and medical training at the University of Michigan. Following a residency in internal medicine, he joined the NIH for fellowship training in infectious diseases and immunology and has been there ever since. He initially served as a member of the U.S. Public Health Service, attaining the rank of Rear Admiral.

Dr. Lane's primary research interests are in the areas of HIV/AIDS and emerging infectious diseases. His HIV research activities range from fundamental basic science to large-scale, international clinical trials. In the area of emerging infectious diseases, he has been involved in studies of unexplained fever, influenza, ebola and of late, COVID-19. Dr. Lane has partnered with host country governments to establish clinical research programs in Mali, South Africa, Indonesia, Mexico, Liberia, Guinea, and most recently, the Democratic Republic of the Congo.

Dr. Lane serves on the WHO Strategic and Technical Advisory Group for International Health, is chair of the Public Health Subcommittee of the U.S. Defense Health Board, and co-chairs the U.S. Department of Health and Human Services Guidelines Panel for the Use of Antiviral Drugs in Adults and Adolescents with HIV Infection and the NIH Treatment Guidelines for COVID-19. He is a Master of the American College of Physicians and a member of multiple other professional societies, including the U.S. National Academy of Medicine.

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Presenter Biographies (in order of appearance)

Dr. Kenneth Bertram

Presentation: MRMC Perspectives

Dr. Kenneth A. Bertram is the Clinical Product Development Officer for the Wake Forest Institute for Regenerative Medicine, Winston-Salem, NC. He leads a team conducting early clinical trials using human stem cells to treat harmful host immune response in multiple diseases. Dr. Bertram retired (June 2018) as the Principal Assistant for Acquisition for the US Army Medical Research and Materiel Command (USAMRMC), Ft. Detrick, Maryland, and as a member of the Senior Executive Service. He was responsible for the advanced development and acquisition of medical products (drugs, vaccines, blood, and devices) for the US Army. In addition, Dr. Bertram served as The Surgeon General's Sponsor's Representative to the US Food and Drug Administration and as the US Army's Milestone Decision Authority (MDA) for medical products and was responsible for the life-cycle management of fielded medical products (research, development, acquisition, and sustainment). Dr. Bertram was awarded the highest recognition for Army civilians, the Department of the Army Decoration for Exceptional Civilian Service by the Secretary of the Army for his contributions to the Warfighter.

Dr. Bertram previously served in the US Army, retiring as a Colonel, Medical Corps, after 24 years of Active Duty. Colonel Bertram's assignments included: Commander, Walter Reed Army Institute of Research; Chief of Staff, USAMRMC; Director, Congressionally Directed Medical Research Programs (USAMRMC); and Chief, Hematology/Medical Oncology Service at Madigan Army Medical Center (Fort Lewis, WA). Colonel Bertram's military honors include two Legion of Merit awards, the Army's The Surgeon General's "A" Proficiency Designator in Hematology/Oncology, and the Order of Military Medical Merit.

Dr. Bertram completed both his Hematology/Medical Oncology Fellowship and Internal Medicine Residency at Madigan Army Medical Center. Dr. Bertram received his M.D. and Ph.D. degrees from the University of Minnesota. He has held faculty appointments at the University of Washington and the Uniformed Services University of Health Sciences. He is a Fellow of the American College of Physicians (F.A.C.P.).

Dr. Bertram currently serves on the Scientific Advisory Board for BioBridge Global, on the Board of Directors for the Geneva Foundation and as a Senior Science Advisor to the Medical Technology Enterprise Consortium (MTEC). He is also a Consultant to medical research and development companies and government relations firms focused on trauma, resuscitation, neuro/psych, infectious disease, and regenerative medicine.

Dr. Geoff Ling (COL, ret.)

Presentation: DARPA's Approach to Military Medical Innovation

Dr. Geoffrey Ling is presently co-founder and CEO of On Demand Pharmaceuticals. Clinically, he is a professor of neurology at both Johns Hopkins University and the Uniformed Services University of the Health Sciences, and an attending neuro critical care physician at Johns Hopkins

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Hospital. He serves as the Chair of the Veterans Administration's National Research Advisory Council.

Dr. Ling is a retired U.S. Army colonel after 21 years on active duty. He served with the 452nd CSH in OEF (2003) and 86th CSH and 10th CSH in OIF (2005). Also, COL Ling has had four in-theater missions as a member of the Joint Chiefs of Staff "Gray Team" to assess traumatic brain injury (TBI) care in the combat theater (2009, 2011). The 10th CSH named him their first "Physician of the Month." Dr. Ling was also a "requested by name" consultant to Congresswoman Gabby Gifford's trauma team following her tragic attack.

He was the Founding Director of the Biological Technologies Office at the Defense Advanced Research Projects Agency (DARPA), where he was a program manager and Deputy Director of the Defense Sciences Office. He served as the Assistant Director for Medical Innovation in President Obama's White House Office of Science, Technology and Policy (OSTP). His BA cum laude is from Washington University in St. Louis, MD from Georgetown University (elected to AOA) and his PhD in neuropharmacology is from Cornell University. He completed his neurology residency at Walter Reed Army Medical Center, neuro critical care fellowship at Johns Hopkins and research fellowship in neuropharmacology at the Memorial Sloan Kettering Cancer Center. He is board certified in both neurology and neuro critical care. He has published more than 200 peer-reviewed articles and book chapters.

Dr. Russ S. Kotwal (COL, ret.)

Presentation: Performance Improvement

Russ Kotwal is the Chief of Strategic Projects at the Joint Trauma System. COL Kotwal received a Bachelor of Science from Texas A&M University in College Station, Texas in 1985; a Doctor of Medicine from the Uniformed Services University in Bethesda, Maryland in 1996; and a Master of Public Health from the University of Texas Medical Branch in Galveston, Texas in 2004. He was commissioned onto active duty in the United States Army in 1985 and retired from the military in 2014. He received residency training in Family Medicine with the Army, and Aerospace Medicine with the Navy. His hospital assignments included Tripler Army Medical Center, Martin Army Community Hospital, Womack Army Medical Center, and Brooke Army Medical Center. His unit assignments included the 1/35 Infantry Battalion and 4/27 Infantry Battalion, 25th Infantry Division (Light); 3rd Battalion, 75th Ranger Regiment; Headquarters, 75th Ranger Regiment; and Headquarters, U.S. Army Special Operations Command. COL Kotwal has conducted multiple combat deployments to both Afghanistan and Iraq, where he participated in hundreds of combat ground and air missions as the senior prehospital medical provider. COL Kotwal currently works from College Station, Texas, as an independent consultant for multiple organizations to include the DoD Joint Trauma System. COL Kotwal is credited with numerous novel training and technology initiatives, professional publications, and national and international presentations related primarily to prehospital medicine on the battlefield. He served on the board of directors for the Special Operations Medical Association for seven years where he is currently the vice president. He is an adjunct professor for both the College of Medicine at Texas A&M University and the Department of Military and Emergency Medicine at the Uniformed Services University.

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COL Kotwal is also a fellow of the American Academy of Family Physicians and a senior advisor to the DoD Committees on Combat Casualty Care.

Dr. S. Shankar Sastry

Presentation: Novel Academic Models for Translational Research

S. Shankar Sastry is currently the Thomas Siebel Professor of Computer Science, the director of the Blum Center for Developing Economies, and the co-Director of the C3 Digital Transformation Institute. He is also the faculty Director of the FHL Vive Center for Enhanced Reality. He has faculty appointments in the departments of Electrical Engineering and Computer Sciences, Bioengineering and Mechanical Engineering. From 2007-2018 he was the Dean and Roy W. Carlson Professor of Engineering. From 2004 to 2007 he was the Director of CITRIS (Center for Information Technology in the Interests of Society) an interdisciplinary center spanning UC Berkeley, Davis, Merced and Santa Cruz. He has served as Chairman, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley from January, 2001 through June 2004. From 1999-2001, he was the Director of the Information Technology Office at the Defense Advanced Research Projects Agency (DARPA) in Arlington, VA. Dr. Sastry received his Ph.D. degree in 1981 from the University of California, Berkeley. He was on the faculty of MIT as Asst. Professor from 1980-82 and Harvard University as a Gordon Mc Kay professor in 1994.

His areas of personal research are AI and Machine Learning, resilient cyber physical systems, mechanism design and incentive theory for the digital transformation system of complex societal scale systems networks, cybersecurity, autonomous robotic vehicles and robots, computer vision, nonlinear and adaptive control, control of hybrid and embedded systems. From 2006-2017 he led a ten year NSF Science and Technology Center (with multi-university partners), TRUST (Team for Research in Ubiquitous Secure Technologies) and its successor five year center 2013-19, FORCES (Foundations of Resilient Cyber Physical Systems).

Dr. Sastry has coauthored about 600 technical papers. He has co-authored or co-edited 10 books, including Adaptive Control: Stability, Convergence and Robustness (with M. Bodson, Prentice Hall, 1989) and A Mathematical Introduction to Robotic Manipulation (with R. Murray and Z. Li, CRC Press, 1994), Nonlinear Systems: Analysis, Stability and Control (Springer-Verlag, 1999), and An Invitation to 3D Vision: From Images to Models (Springer Verlag, 2003) (with Y. Ma. S. Soatto, and J. Kosecka)., and Generalized Principal Component Analysis (Springer Verlag, 2016 with R. Vidal and Y. Ma). Dr. Sastry served as Associate Editor for numerous publications, including: IEEE Transactions on Automatic Control; IEEE Control Magazine; IEEE Transactions on Circuits and Systems; the Journal of Mathematical Systems, Estimation and Control; IMA Journal of Control and Information, International Journal of Adaptive Control and Signal Processing; Journal of Biomimetic Systems and Materials, the IEEE Proceedings. Dr. Sastry was elected to the National Academy of Engineering in 2001 the American Academy of Arts and Sciences in 2004, Fellow of IEEE in 1994, and International Federation of Automatic Control Fellow in 2016.

He received the President of India Gold Medal in 1977, the IBM Faculty Development in 1983, and the NSF Presidential Young Investigator Award in 1985. He got the Eckman Award of the American Automatic Control Council in 1990, and the Ragazzini Award for Distinguished

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Accomplishments in teaching in 2005. He received an M. A. (honoris causa) from Harvard in 1994, an honorary Ph.D. from KTH, the Royal Institute of Technology, Stockholm in 2007, an honorary Ph.D. from the Royal Institute of Technology, Stockholm in 2008, a Ph.D. Honoris causa from the University of Waterloo, Canada in 2016, and a Laurea Dottorato honoris causa from Politecnico di Torino in 2018, and the Berkeley Citation in 2018.

He has also received the distinguished Alumnus Award of the Indian Institute of Technology in 1999, the International House at UC Berkeley, and the David Marr prize for the best paper at the International Conference in Computer Vision in 1999.

Dr. Sastry has been a member of the Air Force Scientific Advisory Board from 2002-5 and the Defense Science Board in 2008 among other national boards. He has been on the Scientific Advisory Boards of the National Science Foundation, Engineering Directorate, Lockheed Martin Corporation and the United Nations Secretary General, the World Economic Forum Global Development Council, Interwest LLC, and Eriksholm Otticon. He is currently on the corporate boards of C3 IoT, HCL Technologies, and Lexmark Corporation. He has supervised over 70 doctoral students and over 50 MS students to completion, as well as over 30 post-doctoral scholars. His advisees occupy leadership roles on the faculties of many major universities in the United States and abroad.

Dr. Chad Roy

Presentation: Novel Academic Models for Translational Research

Chad Roy presently is Professor of Microbiology and Immunology and a core scientist at the Tulane National Primate Research Center, Division of Microbiology. His primary faculty appointment is within the Tulane University School of Medicine Department of Microbiology and Immunology. He also serves as the Director of the Infectious Disease Aerobiology scientific core located within the Division of Microbiology at the TNPRC. Dr. Roy is a career aerobiologist focused on respiratory health and the aerobiology of airborne infectious diseases; specifically, on gaining a better understanding of aerosol infection in the context of the development and application of preclinical disease models; the majority of efforts are directed in the use of the nonhuman primate for this purpose. The practical application of this research has been and continues to be enabling advanced pathogenesis studies as well as medical product evaluation. His laboratory works with a diverse array of infectious and highly toxic agents considered biological threat agents rather than a singular focus on a particular class or agent. Essentially all of the research in the Roy laboratory is performed within a high containment (BSL-3) environment. The inclusion of such a wide number of biological threat agents in the research program has been the result of extensive, highly collaborative studies between a number of extramural laboratories and the Roy laboratory. His current research portfolio includes evaluation studies of antivirals in aerosol-induced poxviral infections, and evaluation of optimized monoclonal antibodies as therapeutic agents for toxin (SEB and ricin) exposure. He is also involved in investigation of the immunogenicity and protective efficacy of virally-vectored vaccines against aerosol-initiated alphaviral disease. There are also significant efforts ongoing in

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his laboratory to develop disease models for biothreat agents such as *Burkholderia pseudomallei* in the nonhuman primate.

Dr. Robert Kaminski

Presentation: Opportunities in the R&D Labs

Robert Kaminski has been involved with enteric vaccine development for the past several decades. He is the Chief of the Department of Diarrheal Disease Research within the Bacterial Diseases Branch at Walter Reed Army Institute of Research (WRAIR) located in Silver Spring, Maryland. The Department focuses on developing effective countermeasures to combat diarrheal diseases in deployed US Military personnel and DoD travelers. The research program spans the pre-clinical development and clinical evaluations of vaccines, hyperimmune colostrum products and the use of pre/pro/sine/xeno biotic solutions to protect the warfighter. The Department conducts research at several sites within the United States and located in Africa, South-East Asia and Europe. Dr. Kaminski is trained as an immunologist with a keen interest in vaccines and vaccine adjuvants. He has received Doctorate and Master's degrees from GWU while his undergraduate work was completed at The Catholic University of America. Dr. Kaminski has been a DoD civilian since 2005 and has served in various positions at the WRAIR since 1990.

Dr. Donald E. Ingber

Presentation: Wyss Institute: A New Innovation Model that Spans the Academic Industrial Interface

Don Ingber is the Founding Director of the Wyss Institute for Biologically Inspired Engineering at Harvard University, *Judah Folkman Professor of Vascular Biology* at Harvard Medical School and the Vascular Biology Program at Boston Children's Hospital, and Professor of Bioengineering at the Harvard John A. Paulson School of Engineering and Applied Sciences. He received his B.A., M.A., M.Phil., M.D. and Ph.D. from Yale University. Ingber is a pioneer in the field of biologically inspired engineering, and at the Wyss Institute, he currently leads a multifaceted effort to develop breakthrough bioinspired technologies to advance healthcare and to improve sustainability. His work has led to major advances in mechanobiology, tumor angiogenesis, tissue engineering, systems biology, nanobiotechnology and translational medicine. Ingber has authored more than 500 publications and over 135 issued or pending patents, founded 5 companies, and has been a guest speaker at more than 550 events internationally. He is a member of the National Academy of Medicine, National Academy of Inventors, American Institute for Medical and Biological Engineering, and the American Academy of Arts and Sciences.

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Presenter Biographies (in order of appearance)

Dr. Stephen Quake

Presentation: Novel Academic Models for Translational Research

Stephen Quake is the Lee Otterson Professor of Bioengineering and Professor of Applied Physics at Stanford University and is co-President of the Chan Zuckerberg Biohub. He received a B.S. in Physics and M.S. in Mathematics from Stanford University in 1991 and a doctorate in Theoretical Physics from the University of Oxford in 1994. Quake has invented many measurement tools for biology, including new DNA sequencing technologies that have enabled rapid analysis of the human genome and microfluidic automation that allows scientists to efficiently isolate individual cells and decipher their genetic code. Quake is also well known for inventing new diagnostic tools, including the first non-invasive prenatal test for Down syndrome and other aneuploidies. His test is rapidly replacing risky invasive approaches such as amniocentesis, and millions of women each year now benefit from this approach. His innovations have helped to radically accelerate the pace of biology and have made medicine safer by replacing invasive biopsies with simple blood tests.

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