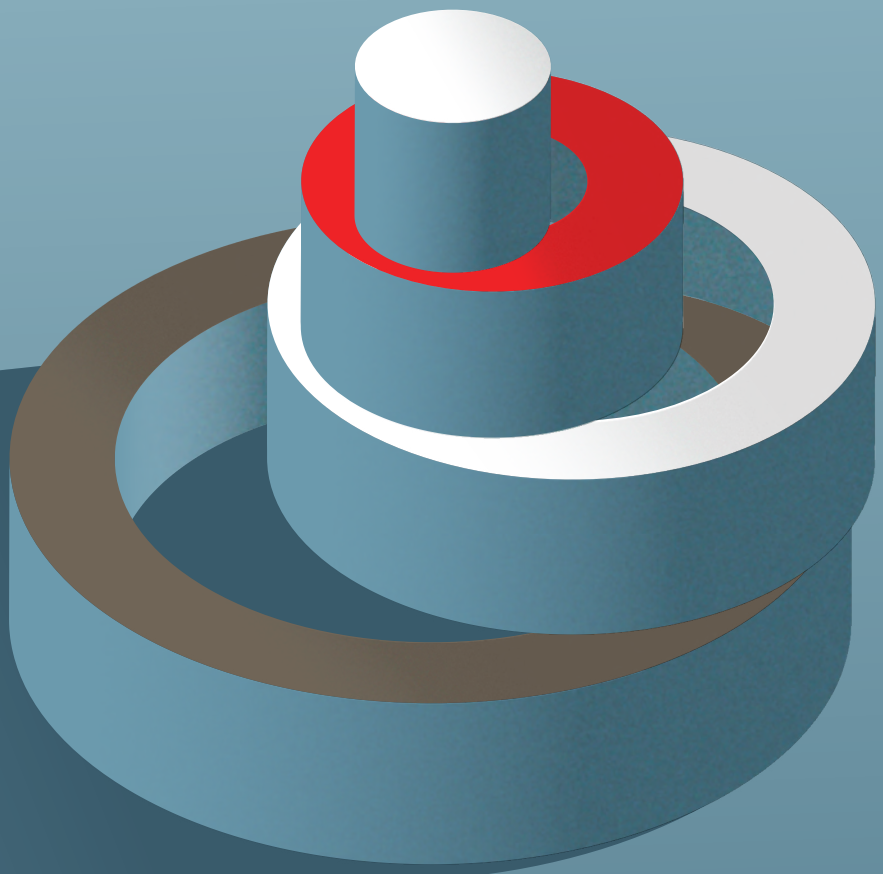
PRECISION Medicine 2017

Breakaway Business Models

The Joseph B. Martin Conference Center
77 Avenue Louis Pasteur, Boston, MA
Harvard Medical School
June 21, 2017



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PRECISION Medicine 2017

Welcome to the third annual Precision Medicine Conference at Harvard Medical School, sponsored by the Department of Biomedical Informatics, the PIC-SURE BD2K Center of Excellence, and Amazon Web Services.

Patients continue to inspire and drive us to the leading edge of precision medicine.* Along the way, these heroic acts of leadership and focus need to be translated into functional business models that can be widely adopted to transform our research and clinical care enterprise.

In this year's conference we address the question of how to implement and disseminate these business models head on. Fortunately there are already several enterprises, some of them led by patients themselves, which provide us early answers to these questions. These are featured in our first panel entitled **Early Disruptors in Precision Medicine.**

As we have noted in our prior conferences, some of the most interesting initiatives have come out of academic centers and others out of purely commercial initiatives. In our second panel entitled **Academia and Industry—How Do We Play to Win?** we explore how these two wellsprings of innovation can best work together.

If we are going to succeed in the goals articulated for precision medicine, some means of measuring our success, particularly for patients and improving health, should be applied. This will allow us as a society to be more agile in finding new solutions. But without a "consumer reports" like function, progress will be difficult to measure. Our third panel, **How Do We Guide the Consumer in the Precision Medicine Era?,** discusses how we might think about such a consumer reports-like function and where it might sit relative to other benchmarking and regulatory processes.

Our opening keynote brings us back to the roots of this conference, which is the imperative to treat patients more successfully using the latest in clinical and molecular technology. **Shirley Pepke** will give us a summary of her harrowing and compelling journey to develop a successful survival plan for herself, in the face of deadly disease.

Our closing keynote by **Jessica Richman,** co-founder of uBiome, compliments our opening keynote by showing how citizen science can generate nationally-scaled breakaway business models.

Isaac S. Kohane
Marion V. Nelson Professor and Chair, Department of Biomedical Informatics

*What do we mean by "precision medicine"? From the perspective of one of the members of the National Academy of Sciences committee that wrote the report, we mean taking an explicit multidimensional view of patients: not just one data modality such as genomics or environmental exposure. We argue that this perspective allows for more precise matching of humans to disease states (diagnosis), future disease states (prognosis) and appropriate therapies.

Agenda

8:30–9:00 **Continental Breakfast and Check-in**

9:00–9:15 **Welcome: Isaac S. Kohane**
Marion V. Nelson Professor and Chair, Department of Biomedical Informatics
Principal Investigator, PIC-SURE BD2K Center of Excellence
Harvard Medical School

9:15–9:30 **Opening Remarks: George Q. Daley**
Caroline Shields Walker Professor of Medicine
Dean of the Faculty of Medicine
Harvard Medical School

9:30–10:30 **Keynote: From Data to Decisions: A Personal Story of Scientific Oncology**
Shirley Pepke – President, Lyrid

10:30–10:45 **Break**

10:45–12:00 **Panel 1: Early Disruptors in Precision Medicine**

- Pamela Gavin – Chief Operating Officer, National Organization for Rare Disorders
- Jamie Heywood – Co-Founder, PatientsLikeMe
- Noga Leviner – Co-Founder & CEO, PicnicHealth
- Matt Might – Co-Founder, Pairnomix

12:00–1:00 **Lunch**

1:00–2:15 **Panel 2: Academia and Industry—How Do We Play to Win?**

- Kathy Giusti – Co-Chair, HBS Kraft Precision Medicine Accelerator
- Josh Mandel and David Kreda – Sync for Science (S4S)
- Ethan Perlstein – CEO, Perlara
- Joe Pickrell – Co-Founder, Seeq; Core Member, New York Genome Center
- Giselle Sholler – Innovative Therapeutics Clinic Director, Helen DeVos Children's Hospital; Chair, Neuroblastoma and Medulloblastoma Translational Research Consortium (NMTRC)

2:15–2:30 **Break**

2:30–3:45 **Panel 3: How Do We Guide the Consumer in the Precision Medicine Era?**

- Jill Hagenkord – Chief Medical Officer, Color Genomics
- Taha Kass-Hout – Founder, Kass-Hout Consulting; former first Chief Health Informatics Officer, Food and Drug Administration (FDA)
- Gary Lyman – Co-Director, Hutchinson Institute for Cancer Outcomes Research, Fred Hutchinson Cancer Research Center
- Jess Mega – Chief Medical Officer, Verily

3:45–4:00 **Break**

4:00–5:00 **Closing Keynote: Citizen Science and Precision Medicine**
Jessica Richman – Co-Founder and CEO, uBiome

Isaac Kohane

Isaac (Zak) S. Kohane, MD, PhD, is the inaugural Chair of the Department of Biomedical Informatics and the Marion V. Nelson Professor of Biomedical Informatics at Harvard Medical School. He served as co-author of the Institute of Medicine Report on Precision Medicine that has been the template for national efforts. He develops and applies computational techniques to address disease at multiple scales: from whole healthcare systems as "living laboratories" to the functional genomics of neurodevelopment with a focus on autism.

Over the last 30 years, Zak's research agenda has been driven by the vision of what biomedical researchers could do to find new cures, provide new diagnoses and deliver the best care available if data could be converted more rapidly to knowledge and knowledge to practice. In so doing, Kohane has designed and led multiple internationally adopted efforts to "instrument" the healthcare enterprise for discovery and to enable innovative decision-making tools to be applied to the point of care. At the same time, the new insights afforded by 'omic-scale molecular analyses have inspired him and his collaborators to work on re-characterizing and reclassifying diseases such as autism, rheumatoid arthritis and cancers. In many of these studies, the developmental trajectories of thousands of genes have been a powerful tool in unraveling complex diseases.

Zak's i2b2 project is currently deployed internationally to over 120 major academic health centers to drive discovery research in disease and pharmacovigilance (including providing evidence on drugs which ultimately contributed to a boxed warning by the FDA). Zak also currently leads three NIH-funded projects that cut across the entire agenda: 1) a Center for Excellence in Big Data to Knowledge (BD2K) called PIC-SURE (Patient-centered Information Commons: Standardized Unification of Research Elements) to both create a nationally scaleable research data-sharing infrastructure and demonstrate its use for neurodevelopmental diseases; 2) a Center for Excellence in Genomic Science to study neuropsychiatric disease at multiple levels (from molecular characterization of induced neurons obtained from fibroblasts of patients to automated classification of the textual component of their electronic medical record); and 3) the Coordinating Center for the Undiagnosed Diseases Network (UDN), where patients with rare and unknown diseases are provided with combined clinical and molecular diagnoses in a nationally-scaled infrastructure so that they can see the right expert with all their relevant data at hand.

In 1987, Zak earned his MD-PhD from Boston University and then completed his post-doctoral work at Boston Children's Hospital, where he has since worked as a pediatric endocrinologist. He joined the faculty at Harvard Medical School in 1992, serving as Director of Countway Library from 2005 to 2015 and as Co-Director of the Center for Biomedical Informatics from 2005 to 2015, before it became the Department of Biomedical informatics in July 2015. Zak has published several hundred papers in the medical literature and authored the widely-used book *Microarrays for an Integrative Genomics*. He is a member of the Institute of Medicine and the American Society for Clinical Investigation.

George Daley

George Q. Daley, MD, PhD, is Dean of Harvard Medical School, Caroline Shields Walker Professor of Medicine, and Professor of biological chemistry and molecular pharmacology at Harvard Medical School.

Daley's research focuses on stem cells, cancer and blood disorders. He received his bachelor's degree, *magna cum laude,* from Harvard (1982), a doctorate in biology from MIT (1989), where he worked with Nobel laureate David Baltimore, and his medical degree from Harvard Medical School (1991), *summa cum laude*.

Daley pursued clinical training in internal medicine at Massachusetts General Hospital, where he served as chief resident (1994–1995), and a clinical fellowship in hematology/oncology at Brigham and Women's Hospital and Boston Children's Hospital.

He was a founding member of the executive committee of the Harvard Stem Cell Institute, and served as president of the International Society for Stem Cell Research from 2007 to 2008 and as its clerk from 2012 to 2015. He anchored the special task forces that produced the society's guidelines for stem cell research (2006) and clinical translation (2008) and their subsequent revisions and updates (2016).

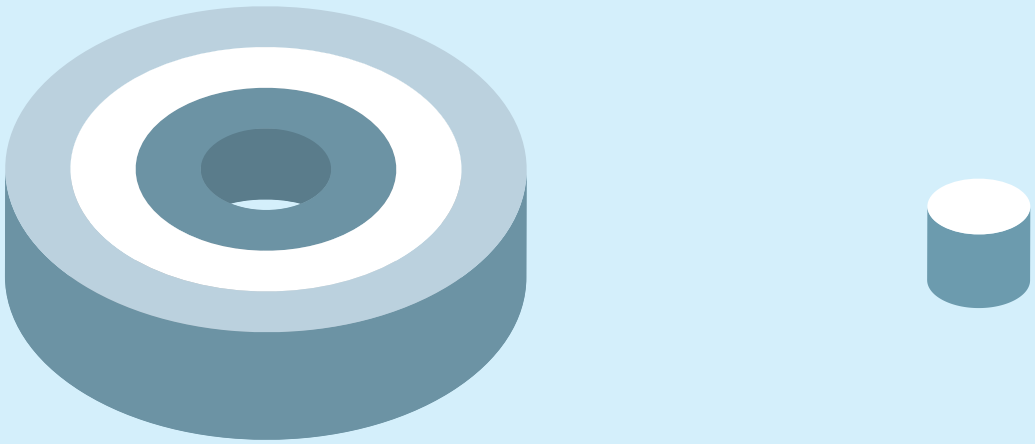
Daley has been elected to the National Academy of Medicine, the American Society for Clinical Investigation, the American Association of Physicians, the American Pediatric Societies, the American Academy of Arts and Sciences and the American Association for the Advancement of Science.

Daley was an inaugural winner of the National Institutes of Health Director's Pioneer Award for highly innovative research and has received the Judson Daland Prize from the American Philosophical Society for achievement in patient-oriented research, the E. Mead Johnson Award from the American Pediatric Society for contributions to stem cell research, and the E. Donnall Thomas Prize of the American Society of Hematology for advances in human induced pluripotent stem cells.

Shirley Pepke

Shirley Pepke earned her BA with honors in physics at the University of Chicago and her PhD in condensed matter theory at UC Santa Barbara. She subsequently worked on artificial intelligence and software engineering applications, including autonomous spacecraft systems at NASA Ames. In 2001, inspired by the first release of the human genome sequence, she moved into genomics. Beginning in 2006, she spent several years at Caltech's Center for Advanced Computing Research, where she applied her computational and mathematical skills to modeling and interpreting data from neuroscience and genomics experiments, the latter especially as part of the ENCODE (Encyclopedia of DNA Elements) project. She has contributed to peer-reviewed journal articles in condensed matter physics, geophysics, microbial evolution, neuroscience, and high throughput genomics. Shirley has been an independent researcher and consultant for several years and is also the founder of Lyrid LLC, focused on research and development of integrated data analysis and analytics to improve patient outcomes.

In September of 2013, Shirley was diagnosed with advanced ovarian cancer. Faced with low odds of long-term survival and decades-old treatment regimens, she turned her focus to ovarian cancer. She engaged with oncology, genomics, and machine learning researchers to both sequence her own tumor's genome and transcriptome and develop novel analyses of publicly available ovarian tumor data. Her efforts paid off when her cancer recurred in early 2015 and she was able to use what they had learned to guide her treatment decisions. She has been in remission for almost two years and continues to work to accelerate the translation of advances in big data, genomics, and machine learning for personalized and effective cancer treatment.



Early Disruptors in Precision Medicine

Pamela Gavin

Pamela Gavin sets the strategic direction for National Organization for Rare Disorders (NORD) and implements programs and services that provide innovative solutions to address the needs of the rare disease community. She is responsible for bringing together all stakeholders within the rare disease space and works closely with NORD's board of directors, donors, corporate council and member organizations, other partners, and staff.

Prior to joining NORD in 2010, Pam spent 13 years executing complex, multi-stakeholder programs aimed at improving healthcare safety. As a consultant to the federal government, she implemented a new web-based portal for reporting pre-market and post-market safety data to Food and Drug Administration (FDA) and National Institutes of Health (NIH), for which she received Special Citations from the FDA Commissioner and Director of the Center for Food Safety and Applied Nutrition (CFSAN) for outstanding leadership and teamwork.

As Senior Director in the Office of the President at the University of Pittsburgh Medical Center, Pam worked in an equity partner business unit, bringing new concepts and emerging technologies to market to improve healthcare delivery. She oversaw several strategic business initiatives, including a clinical trial enrollment and adverse event reporting system; a multi-biomarker assay for the early detection of ovarian cancer; a medical simulation training system; and a clinical decision support system for infection control and antibiotic management.

Pam is the co-founder of SafeCare™ Systems, LLC, which developed one of the country's first patient safety management systems and provides data driven solutions to healthcare providers, clinicians, administrators, and support staff.

She served as director for RMF Strategies, a division of the Risk Management Foundation of the Harvard Medical Institutions, responsible for the commercialization of data-driven risk management solutions.

Pam earned an undergraduate degree in biology from Smith College and an MBA, with a concentration in health care management, from Northeastern University.

Jamie Heywood

An MIT-trained mechanical engineer, Jamie Heywood entered the field of translational medicine when his 29 year old brother Stephen was diagnosed with ALS, or Lou Gehrig's Disease. Jamie co-founded PatientsLikeMe, described by CNNMoney as one of the 15 companies that will change the world, to ensure patient outcomes become the primary driver of the medical care and discovery process. He is also the founder and past CEO of the ALS Therapy Development Institute (ALS TDI), the world's first non-profit biotechnology company. During his tenure at ALS TDI, Jamie helped pioneer an open research model and industrialized a therapeutic validation process that made ALS TDI the world's largest and most comprehensive ALS research program.

Jamie has founded or co-founded three other health care companies: AOBiome, Genetic Networks, and Love Steve, and is an active member of a community of innovators working to bring dramatic improvements to the way we discover, develop and deliver effective health care. Jamie and his brother were the subject of Pulitzer Prize-winning author Jonathan Weiner's biography *His Brother's Keeper* and the documentary *So Much So Fast*.

Noga Leviner

Noga Leviner is the co-founder and CEO of PicnicHealth, a venture-backed digital-health startup with the mission to structure the world's medical data to make it useful for both patients and researchers.

After being diagnosed with Crohn's disease and struggling to keep track of her own health data, she was inspired to create a company to empowers patients with access to their complete, digital medical history. PicnicHealth regularly works with research initiatives to provide study volunteers access to their own data, and in the process creates data sets that power some of today's most cutting edge precision medicine research.

Noga is a vocal advocate for patient data access in the US healthcare system and has spoken widely on the subject, including at the White House. She spent the early part of her career working with Ashoka to support social entrepreneurs in Latin America and then co-founded Lumni USA, where she raised and deployed the first US investment fund to help underserved students access low-risk student loan products. Noga has a BA from Stanford, where she studied Human Biology and Economics.

Matt Might

Matt Might is Scientific Advisor and Co-founder at Pairnomix, LLC.

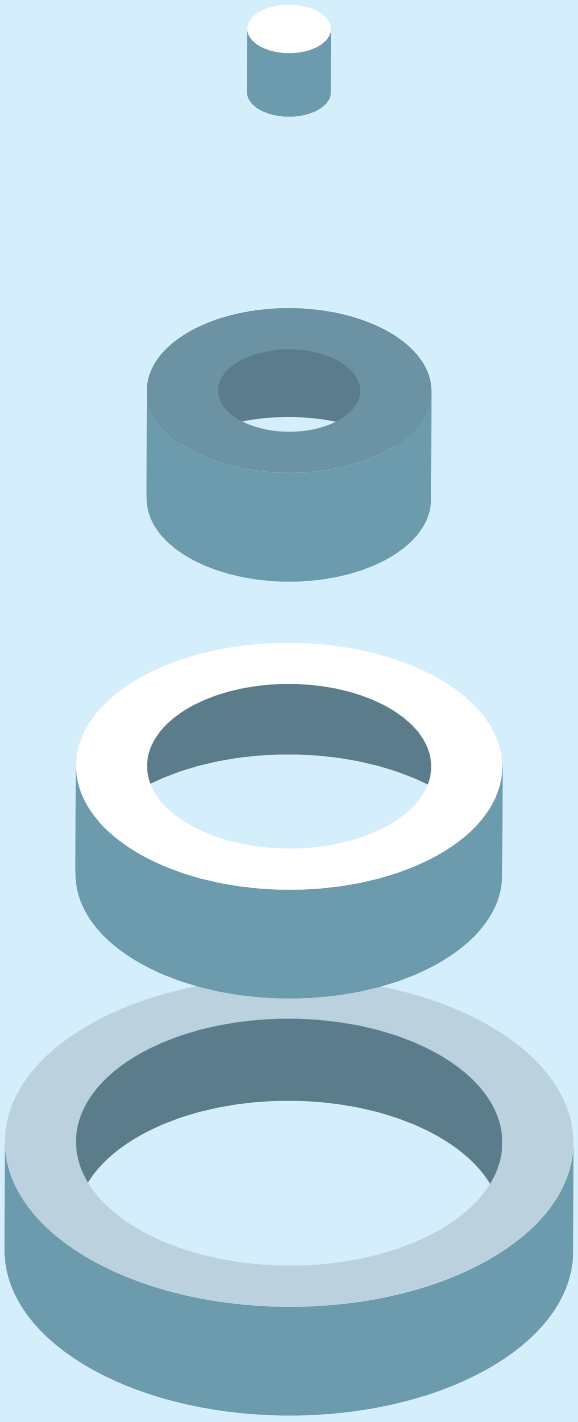
Pairnomix conducts individualized drug screens for genetic disorders in order to find both novel and approved therapies for patients.

Pairnomix is currently focused on genetic epilepsies. A professor in computer science by training, Matt pivoted into medicine through a diagnostic odyssey in which exome sequencing revealed his son to be the first known patient with NGLY1 deficiency. A subsequent odyssey to find therapeutics for his son led Matt to develop a generalized approach for finding treatments in genetic disorders.

President Obama tapped Matt to help design and implement the Precision Medicine Initiative. Matt has also served as a Strategist in the Executive Office of the President at the White House since March 2016, having since been retained by the Trump administration to work on the VA's own precision medicine initiative, the Million Veteran's Program.

Matt is also a Visiting Associate Professor in Biomedical Informatics at the Harvard Medical School, where he is an advisor to and co-investigator in the Undiagnosed Diseases Network. At Harvard, Matt is also working on leveraging social media to diagnose patients and utilizing data to develop treatments for rare genetic disorders.

Matt is also President of NGLY1.org and soon to be the Director of the Hugh Kaul Precision Medicine Institute at the University of Alabama at Birmingham.



Academia and Industry: How Do We Play To Win?

Kathy Giusti

Kathy Giusti, a multiple myeloma patient, is the Founder of the Multiple Myeloma Research Foundation (MMRF) and currently serves on its Board of Directors. Kathy also serves as Faculty Co-Chair of Harvard Business School (HBS) Kraft Precision Medicine Accelerator. Kathy is recognized as a pioneer of precision medicine, a champion of open-access data sharing, and a strong advocate for patient engagement in their treatment and care and as part of the research process.

Since founding the MMRF in 1998, Kathy has led the Foundation in establishing collaborative research models in the areas of tissue banking, genomics, and clinical trials that are dramatically accelerating the pace at which lifesaving treatments are brought to patients.

In 2016, Kathy was named Co-Chair of the HBS Kraft Precision Medicine Accelerator, a $20M endowed program provided by Robert Kraft and the Kraft Family Foundation. Convening best-in-class leaders from across science, business and technology, the mission of the HBS Kraft Accelerator is to speed breakthroughs in precision medicine for all cancers.

Kathy has been recognized as one of “34 Leaders Who Are Changing Healthcare” and “Top 3 Business Leaders Disrupting Healthcare” by Fortune Magazine. She was also ranked #19 on Fortune’s World’s 50 Greatest Leaders list and named one of TIME magazine’s 100 Most Influential People in the World. She was appointed to and served on President Obama’s Precision Medicine Initiative Working Group and has served as an advisor to Vice President Biden’s Cancer Moonshot program.

Kathy has more than two decades of experience in the pharmaceutical industry. She received her MBA from Harvard Business School and holds an honorary Doctorate from the University of Vermont.

David Kreda

Since 2010, David Kreda has worked on several Harvard DBMI healthcare informatics projects. From 2010 to 2014, he served as Translation Advisor to the SMART Health IT project at Harvard Medical School and Boston Children's Hospital, collaborating with external medical and informatics experts, EHR vendors, regulators, software developers and user experience designers. David oversaw concept, design, and development work for several SMART apps, including the Pediatric Growth Chart (a 2013 Red Dot Design Award winner), the Genomics Advisor, the Diabetes Monograph, and the Disease Monograph. He also helped guide the early SMART on FHIR work while it was getting its first industry attention. In 2012 and 2013, he co-led the SMART C-CDA Collaborative, whose findings (in a published paper) influenced aspects of Meaningful Use Stage 3. In 2014 and 2015, he helped negotiate a first-of-its-kind data sharing and use agreement among a dozen academic centers in the NIH-funded Undiagnosed Diseases Network (UDN). Since 2016, David has been part of Harvard's NIH-funded Sync for Science (S4S) effort, where he is responsible for general project management as well as developing workflow guidelines to help vendors deliver a common experience for patients to share their EHR data electronically with research projects, including, in particular, the "All of Us" Research Program.

David has co-authored a number of peer-reviewed informatics journal articles. He is active in both the HL7 Clinical Genomics Work Group and the Variant Modeling Collaboration, an independent "tiger team" developing a variant data specification that could serve both research and clinical system needs.

Earlier in his career, David worked at McKinsey, SunGard, and Reuters, while consulting independently in several areas in information technology, as well as co-founding a charitable services technology start-up. He has a BA in Economics from Yale University.

Josh Mandel

Josh is a physician and software developer working to fuel an ecosystem where technology supports better health. He works at Verily as Health IT Ecosystem Lead, with a focus on the Precision Medicine Initiative's "All of Us" Research Program. After earning a B.S. in computer science and electrical engineering from the Massachusetts Institute of Technology and an M.D. from the Tufts University School of Medicine, he joined the Harvard Medical School Department of Biomedical Informatics, where he served as lead architect for SMART Health IT (smarthealthit.org) and spearheaded the Clinical Decision Support Hooks project. As a member of the national Health IT Standards Committee, Josh has a special interest in tools and interfaces that support software developers who are new to the health domain.

Ethan Perlstein

Over the course of the last 15 years, first as a graduate student at Harvard University in the Department of Molecular and Cell Biology with PhD advisor Professor Stuart Schreiber and then as an independent postdoctoral fellow at the Lewis-Sigler Institute at Princeton University, Dr. Ethan Perlstein developed an approach to studying old drugs and discovering new drugs in model organisms called evolutionary pharmacology. Ethan is an author on 19 peer-reviewed scholarly publications, including the discovery of a novel mechanism of action for the antidepressant Zoloft based on studies in yeast cells. In 2014, he founded Perlara PBC, the first personalized drug discovery platform company ready to partner with 1 in 10 families around the globe to cure diseases previously thought too rare to matter.

Joe Pickrell

Joe Pickrell, PhD, is a Core Member and Assistant Investigator at the New York Genome Center. He holds a joint appointment as Adjunct Assistant Professor in the Department of Biological Sciences at Columbia University. His lab is focused on developing computational and statistical tools to transform large-scale genomic data into a better understanding of human biology. Much of his research is dedicated to gaining a better understanding of natural human variations.

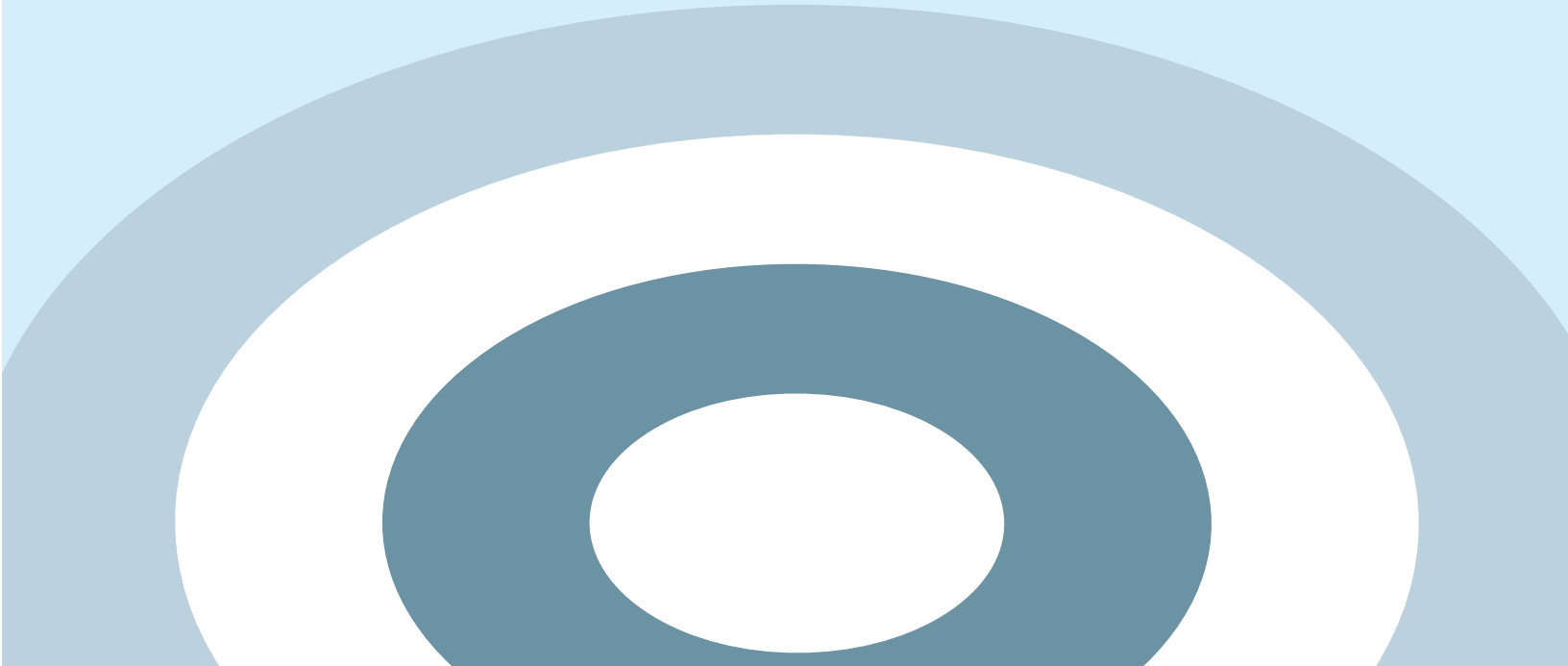
Dr. Pickrell's research is partially supported by the National Institute of Mental Health. He and his team are working to build software tools to predict the molecular mechanisms by which genetic variants influence neurological diseases like schizophrenia and Parkinson's disease. Additionally, this work is exploring the genetic connections between these diseases and other traits like autoimmunity and metabolism.

Before joining NYGC, Dr. Pickrell was a postdoctoral researcher at Harvard Medical School. He earned a PhD in Human Genetics from the University of Chicago and a BS in Biology from the University of North Carolina at Chapel Hill.

Giselle Sholler

Dr. Sholler is the Endowed Haworth Family Director of the Innovative Therapeutics Clinic, Director of Pediatric Oncology Research at Helen DeVos Children's Hospital and an Associate Professor at Michigan State University College of Human Medicine. In addition, she is the founder and chair of the Neuroblastoma and Medulloblastoma Translational Research Consortium (NMTRC) consisting of 35 hospitals and research centers internationally. Within the NMTRC she has opened and led Phase I and II trials for medulloblastoma and neuroblastoma as well as leading the Dell Precision Medicine Program for pediatric cancers.

How Do We Guide the Consumer in the Precision Medicine Era?



Jill Hagenkord

Dr. Hagenkord is a board-certified pathologist with subspecialty boards in molecular genetic pathology. As Chief Medical Officer, Jill is involved in health product strategy, identification and evaluation of strategic business partnerships, regulatory strategy, health information review, and the development of provider and patient support tools. She also serves as the company liaison to medical professional societies as an active member in the Association for Molecular Pathology, the College of American Pathologists, American College of Medical Genetics and Genomics, and the National Academies of Science, Engineering, and Medicine's Roundtable on Genomics and Precision Health. Jill received her M.D. from Stanford University School of Medicine in 1999, did residency training at the University of California at San Francisco and the University of Iowa, and completed fellowships at the University of Pittsburgh Medical Center. Subsequently, Dr. Hagenkord practiced pathology at Creighton University Medical Center where she founded iKaryo Diagnostics. Prior to joining Color, Jill was the Chief Medical Officer at 23andMe, Invitae, and Complete Genomics.

Taha Kass-Hout

Dr. Taha Kass-Hout, co-founder, Kass-Hout Consulting and Humanitarian Tracker, is a trained cardiologist (Harvard's Beth Israel Deaconess Medical Center) and biostatistician (University of Texas Health Sciences) with over 20 years of experience in healthcare, informatics, big data and analytics in public and private sectors. He was the first Chief Health Informatics Officer for the US Food and Drug Administration (FDA) (2013-2016) where he created openFDA and precisionFDA. PrecisionFDA is part of President Obama's 2015 Precision Medicine Initiative, and was awarded the top prize at the 2016 Bio-IT World Best Practices Awards. Both openFDA and precisionFDA were referenced in the 2015 White House updated Strategy for American Innovation. Additionally, he has spearheaded a number of innovative informatics, public health, and clinical projects previously at the Centers for Disease Control and Prevention (CDC), for electronic disease surveillance and early disease detection (2009-2013), and developed InSTEDD's Riff (InSTEDD was founded by Google in 2006) for automated early warning and response for natural disasters and pandemics (2006-2009). Recently, Dr. Kass-Hout served as a member of the American Heart Association (AHA)'s Innovation Think Tank, and as a strategic advisor to AHA Institute for Precision Cardiovascular Medicine (Jul 2016- Apr 2017). In this capacity, he led the development of AHA's Precision Medicine platform developed in partnership with Amazon AWS, launched in closed Beta on Nov 13, 2016 and open Beta on Mar 15, 2017.

Gary Lyman

Gary H. Lyman, MD, MPH, is Co-Director of the Hutchinson Institute for Cancer Outcomes Research and Member of the Public Health Sciences and Clinical Research Divisions at the Fred Hutchinson Cancer Research Center. He is also Adjunct Professor in the School of Pharmacy and the School of Public Health at the University of Washington as well as Professor of Medicine in the Department of Medicine in the University of Washington School of Medicine. Lyman is a medical oncologist and hematologist and an internationally recognized clinical oncology researcher and leader in clinical practice guidelines and cancer policy. His research interests include comparative effectiveness and outcomes research related to targeted therapies and biomarkers, efforts to integrate health economics into evidence-based medicine, health policies and real-world research paradigms.

Jess Mega

Jessica L. Mega, MD, MPH, is the Chief Medical Officer at Verily Life Sciences. As CMO, Mega's focus is on translating scientific insights and technological innovations into partnerships and programs that improve patient outcomes. She oversees all of Verily's clinical research efforts, including the Baseline Study.

As a faculty member at Harvard Medical School (on leave), a senior investigator with the TIMI Study Group, and a cardiologist at Brigham and Women's Hospital, she led large international randomized trials evaluating novel cardiovascular therapies. She also directed the TIMI Study Group's Genetics Program. Her research findings have been published in the *New England Journal of Medicine, Lancet, JAMA,* and elsewhere.

Mega is a graduate of Stanford University, Yale University School of Medicine and Harvard School of Public Health. She completed Internal Medicine Residency at Brigham and Women's Hospital and Cardiovascular Fellowship at Massachusetts General Hospital. She is board certified in Internal Medicine and Cardiology. She has won the Laennec Society, Samuel A. Levine, and Douglas P. Zipes Awards, and she is a Fellow of the American Heart Association (AHA) and the American College of Cardiology (ACC).

Jessica Richman

Dr. Jessica Richman is co-founder and CEO of uBiome, which uses big data to understand bacteria. uBiome has filed over 100 patents on its technology, with Richman as a co-inventor, and has launched the world's first sequencing-based clinical microbiome testing. uBiome has raised $22m from Y Combinator, Andreesen Horowitz, 8VC, and other leading investors.

Dr. Richman studied computer science and economics at Stanford University and then received a fellowship to Oxford, where she received her Masters and PhD and was awarded a Fulbright Scholarship. Her work has been featured in the *New York Times, Wall Street Journal, Wired, MIT Technology Review, Scientific American, NPR,* and dozens of other media outlets.

Speaker Index

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