



Harvard Medical School Annual Bioethics Conference

Biotechnology

and the Future of

Medicine

MARCH 9–10, 2020



CENTER FOR
BIOETHICS
HARVARD MEDICAL SCHOOL



“As we look forward to more biotechnologically driven advances in health care, we must consider the role of ethical values.”

— INSOO HYUN, CONFERENCE CHAIR

CENTER FOR BIOETHICS AT HARVARD MEDICAL SCHOOL

Robert Truog
Director

Christine Mitchell
Executive Director

Edward Hundert
Associate Director

Mildred Solomon
*Director of the Fellowship
in Bioethics Program*

Rebecca Weintraub Brendell
*Associate Director and Director of
the Master of Bioethics Program*

Genevieve Saphier
Director of Administration

Stowe Locke Teti
*Executive Editor,
HMS Bioethics Journal and
Pediatric Ethiscope*

Brooke Tempesta
Associate Director of Education

Lisa Bastille
*Program and Finance
Administrator*

Angela Alberti
*Marketing and
Communications Manager*

Amanda Chieco
Education Coordinator

Ashley Trautmann
Events Coordinator

Kyle Amato
Center Assistant

Laura Gallant
Center Assistant

Julie Tomas
Design Assistant

**2020 CONFERENCE
ORGANIZERS:**

Insoo Hyun, PhD
Conference Chair

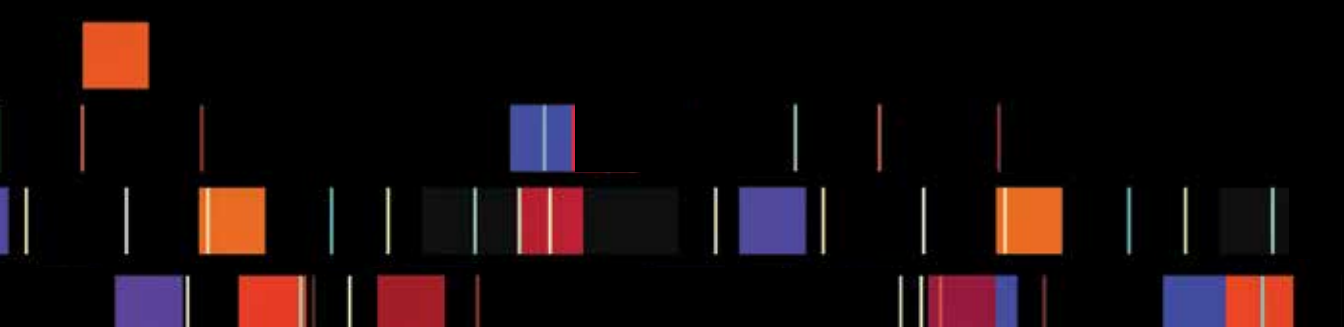
Robert Truog, MD

Christine Mitchell, RN, MS, MTS

Angela Alberti, ALM

Ashley Trautmann, BS

Linda Yang, MBE '20



CONTENTS

Welcome	4
About the Conference	6
About the Sponsors	8
Schedule	
Monday	11
Tuesday	13
Presenter & Moderator Bios	15

Conference Materials & Digital Connections

Subscribe to get news and information on upcoming Center events:
bioethics.hms.harvard.edu/subscribe

SOCIAL MEDIA

Join the conversation and share your experiences via social media.



Twitter
@hmsbioethics



Facebook
@HMSBioethics



LinkedIn
linkedin.com/school/harvardbioethics

#HarvardBioethics
#HMSABC

WiFi

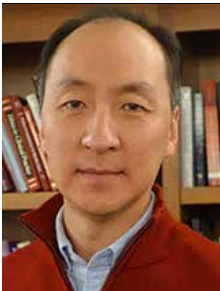
WiFi is available across the Harvard Medical School campus.

TO ACCESS:

Open a web browser from your device to be automatically directed to the HMS terms of conditions webpage. Once you accept the agreement you will be connected to the HMS Public wireless network.

Biotechnology and the Future of Medicine

A Message from the 2020 Conference Chair



“Biotechnology” is a word with many modern-day connotations, especially here in the greater Boston area. But biotechnology as a concept is not new; it has a long history with its origins in industrial-scale fermentation. One might say that 19th century breweries were the world’s first biotech start-ups. From beer production to penicillin to vaccines and other biotechnological success stories of previous generations,

it is easy to feel the pull of our ancestral temptation to redirect nature into something useful on a large scale.

Today in 2020, biotechnology involves the technical and computational manipulation of biological systems for human purposes. Although biotechnology has far-reaching applications in agriculture, manufacturing, and environmental science, this year’s annual bioethics conference focuses on biotechnology’s future impact on medicine. Interrelated scientific pursuits, such as stem cell-based bioengineering, organoid technology, personal genome sequencing, machine learning, and efficient genome editing promise to produce more effective personalized treatments for patients and thus to transform medicine as we know it.

Yet, as we look forward to more biotechnologically driven advances in health care, we must consider the role of ethical values. As conference chair, I welcome you warmly to our conference and ask you to reflect on how ethics must interact with biotechnology in medicine. Multiple perspectives are necessary—from scientists, clinicians, ethicists, lawyers,

and many others—to ensure that biotechnology proceeds responsibly, including ensuring equitable access of advances in medicine to all members of society. We have designed this conference to bring many diverse voices together in an open and mutually respectful environment. Please listen carefully to what others have to say. Socialize. Learn. Network. Enjoy some local beer (or other equally attractive beverage). Welcome to Harvard Medical School!

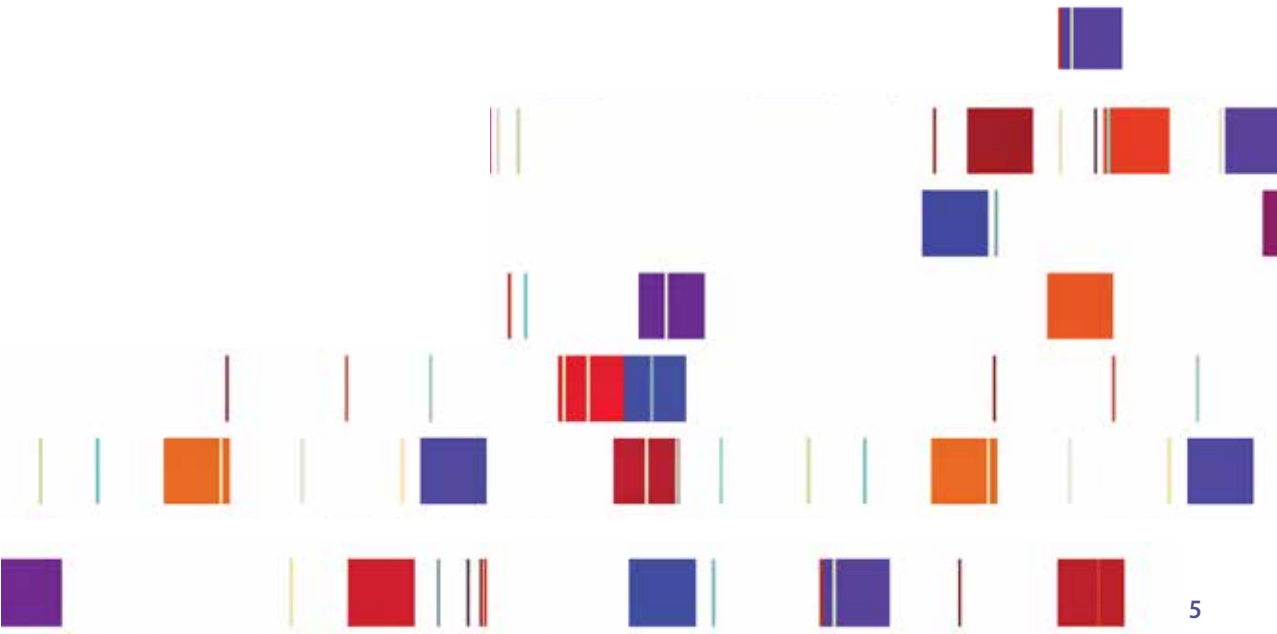
I wish to thank the other conference organizers and each of our distinguished speakers. This event would not be possible without you and your tireless efforts to help bring this conference together. I am proud of the comprehensive and balanced program we have created, which is filled with authorities in their respective fields. Also, to my colleagues at Harvard Medical School's Center for Bioethics and our dedicated and professional staff—thank you for your support and for giving me the opportunity to suggest the theme for this year's conference. My hope is that this event will help aid the important ethical and scientific work ahead of us that may enable biotechnology to thrive in Boston and beyond.

Insoo Hyun, PhD

Faculty, Center for Bioethics

Senior Lecturer on Global Health and Social Medicine

Harvard Medical School



About the Conference

The Conference Mission

The Harvard Medical School annual bioethics conference convenes leaders in the field to explore ethical questions and concerns in healthcare. Held each spring, this conference facilitates conversations among experts, and supports members of ethics committees, health care professionals, bioethicists, administrators, attorneys, and others who are interested in addressing ethical issues.

Poster Session

Poster sessions offer participants the opportunity to learn from the research findings and field work of bioethics students, researchers, and clinicians. This year's call for abstracts went out to the community in January 2020.





2020 Annual Bioethics Conference:
Biotechnology and the Future of Medicine

This year's will explore the potential of biotechnology to drive and shape the future of clinical care and research, and how ethics interacts with biotechnology in medicine, and consider multiple approaches to how we might ensure that biotechnology continues to evolve ethically.

The practice of medicine over the course of the last fifty years has changed dramatically. Novel technological developments will continue to generate new discoveries, therapies, and patient outcomes. Recent advances in intertwined areas, such as stem cell-based bioengineering, organoid technology, low-cost personal genome sequencing, machine learning, and human genome editing have the potential to create more effective, personalized medical treatments. But as we progress toward this biotechnologically-driven medical future, we must consider how ethical values can shape these advancements and vice versa.



About the Sponsors

The Center for Bioethics at Harvard Medical School

The Center for Bioethics brings together the rich intellectual resources of Harvard Medical School (HMS)—the largest biomedical research community in the world—including sixteen affiliated hospitals and research institutions; the expertise of more than twelve thousand HMS faculty members, physicians, and research scientists; and partnerships across Harvard University’s schools and academic departments.

Based in Boston, a global epicenter of biomedical research and innovation, the Center’s resources are designed to integrate ethics, scientific discovery, and clinical care more closely than ever before.

Professionals from around the world participate in the Center’s many programs, including a master of bioethics degree program, fellowship in bioethics, and professional and public education conferences and lectureships that address health care and social justice issues at the intersection of bioethics, law, and public policy. For more information, see bioethics.hms.harvard.edu.

The Petrie-Flom Center

The Petrie-Flom Center for Health Law Policy, Biotechnology, and Bioethics is a leading research program dedicated to the unbiased legal and ethical analysis of pressing questions facing health policymakers, medical professionals, patients, families, and others who influence and are influenced by the health care system.

The Petrie-Flom Center hosts public events and conferences, publishes the Bill of Health blog (<http://blogs.harvard.edu/billofhealth>), co-edits the Journal of Law and Biosciences, runs various fellowship programs, conducts sponsored research, hosts collaborations and produces independent scholarship on a range of topics under the umbrellas of health law policy, biotechnology, and bioethics. For more information, see petrieflom.law.harvard.edu.

The Hastings Center

The Hastings Center addresses fundamental ethical and social issues in health care, science, and technology. Through our scholars' writing and speaking, and through the work of the many other people who participate in our projects or submit articles to our publications, we shape ideas that influence key opinion leaders, including health policy-makers, regulators, lawyers, legislators, and judges. Our analyses also deeply influence professional practice: from end-of-life care to psychiatric practice to immigrant health care, we have helped to shape the standards of practice adopted by physicians, nurses, and lawyers. Founded in 1969 by philosopher Daniel Callahan and psychoanalyst Willard Gaylin, The Hastings Center is the oldest independent, nonpartisan, interdisciplinary research institute of its kind in the world. For more information, see [thehastingscenter.org](https://www.thehastingscenter.org).



CONFERENCE SCHEDULE



Monday, March 9, 2020

LOCATION: Joseph B. Martin Conference Center, 77 Avenue Louis Pasteur

TIME	DESCRIPTION	SPEAKER
8:00 a.m. – 9:00 a.m.	Registration & Breakfast Joseph B. Martin Conference Center, Lobby	
9:00 a.m. – 9:10 a.m.	Welcome Address	Insoo Hyun
SESSION 1: Stem Cell Research: From Bench to Bedside		Moderator: Insoo Hyun
9:10 a.m. – 9:25 a.m.	Scientific View	George Daley
9:25 a.m. – 9:40 a.m.	Clinical Research View	Jeffrey Cohen
9:40 a.m. – 9:55 a.m.	Bioethical View	Jeremy Sugarman
9:55 a.m. – 10:10 a.m.	Q & A	
10:10 a.m. – 10:25 a.m.	Break	
SESSION 2: Machine Learning and Medicine		Moderator: Sara Gerke
10:25 a.m. – 10:40 a.m.	Research View	Tina Eliassi-Rad
10:40 a.m. – 10:55 a.m.	Clinical Research View	Erich S. Huang
10:55 a.m. – 11:10 a.m.	Bioethical View	Alex John London
11:10 a.m. – 11:25 a.m.	Q & A	
11:25 a.m. – 11:40 a.m.	Break	

Monday, March 9, 2020 *Continued*

TIME	DESCRIPTION	SPEAKER
SESSION 3: Human Genome Editing for Patients and for Reproduction		
11:40 a.m. – 11:55 a.m.	Scientific View	Rudolf Jaenisch
11:55 a.m. – 12:10 p.m.	Clinical View	Ingrid Holm
12:10 p.m. – 12:25 p.m.	Science History View	Ben Hurlbut
12:25 a.m. – 12:40 p.m.	Q & A	
12:40 p.m. – 1:40 p.m.	Lunch: Joseph B. Martin Conference Center	
1:40 p.m. – 2:40 p.m.	Poster Discussions: Joseph B. Martin Conference Center	
SESSION 4: “N=1 Trials” and the Future of Hyper-Personalized Medicine		
2:40 p.m. – 2:55 p.m.	Medical-Scientific View	Timothy Yu
2:55 p.m. – 3:10 p.m.	Bioethical View	Jonathan Kimmelman
3:10 p.m. – 3:25 p.m.	Legal View	Jacob Sherkow
3:25 p.m. – 3:40 p.m.	Q & A	
3:40 p.m. – 3:55 p.m.	Break	
SESSION 5: The Role of Chimera Research in Translational Research		
3:55 p.m. – 4:10 p.m.	Scientific View	Jun Wu
4:10 p.m. – 4:25 p.m.	Scientific View	Ali Brivanlou
4:25 p.m. – 4:40 p.m.	Science Policy View	M. William Lensch
4:40 p.m. – 4:55 p.m.	Q & A	
4:55 p.m. – 5:00 p.m.	Break / Transition to Reception	
5:00 p.m. – 6:00 p.m.	Reception	

Tuesday, March 10, 2020

TIME	DESCRIPTION	SPEAKER
7:30 a.m. – 8:30 a.m.	Registration & Breakfast Joseph B. Martin Conference Center, Lobby	
SESSION 6: Human Brain Organoids		Moderator: Sarah Sullivan
8:30 a.m. – 8:45 a.m.	Scientific View	Paola Arlotta
8:45 a.m. – 9:00 a.m.	Clinical View	David Silbersweig
9:00 a.m. – 9:15 a.m.	Bioethical View	Jeantine Lunshof
9:15 a.m. – 9:30 a.m.	Q & A	
9:30 a.m. – 9:45 a.m.	Break	
SESSION 7: Embryo Modeling and Cultivation to Improve Assisted Reproduction		Moderator: Christine Mitchell
9:45 a.m. – 10:00 a.m.	Clinical View	Sigal Klipstein
10:00 a.m. – 10:15 a.m.	Scientific View	Jianping Fu
10:15 a.m. – 10:30 a.m.	Bioethical View	Insoo Hyun
10:30 a.m. – 10:45 a.m.	Q & A	
10:45 a.m. – 11:00 a.m.	Break	
SESSION 8: Beyond Normal Function: Bioengineered Living Human Systems		Moderator: Jim Howard
11:00 a.m. – 11:15 a.m.	Scientific View	George Church
11:15 a.m. – 11:30 a.m.	Scientific View	Ritu Raman
11:30 a.m. – 11:45 a.m.	Science, Technology, and Society View	Matthew Sample
11:45 a.m. – 12:00 p.m.	Q & A	
Noon – 12:10 p.m.	Closing Address	Insoo Hyun
12:10 p.m. – 1:00 p.m.	Lunch	

Join the Center for Bioethics for Lunch

Bring your tote lunch and learn more about the master of bioethics program. Get details at the registration desk.

PRESENTER BIOS



Paola Arlotta, PhD

Golub Family Professor of Stem Cell and Regenerative Biology,
Department of Stem Cell and Regenerative Biology, *Harvard University*



Paola Arlotta is a professor of stem cell and regenerative biology at Harvard University, and of Harvard Department of Stem Cell and Regenerative Biology (HSCRB). She is a principal faculty member at the Harvard Stem Cell Institute, an institute member at the Broad Institute, and an associate member of the Stanley Center for Psychiatric Research at the Broad Institute. Focusing on the developing cerebral cortex, the Arlotta lab has had a long-standing interest in discovering the mechanistic principles that govern the establishment and maintenance of cellular diversity and its integration into working networks that subserve cortical function. Motivated by understanding how our own cortex develops and how human neurodevelopmental disease emerges, the lab has built on their basic program in the mouse to instruct, validate and study human cortical development in vitro, within 3D cortical organoids of unprecedented complexity and reproducibility. Collectively, the Arlotta lab research program explores the interface between development and engineering of the neocortex, to gain fundamental understanding of both the principles that govern normal cortical development and of previously-inaccessible mechanisms of human neurodevelopmental disease. Arlotta received her master of science in biochemistry from the University of Trieste, Italy, and her PhD in molecular biology from the University of Portsmouth in the UK. She subsequently completed her postdoctoral training in neuroscience at Harvard Medical School.

Ali H. Brivanlou, PhD

Robert & Harriet Heilbrunn Professor, *The Rockefeller University*



Ali Brivanlou uses in vitro attached human embryos and genome-edited “synthetic embryos” derived from human embryonic stem cells to unveil the molecular, cellular, and embryological basis of early human development. His studies employ high-resolution quantitative approaches, and span both theoretical physics and molecular embryology. The lab is particularly interested in the emergence of the human brain and modeling neurodegenerative diseases. As an international leader in the effort to understand the intricacies of human embryonic stem cells and to harness their therapeutic potential, Brivanlou has also played a key role in establishing scientific standards for human embryonic stem cell research. In addition, he and his colleagues have derived several human embryonic stem cell lines that were among the first to be included in the National Registry at the National Institutes of Health, and are now used in laboratories worldwide.

George Church, PhD

Founding Core Faculty & Lead, Synthetic Biology, Wyss Institute, Harvard University
Professor of Genetics, Harvard Medical School
Professor of Health Sciences and Technology,
Harvard University and Massachusetts Institute of Technology



George Church leads synthetic biology at the Wyss Institute, where he oversees the directed evolution of molecules, polymers, and whole genomes to create new tools with applications in regenerative medicine and bio-production of chemicals. Among his recent work at the Wyss is development of a technology for synthesizing whole genes, and engineering whole genomes, far faster, more accurate, and less costly than current methods. Church is widely recognized for his innovative contributions to genomic science and his many pioneering contributions to chemistry and biomedicine. In 1984, he developed the first direct genomic sequencing method, which resulted in the first genome sequence (the human pathogen, *H. pylori*). He helped initiate the Human Genome Project in 1984 and the Personal Genome Project in 2005. Church invented the broadly applied concepts of molecular multiplexing and tags, homologous recombination methods, and array DNA synthesizers. His many innovations have been the basis for a number of companies including Editas (Gene therapy); Gen9bio (Synthetic DNA); and Veritas Genetics (full human genome sequencing). He is director of the U.S. Department of Energy Technology Center and director of the National Institutes of Health Center of Excellence in Genomic Science.

Jeffrey A. Cohen, MD

Hazel Prior Hostetler Endowed Chair and Professor, Cleveland Clinic Lerner College of Medicine
Director of Experimental Therapeutics, Mellen MS Center, Cleveland Clinic



Jeffrey Cohen is professor of neurology in the Cleveland Clinic Lerner College of Medicine and holds the Hazel Prior Hostetler Endowed Chair. He received a BA from Connecticut College and MD from the University of Chicago School of Medicine. He completed a neurology residency followed by a post-doctoral research fellowship in neuroimmunology both at the University of Pennsylvania. Cohen has worked at the Mellen MS Center at the Cleveland Clinic since 1994 and was director from 2014–2017. He currently is director of the Experimental Therapeutics Program, the Clinical Neuroimmunology Fellowship, and the MS Academic Coordinating Center. Cohen has published extensively on clinical, immunologic, and imaging aspects of MS. He has had a leadership role in a large number of clinical trials of potential therapies for MS, translational studies, studies to validate outcome measures, and observational studies. He recently served as chair of the International Advisory Committee on Clinical Trials in MS and cochair of the International Panel on Diagnosis of Multiple Sclerosis which proposed the 2017 McDonald Diagnostic Criteria. He currently is president of Americas Committee for Treatment and Research in Multiple Sclerosis.

George Q. Daley, MD, PhD

Dean of the Faculty of Medicine, *Harvard Medical School*;

Caroline Shields Walker Professor of Medicine, *Harvard Medical School*



George Q. Daley, Dean of Harvard Medical School and the Caroline Shields Walker Professor of Medicine, is an internationally recognized leader in stem cell science and cancer biology. He is also a longtime member of the HMS faculty whose work spans the fields of basic science and clinical medicine. Daley has been professor of biological chemistry and molecular pharmacology at HMS since 2010 and was an investigator of the Howard Hughes Medical Institute from 2008 until he resigned in 2017 upon assuming the deanship. He previously

held, as its inaugural incumbent, the Samuel E. Lux, IV Chair in Hematology/Oncology at Boston Children's Hospital and was the Robert A. Stranahan Professor of Pediatrics and Professor of Biological Chemistry and Molecular Pharmacology at HMS. Beyond his research, Daley has been a principal figure in developing international guidelines for conducting stem cell research and for the clinical translation of stem cells, particularly through his work with the International Society for Stem Cell Research, for which he has served in several leadership positions, including president (2007-08).

Tina Eliassi-Rad, PhD

Associate Professor, Khoury College of Computer Sciences, *Northeastern University*



Tina Eliassi-Rad is associate professor of computer science at Northeastern University in Boston, MA. She is also a core faculty member at Northeastern University's Network Science Institute. Prior to joining Northeastern, she was an associate professor of computer science at Rutgers University; and was previously a member of technical staff and principal investigator at Lawrence Livermore National Laboratory. Eliassi-Rad earned her PhD in computer sciences (with a minor in mathematical statistics) at the University of

Wisconsin-Madison. Her research is rooted in data mining and machine learning; and spans theory, algorithms, and applications of big data from networked representations of physical and social phenomena. She has over 100 peer-reviewed publications and has given over 200 invited talks and fourteen tutorials. Eliassi-Rad's work has been applied to personalized search on the World-Wide Web, statistical indices of large-scale scientific simulation data, fraud detection, mobile ad targeting, cyber situational awareness, and ethics in machine learning. Her algorithms have been incorporated into systems used by the government, industry, and open-source software. In 2017, she served as the program co-chair for the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining and as the program cochair for the International Conference on Network Science. In 2020, she is serving as the program cochair for the International Conference on Computational Social Science. She became a fellow of the ISI Foundation in Turin, Italy in 2019.

Jianping Fu, PhD

Associate Professor of Mechanical Engineering, Biomedical Engineering, and Cell & Developmental Biology, *University of Michigan*



Jianping Fu is an Associate Professor of Mechanical Engineering at the University of Michigan, Ann Arbor. His group integrates micro/nanoengineering, single-cell technologies, and systems and synthetic biology methods with new discoveries of mechanobiology, epigenetics, and stem cell biology for advancing understandings of human development and cancer biology. Fu's research on developing synthetic models of human embryonic development has contributed significantly to the emerging field of "Synthetic

Embryos", which was selected by the *MIT Technology Review* as "10 Breakthrough Technologies of 2018".

Sara Gerke, Dipl.-Jur. Univ.

Research Fellow, Medicine, Artificial Intelligence, and Law, Petrie-Flom Center for Health Law Policy, Biotechnology, and Bioethics, *Harvard Law School*



Sara Gerke is the research fellow in medicine, artificial intelligence, and law at the Petrie-Flom Center for Health Law Policy, Biotechnology, and Bioethics at Harvard Law School. She oversees the day-to-day work of the Center's Project on Precision Medicine, Artificial Intelligence, and the Law, including conducting law, policy, and ethics research; drafting reports and recommendations; and coordinating the Center's efforts with collaborators at the Center for Advanced Studies in Biomedical Innovation Law at the University of

Copenhagen as well as other partners. Gerke's current research focuses on the ethical and legal challenges of artificial intelligence and big data in the United States and Europe. Sara also researches comparative law and ethics of other digital health topics such as ingestible electronic sensors ("smart pills") as well as mitochondrial replacement techniques. Gerke's work has appeared in venues such as *JAMA*, *Science*, *Nature Biotechnology*, *Annual Reviews of Genomics and Human Genetics*, and *Nature Electronics*. Before joining the Petrie-Flom Center, Gerke was the General Manager of the Institute for German, European and International Medical Law, Public Health Law and Bioethics of the Universities of Heidelberg and Mannheim (IMGB) in Germany. She was also the co-investigator of an interdisciplinary project, known as "ClinhiPS", sponsored by the German Federal Ministry of Education and Research. This project analyzed the clinical application of human induced pluripotent stem cells (hiPSCs) in Germany and Austria from scientific, ethical, and comparative legal perspectives.

Ingrid A. Holm, MD, MPH

Associate Professor of Pediatrics, *Harvard Medical School*

Associate in Pediatrics, Division of Genetics and Genomics, *Boston Children's Hospital*



Ingrid A. Holm, is associate professor of pediatrics at Harvard Medical School (HMS), faculty member of the Division of Genetics and Genomics and the Division of Endocrinology at Boston Children's Hospital (BCH), and teaching faculty at the Center for Bioethics at HMS. She received her MD at the University of California, Los Angeles, and completed her residency in pediatrics and joint fellowship in genetics and endocrinology at BCH. She received her MPH in clinical effectiveness at the Harvard School of Public Health, and she has

a certificate in pediatric bioethics from Children's Mercy Center for Bioethics. Holm's primary research interest is in the ethical, legal, and social implications (ELSI) of returning genomic information to participants, families, and health care providers. Holm cochairs the Return of Results-ELSI Work Group for the Electronic Medical Records and Genomics (eMERGE) III Network, and she is PI of an R01 to study the impact of return of actionable genetic information on eMERGE participants to their health care providers. She was co-investigator on the Newborn Sequencing in Genomic Medicine and Public Health (NSIGHT) U19 project "*Genomic Sequencing and Newborn Screening Disorders*" (BabySeq), which explored the medical, behavioral, and economic impacts of integrating genomic sequencing into the care of newborns. Holm's other area of research is in rare disease and she is associate director of Robert's Program for Sudden Unexpected Death in Pediatrics (SUDP) Program at BCH where she leads the genomic sequencing studies to identify genetic contributions to SUDP. She is also a member of the NIH-funded Undiagnosed Diseases Network (UDN). Dr. Holm has been elected to the Society for Pediatric Research, is a Fellow of the American Academy of Pediatrics, and is a Fellow in the American College of Medical Genetics and Genomics. Dr. Holm has been a member of BCH IRB since 2007.

Jim Howard, JD, MBE

Vice President, Technology Transactions, *Sana Biotechnology, Inc.*



Jim Howard is the vice president of technology transactions for Sana Biotechnology, Inc. — a cell and gene therapy company with locations in Cambridge, Seattle and San Francisco. He has a masters in bioethics from the University of Pennsylvania School of Medicine and a law degree from the University of Pennsylvania Law School.

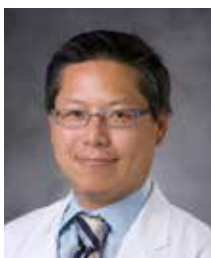
Jim was previously the vice president of technology transactions for Juno Therapeutics, Inc and before that he was an attorney in the Life Sciences practice group of the law firm Ropes & Gray in Boston.

Jim also has experience in institutional review board and clinical trial management.

Erich S. Huang, MD, PhD

Co-Director of Duke Forge, Assistant Professor in Biostatistics and Bioinformatics,

Duke University



Erich S. Huang is director of Duke Forge, director of Duke Crucible, and assistant dean for biomedical informatics for Duke University School of Medicine. He was the first faculty recruit to a new initiative and new Division at Duke in the Department of Biostatistics & Bioinformatics. Huang served as principal investigator on a NIH-funded project under the Big Data to Knowledge (BD2K) RFAs, and also served as faculty lead for informatics on the Google Life Sciences-funded Baseline Study. He is also currently leading a Duke

University School of Medicine-wide initiative for a data service for biomedical researchers, as well as projects on applied machine learning, user interfaces, and visualization of surgical outcomes (Clinical & Analytic Learning Platform for Surgical Outcomes, CALYPSO) and a chronic kidney disease "early warning" system. His overarching aim is to create a data science culture and infrastructure for biomedical and healthcare research.

Ben Hurlbut, PhD

School of Life Science Associate Professor, *Arizona State University*



J. Benjamin Hurlbut is trained in the history of modern biomedical and life sciences. His research lies at the intersection of science and technology studies, bioethics and political theory. He studies the changing relationships between science, politics and law in the governance of biomedical research and innovation in the 20th and 21st centuries. Focusing on controversy around morally and technically complex problems in areas such as human embryonic stem cell research and genomics, Hurlbut examines the interplay

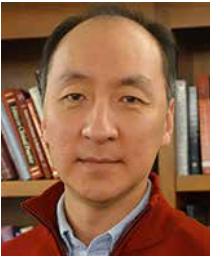
of science and technology with shifting notions of democracy, of religious and moral pluralism, and of public reason. He is author of *Experiments in Democracy: Human Embryo Research and the Politics of Bioethics* (Columbia University Press, 2017). He holds an A.B. from Stanford University, and a Ph.D. in the History of Science from Harvard University. He was a postdoctoral fellow in the Program on Science, Technology, and Society at Harvard Kennedy School.

Insoo Hyun, PhD

Faculty, Center for Bioethics, Harvard Medical School

Senior Lecturer on Global Health and Social Medicine, *Harvard Medical School*

Professor of Bioethics and Philosophy, *Case Western Reserve University School of Medicine*



Insoo Hyun is a faculty member of the Center for Bioethics and senior lecturer on global health and social medicine at Harvard Medical School and professor of bioethics and philosophy at Case Western Reserve University School of Medicine. As a Fulbright Scholar and Hastings Center Fellow, his interests include ethical and policy issues in stem cell research and new biotechnologies.

Currently, Hyun is the principal investigator of a BRAIN Initiative-funded project exploring the ethical issues surrounding human brain organoid research, in collaboration with leading scientists at Harvard and Stanford. He is the co-principal investigator, along with colleagues at the Hastings Center, of an NIH grant identifying ways to improve the oversight of stem cell-based human-animal chimera research. And he is the principal investigator of a Greenwall Foundation project seeking to formulate a new bioengineering ethics framework for research involving the use of multi-cellular engineered living systems derived from human cells. Hyun has been involved for many years with the ISSCR (International Society for Stem Cell Research), for which he has helped draft all of the ISSCR's international research guidelines and has served as their chair of the Ethics and Public Policy Committee. He now serves as a member of the Neuroethics Subgroup of the BRAIN 2.0 Working Group of Advisory Committee to the Director, NIH. Hyun received his BA and MA in philosophy with honors from Stanford University and his PhD in philosophy from Brown University.

Rudolf Jaenisch, MD

Professor of Biology, *Massachusetts Institute of Technology*

Founding Member, *Whitehead Institute*



Rudolf Jaenisch, a Whitehead Institute Founding Member and National Medal of Science recipient, focuses on understanding epigenetic regulation of gene expression. Most recently, this work has led to major advances in our understanding of embryonic stem cells and “induced pluripotent stem” (IPS) cells, which appear identical to embryonic stem cells but can be created from adult cells without using an egg. In 2007, the Jaenisch lab was one of three labs worldwide that reported successfully taking cells from mouse tails and

reprogramming them into IPS cells, by over-expressing four master gene regulators. Later that year, the lab followed up by further manipulating IPS cells to treat sickle-cell anemia in mice, the first proof in principle of therapeutic use of such cells. In 2008, the lab reported that neurons derived from IPS cells successfully integrated into fetal mouse brains and reduced symptoms in a Parkinson's disease rat model. In addition to its stem cell work, Jaenisch's lab is investigating epigenetic mechanisms for certain types of cancer and for brain development. Jaenisch received his doctorate in medicine from the University of Munich in 1967. Before coming to Whitehead, he was head of the Department of Tumor Virology at the Heinrich Pette Institute at the University of Hamburg. He has coauthored more than 375 research papers and has received numerous prizes and recognitions, including an appointment to the National Academy of Sciences in 2003.

Jonathan Kimmelman, PhD

Director, Biomedical Ethics Unit, *McGill University*



Jonathan Kimmelman is a James McGill Professor in the Biomedical Ethics Unit/Social Studies of Medicine. He has cross appointments in experimental medicine, epidemiology, biostatistics and occupational health, and human genetics. Kimmelman holds a PhD in from Yale University, and joined McGill in 2005. His research revolves around the ethical, social and policy dimensions of translational research. He received the Institute of Genetics Maud Menten New Investigator Prize, a CIHR New Investigator Award (2008) and a Friedrich Bessel- Humboldt Award (2014). Kimmelman chaired the ethics committee of the American Society of Gene and Cell Therapy, 2008-2010, and chairs the ethics committee of the International Society of Stem Cell Research. He also served on the CIHR Stem Cell Oversight Committee, is a current member of the Gene and Cell Therapy DSMB of U.S. National Heart, Lung, and Blood Institute, and has been a member of two U.S. Institute of Medicine committee reports. His book, *Gene Transfer and the Ethics of First-in-Human Trials: Lost in Translation*, was published by Cambridge University Press. In 2018, he was named as a Hastings Center Fellow.

Sigal Klipstein, MD

Fertility Specialist, *InVia Fertility*



Sigal Klipstein is a graduate of the University of Chicago Pritzker School of Medicine. She is board certified in both obstetrics and gynecology as well as reproductive endocrinology and infertility. She holds fellowships in both infertility and medical ethics. After completing a year at Northwestern Memorial Hospital, she continued her studies with a residency in obstetrics and gynecology at Beth Israel Deaconess Medical Center and Harvard Medical School in Boston. She completed a fellowship in reproductive endocrinology and infertility at Boston IVF and Harvard as well as a fellowship in medical ethics at Harvard University. Her research interests include: preimplantation genetic diagnosis, pregnancy in women over forty years of age, egg donation, surrogacy, and reproductive ethics. She has lectured on the ethics of infertility, stem cell research, cloning, and preimplantation genetic diagnosis to medical students, physicians, and community groups. Klipstein is widely published, having written numerous articles in both medical and ethics journals. She has also authored several book chapters and presented at numerous medical conferences. Klipstein is the current chair of the American College of Obstetrics and Gynecology Committee on Ethics, and a liaison to the American Academy of Pediatrics Committee on Bioethics. She is a member of the American Society for Reproductive Medicine Ethics Committee

M. William Lensch, PhD

Strategic Advisor, *Harvard Medical School*



M. William Lensch, Ph.D. is Strategic Advisor to the Dean at the Harvard Medical School (HMS). Lensch earned his Ph.D. in the Department of Molecular and Medical Genetics at Oregon Health Sciences University, where he investigated pediatric bone marrow failure and rare diseases of the blood. His post-doctoral work at the Whitehead Institute for Biomedical Research (MIT) and Harvard Medical School/Boston Children's Hospital used various types of human cells and tissue as platforms for understanding the genetics of the

blood-forming system. He is author or co-author of over sixty peer-reviewed and other publications, has offered more than 200 lectures and panel discussions, and provided some three-dozen written or verbal commentaries on public policy at it relates to biomedical research including to elected officials, various government offices, exploratory committees, and representatives of foreign governments. He currently serves as HMS's government affairs representative to the Association of American Medical Colleges (AAMC). Among other honors, he has been recognized by Harvard University for distinction in teaching and by Governor M. Jodi Rell for his work to advance stem cell research within the State of Connecticut.

Alex John London, PhD

Clara L. West Professor of Ethics and Philosophy & Director,
Center for Ethics and Policy Carnegie Mellon University



Alex John London is Clara L. West Professor of Ethics and Philosophy and Director of the Center for Ethics and Policy at Carnegie Mellon University. An elected fellow of the Hastings Center, his work focuses on ethical and policy issues surrounding the development and deployment of novel technologies in medicine, biotechnology and artificial intelligence. His work on ethics and AI deals with algorithmic bias and the role of transparency, explainability and empirical validation for trust and accountability. He has

authored or coauthored over ninety papers that have appeared in journals from *Science* and *JAMA* to *Mind* and the *Philosopher's Imprint*. He was a member of the working group that produced the 2016 CIOMS International Ethical Guidelines for Health-related Research Involving Humans and he has served as an ethics expert in consultations with numerous national and international organizations including the U.S. National Academy of Medicine, the U.S. National Institutes of Health, the World Health Organization, the World Medical Association and the World Bank.

Jeantine E. Lunshof, PhD

Philosopher and ethicist, *Harvard Wyss Institute for Biologically inspired Engineering Lecturer, Harvard Medical School*

Assistant Professor, Department of Genetics, *University Medical Center Groningen, University of Groningen, Netherlands*



Jeantine Lunshof's research interests are concerned with philosophical research ethics in the field of genomic sciences and biological engineering where disruptive technological innovations call for epistemological and normative exploration. She conducts her philosophical and ethical work as a full-time ethicist on the workflow of the lab. As a collaborator of George Church in the Department of Genetics at Harvard Medical School she developed the model of 'Collaborative Ethics' that she is currently implementing across the field of biologically inspired engineering at the Wyss Institute. Lunshof was awarded a Marie Curie International Outgoing Fellowship (2013-2015) for the study of conceptual and normative questions in systems biology. She is also a member of the Faculty of the Harvard Center for Bioethics and teaches Conduct of Science at the Division of Medical Sciences at HMS. She is Associated Researcher with the Broad Institute of MIT and Harvard. Lunshof received her BA in philosophy and Tibetan language and culture from the University of Hamburg, her MA in philosophy and health law from the University of Amsterdam, and her PhD from VU University Amsterdam.

Christine Mitchell, RN, MS, MTS

Executive Director, Center for Bioethics, *Harvard Medical School*



Christine Mitchell is executive director of the Center for Bioethics. She received her bachelor's and master's degrees in science from Boston University School of Nursing and a master's degree from Harvard where she majored in philosophical and religious ethics as a Kennedy Fellow in Medical Ethics through the Interfaculty Program at Harvard Medical School, Harvard Divinity School and Harvard School of Public Health. She is also an elected fellow of the American Academy of Nurses.

Mitchell founded the ethics program at Boston Children's Hospital, directing the ethics consultation service and leading the Ethics Advisory Committee for thirty years. She was also associate director of clinical ethics at Harvard Medical School's Division of Medical Ethics where she developed the Ethics Leadership Group, an intensive clinical bioethics course, and an all-volunteer citizen Community Ethics Committee for informed public input on ethical aspects of health care and health policies. She leads the monthly Harvard Ethics Consortium discussion of ethics cases and teaches in the HMS Medical Ethics Fellowship program. Her research has focused on ethics consultation, and public engagement in policies regarding resource allocation related to major natural disasters or pandemics. Mitchell has served on numerous national most recently, the Ethical Legal and Social Aspects Committee for the Human Brain Project funded by the European Commission. She lectures nationally and internationally on issues in clinical ethics.

Ritu Raman, PhD

Postdoctoral Fellow, *Massachusetts Institute of Technology*



Ritu Raman, is an engineer, writer, and educator with a passion for introducing biohybrid materials into the toolbox of every inventor. Her research focuses on using biohybrid design to build implantable devices that dynamically sense and adapt to the body. She grew up in India, Kenya, and the United States where she learned to appreciate and thrive in diverse and dynamic environments. Her life experiences have forged the belief that technical innovation can drive positive social change, and this inspires her work to

democratize and diversify STEM education around the world. Raman is currently a postdoctoral fellow in the renowned Langer Lab at MIT. She is funded by a Ford Foundation Fellowship by The National Academies of Sciences, Engineering, and Medicine and a L'Oreal USA For Women in Science Fellowship. She holds many awards and honors, including being named to the Forbes 30 Under 30 Science list and the MIT Technology Review 35 Innovators Under 35 list, as well as being named an Innovation and Technology Delegate to the International Achievement Summit. Raman is passionate about increasing diversity in STEM and has championed many initiatives to empower women in science, including being named a AAAS IF/THEN ambassador and founding the Women in STEM Database at MIT (WiSDM). Ritu received her bachelor of science magna cum laude from Cornell University, and her MS and PhD as an NSF Fellow at the University of Illinois at Urbana-Champaign.

Heather Rooke, PhD



Heather Rooke served as executive director of Harvard's Department of Stem Cell & Regenerative Biology from 2017-2020. where she was responsible for the department's communications and administration teams, including all aspects of operations and compliance. Before Harvard, Rooke was the scientific director for the International Society for Stem Cell Research (ISSCR), working closely with the society's leadership, committees, task forces and staff to disseminate information and ideas relating to stem cell research to both the research

community and the public. She directed the society's scientific and educational initiatives, oversaw the ISSCR's publishing relationships, and drove the operations of the society's open-access journal *Stem Cell Reports*. Rooke played an instrumental role in the development of the ISSCR's "Guidelines for the Conduct of Human Embryonic Stem Cell Research" (2006), "Guidelines for the Clinical Translation of Stem Cells" (2008) and "Patient Handbook on Stem Cell Therapies" (2008). In 2010, she played a key role in developing the ISSCR's web-resource, *A Closer Look at Stem Cells*. Rooke obtained her PhD in molecular medicine from the University of Auckland, New Zealand, with scholarships from the Cancer Society of New Zealand and the Matamata Leukemia Research Trust. Her postdoctoral training was with Dr. Stuart Orkin at Boston Children's Hospital, investigating transcription factor control of normal and aberrant hematopoiesis and participating in work that identified a component critical for hematopoietic stem cell renewal.

Matthew Sample, PhD

Philosopher and Postdoctoral Research, Pragmatic Health Ethics Research Unit,
McGill University



Matthew Sample is a philosopher of science and technology at the Institut de recherches cliniques de Montréal and McGill University. Currently focusing on brain-computer interfaces, his research maps the interactions between ethical ideals, emerging technologies, and democratic governance.

Carmel Shachar, JD, MPH

Executive Director, *Petrie-Flom Center for Health Law Policy, Biotechnology, and Bioethics*



Carmel Shachar, is the executive director of the Petrie-Flom Center for Health Law Policy, Biotechnology, and Bioethics at Harvard Law School. She is responsible for oversight of the Center's sponsored research portfolio, event programming, fellowships, student engagement, development, and a range of other projects and collaborations. She is co-lead of the Center's Involvement with the Regulatory Foundations, Ethics, and Law Program of Harvard Catalyst | The Harvard Clinical and Translational Science Center, and eo-editor of the Center's collaborative health policy blog, *Bill of Health*.

Shachar's scholarship focuses on law and health policy, in particular the regulation of access to care for vulnerable individuals, health care anti-discrimination law and policy, and the use of all-payer claims databases in health care research. She is also a lecturer on law at Harvard Law School, where she co-teaches a course on "Health Care Rights in the Twenty-First Century." Shachar was previously a clinical instructor on law at the Center for Health Law and Policy Innovation at Harvard Law School (CHLPI), where she helped lead CHLPI's access to care and Affordable Care Act implementation work. During her time at CHLPI, Shachar focused on analyzing and translating health policy issues and opportunities for a broad range of audiences, including many federal and state-level health policy coalitions. She also coordinated and led a major multi-state initiative to document discriminatory benefit designs on the health insurance marketplaces. Shachar previously practiced health care law at Ropes & Gray, LLP in Boston. Shachar's currently serves on the board of the Fishing Partnership Support Services as well as on the Institutional Animal Care and Use Committee of Boston University. Shachar graduated cum laude from Harvard Law School, where she was a student fellow at the Petrie-Flom Center, and the Harvard T. H. Chan School of Public Health.

Jacob S. Sherkow, MA, JD

Professor of Law, *New York Law School*

Edmond J. Safra/Petrie-Flom Centers Joint Fellow-in-Residence, *Harvard University*



Jacob S. Sherkow is the Edmond J. Safra/Petrie-Flom Centers joint fellow-in-residence at Harvard University and professor of law at the Innovation Center for Law and Technology at New York Law School. His research focuses on the legal and ethical implications of advanced biotechnologies, especially as related to intellectual property. He is the author of over forty articles published in both scientific journals and traditional law reviews, including *Science*, *Nature*, *the Yale Law Journal*, and the *Stanford Law Review*. In 2018, he was appointed

to the National Academy of Medicine as an emerging leader in health and Medicine. Sherkow also currently serves on the New York Genome Center's Institutional Biosafety Committee; on the editorial board of a peer-reviewed scientific journal, the *CRISPR Journal*; and as an advisor to a committee of France's National Assembly on issues concerning the patenting of biotechnological research tools. Sherkow graduated cum laude from the University of Michigan Law School, where he was an editor of the *Michigan Law Review* and the recipient of the Fred L. Leckie and James N. Adler Scholarships. He holds an MA in biotechnology from Columbia University and a BSc from McGill University, where he majored in molecular biology and English literature. In addition to his legal training, Sherkow has several years of experience as a research scientist in molecular biology

David A. Silbersweig, MD

Chair, Department of Psychiatry and Institute for the Neurosciences,

Brigham and Women's/Faulkner Hospitals

Academic Dean, *Partners Health Care System and Harvard Medical School*



David Silbersweig, is one of the pioneers of functional neuroimaging research in psychiatry. The aim of his current work in systems-level neuropathophysiology is to help provide a foundation for the development of novel, targeted, and biologically based diagnostic and therapeutic strategies to aid those suffering with mental illness.

Silbersweig is now the chairman of the Department of Psychiatry at the Brigham and Women's/Faulkner Hospitals, and chairman of the Brigham and Women's Hospital Institute for the Neurosciences. He

also is Stanley Cobb Professor of Psychiatry at Harvard Medical School.

Jeremy Sugarman, MD, MPH, MA

Harvey M. Meyerhoff Professor of Bioethics and Medicine, *Johns Hopkins Berman Institute of Bioethics and Johns Hopkins School of Medicine*



Jeremy Sugarman is the Harvey M. Meyerhoff Professor of Bioethics & Medicine, professor of medicine, professor of health policy and management, and deputy director for medicine of the Berman Institute of Bioethics at Johns Hopkins University. He is internationally recognized as a leader in biomedical ethics with particular expertise in applying empirical methods and evidence-based standards for evaluating and analyzing bioethical issues. His contributions to both bioethics and policy include his work on the ethics of informed consent, umbilical cord blood banking, stem cell research, international HIV prevention research, global health, and research oversight.

Sarah Sullivan, BA

Project Manager, *Harvard Wyss Institute for Biologically inspired Engineering*



Sarah Sullivan graduated earned her BA in psychology and anthropology/sociology from Kalamazoo College in Kalamazoo, Michigan. She has previously conducted research with a clinical psychologist at the University of Michigan Health System/C.S. Mott Children's Hospital, and then moved to Boston to work within the Division of Genetics at Boston Children's Hospital. Sullivan has been afforded research opportunities in the areas of pharmacogenomics, clinical psychology, anthropology, biobanking, and is now able to use those experiences to support the wide array of research conducted at the Wyss Institute.

Robert Truog, MD

Director, Center for Bioethics, *Harvard Medical School*

Frances Glessner Lee Professor of Medicine, *Boston Children's Hospital*



Truog received his MD from the UCLA and is board certified in the practices of pediatrics, anesthesiology, and pediatric critical care medicine. He also holds a master's degree in philosophy from Brown University and an honorary MA from Harvard University. Truog practices pediatric intensive care medicine at Boston Children's Hospital, where he has served for more than thirty years. He has published more than 300 articles in bioethics and related disciplines; his writings on brain death have been translated into several languages, he authored current national guidelines for providing end-of-life care in the intensive care unit, and was PI on the recently completed NIH study *Toward Optimal Palliative Care in the PICU Setting*. His books include *Talking with Patients and Families about Medical Error: A Guide for Education and Practice* (2010), and *Death, Dying, and Organ Transplantation* (2012). He lectures nationally and internationally, is an active member of numerous committees and advisory boards, and has received several awards over the years, including the William G. Bartholome Award the Christopher Grenvik Memorial Award, and the Shubin-Weil Master Clinician-Teacher Award. In 2013 he was honored with the Spinoza Chair at the University of Amsterdam.

Jun Wu, PhD

Assistant Professor, Department of Molecular Biology, *UT Southwestern*



Jun Wu's work has contributed to the generation of new stem cells for basic and translational studies, and developing novel and efficient genome and epigenome editing tools. His group is particularly interested in harnessing stem cell derived interspecies chimeras and synthetic embryos for studying early mammalian development, pluripotency and molecular mechanisms of xenogeneic barriers.

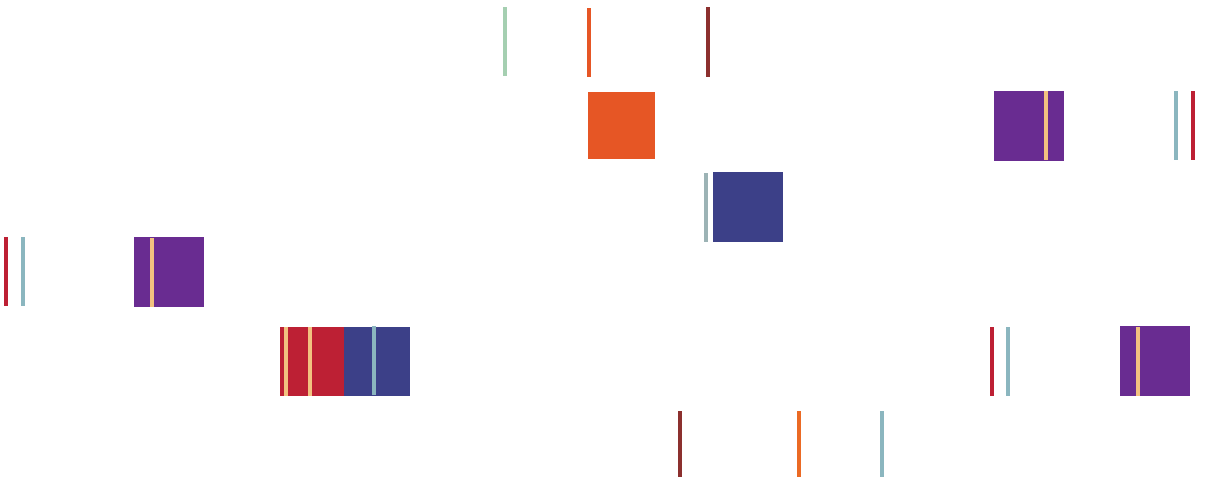
Timothy Yu, MD, PhD

Attending Physician, Division of Genetics & Genomics, *Boston Children's Hospital*
Assistant Professor in Pediatrics, *Harvard Medical School*



Tim Yu is the principal investigator of the Yu lab. He completed his undergraduate degree in biochemistry and molecular biology at Harvard College, his MD and PhD (neuroscience) degrees at the University of California at San Francisco, and neurology residency at Massachusetts General Hospital and Brigham and Women's Hospital. He joined Boston Children's Hospital as an instructor in 2010 and started his own independent research group in 2013. He is an assistant professor at Harvard Medical School and Associate

Member at the Broad Institute of MIT and Harvard.





**CENTER FOR
BIOETHICS**
HARVARD MEDICAL SCHOOL

Interested in the
ethical aspects of
science, medicine,
and clinical care?
Us too.

Join us for lunch!

**Tuesday, March 10
12:30 – 1:30 p.m.**

Find out how a master's degree in bioethics
from Harvard can invigorate your career.

Bring your tote lunch and join
MBE faculty, students, and admissions
representatives for a short question and answer
session after the conference.
Get details at the registration desk.

BIOETHICS.HMS.HARVARD.EDU/APPLY

Harvard Clinical Bioethics Course

June 10 – 12, 2020

- Taught by experts and thought-leaders in clinical bioethics
- Earn 20+ AMA PRA Category 1 Credits™
- Small classes for effective group discussion
- Space is limited

Register Online:

bioethics.hms.harvard.edu/HCBC



**CENTER FOR
BIOETHICS**
HARVARD MEDICAL SCHOOL

Harvard Medical School Center for Bioethics
641 Huntington Avenue
Boston, MA 02115



THE PETRIE-FLOM CENTER
FOR HEALTH LAW POLICY, BIOTECHNOLOGY,
AND BIOETHICS AT HARVARD LAW SCHOOL



The Hastings Center

The Harvard Annual Bioethics Conference is co-sponsored by the Center for Bioethics at Harvard Medical School, the Hastings Center, and the Petrie-Flom Center for Health Law Policy, Biotechnology, and Bioethics at Harvard Law School, with support from the Oswald DeN. Cammann Fund.

PHOTOS: LIPOFSKY.COM; JOHN SOARES; ROSE LINCOLN; LEN RUBENSTEIN