

Thank you to our sponsors!

**Center for Research on  
Reproduction and  
Women's Health**



# Reproduction Meets Regeneration

Implications for long term health  
of parents and future offspring

**NOVEMBER 1, 2023**

Smilow Rubenstein  
Auditorium & Commons  
10:30 AM – 5:00 PM

## **SPEAKERS:**

**Diana Laird, PhD**  
University of California San Francisco

**Monica A. Mainigi, MD**  
Hospital of the University of Pennsylvania

**Andrew Modzelewski, PhD**  
University of Pennsylvania

**Kathleen O'Neill, MD, MTR**  
University of Pennsylvania

**Mitunori Saitou, MD, PhD**  
Kyoto University

**Kotaro Sasaki, MD, PhD**  
University of Pennsylvania

**Ariella Shikanov, PhD**  
University of Michigan

**James Turner, PhD**  
Francis Crick Institute

## **CO-SPONSORS**



Center for Research  
on Reproduction  
and Women's Health



# Schedule of Events

- 9:30 – 10:30 Registration and Brunch.  
10:35 – 10:45 Opening remarks by **Jon Epstein**, MD  
*Chief Scientific Officer, Perelman School of Medicine, University of Pennsylvania*  
10:45 – 10:50 Welcome and Introduction by **Ken Zaret**, PhD  
*Joseph Leidy Professor, Director, Institute for Regenerative Medicine, Department of Cell and Developmental Biology, Perelman School of Medicine, University of Pennsylvania*

## Session 1

- 10:50 – 11:20 **Mitinori Saitou**, MD, PhD  
*Institute for the Advanced Study of Human Biology,  
Department Of Anatomy and Cell Biology  
Graduate School Of Medicine, Kyoto University*  
Mechanism and in vitro reconstitution of mammalian germ cell development  
11:25 – 11:45 **Kotaro Sasaki**, MD, PhD  
*University of Pennsylvania*  
Human male germline development and in vitro gametogenesis  
11:50 – 12:20 **Diana Laird**, PhD  
*CZ BIOHUB Investigator, Eli and Edythe Broad Center for Regeneration Medicine and Stem Cell Research Center for Reproductive Services, Department Of OBGYN, University Of California San Francisco*  
Age and Experience in the Germline  
12:20 – 2:00 Luncheon Break, Poster Session

## Session 2

- 2:05 – 2:25 **Kathleen O'Neill**, MD, MTR  
*Department of Obstetrics and Gynecology, University of Pennsylvania*  
Lessons Learned in Endometrial Growth and Differentiation Using a Human Model of Uterus Transplant  
2:30 – 3:00 **Ariella Shikanov**, PhD  
*Department of Biomedical Engineering, University of Michigan*  
Functional and Tunable Biomimetics for Reproductive Tissue Engineering  
3:00 – 3:20 Coffee Break

## Session 3

- 3:25 – 3:45 **Monica A. Mainigi**, MD  
*Hospital of the University Of Pennsylvania*  
Implantation-on-a-chip: Microphysiological modeling of early human placentation  
3:50 – 4:10 **Andrew Modzelewski**, PhD  
*School of Veterinary Medicine, University of Pennsylvania*  
Rewired regulatory pathways involving retrotransposons impact reproduction and early development  
4:15 – 4:45 **James Turner**, PhD  
*Assistant Research Director, Francis Crick Institute*  
Functions of the Sex Chromosome in the Germ Line  
4:50 – 5:00 Closing Remarks by **Marisa Bartolomei**, PhD  
*Perelman Professor of Cell and Developmental Biology, University of Pennsylvania*  
5:00 – 6:00 Reception

# Notes

## Ariella Shikanov, PhD

*Department of Biomedical Engineering, University of Michigan*



Ariella Shikanov is an Associate Professor at the Department of Biomedical Engineering at the University of Michigan, with appointments at the Department of Obstetrics and Gynecology, Cellular and Molecular Biology Program and Macromolecular Science and Engineering. She joined UM in Fall 2012 as an Assistant Professor after completing her postdoctoral fellowship at Northwestern University in Chicago in a multidisciplinary collaboration called the Oncofertility Consortium aiming to address infertility induced by chemotherapy in cancer survivors.

The research in the Shikanov lab aims to restore ovarian reproductive and endocrine function in young women and girls with premature ovarian insufficiency (POI) using bioengineering tools. The newly designed biomimetic environments with controlled physical and biological properties promote the survival and development of ovarian follicles, drive tissue regeneration and restore biological function both in vivo and in vitro.

Dr. Shikanov is the recipient of The Hartwell Foundation (2014), NSF CAREER (2016), Cellular and Molecular Bioengineering Young Innovator (2018) awards and a 2023 American Institute of Medical and Bioengineering (AIMBE) fellow. She is funded by NIBIB and NICHD. Dr. Shikanov was also nominated for the Golden Apple Teaching award (2017) and was voted an Outstanding Undergraduate Research Opportunity Program mentor (2014). In 2020 Dr. Shikanov founded the start-up company, "ArtOva Therapeutics, Inc", with the goal to bring the technology developed in her lab into the clinic.

## Diana Laird, PhD

*Department of Obstetrics, Gynecology and Reproductive Science, University of California San Francisco*



Diana Laird is a Professor at University of California San Francisco in the Department of Obstetrics, Gynecology and Reproductive Science and the Institute for Regeneration Medicine. She directs the Laboratory of Germline Development, Fitness, and Aging. Her basic research program is motivated by solving infertility, reproductive aging, and understanding the effects of prenatal exposures to endocrine-disrupting chemicals and psychosocial stressors. She is involved in the intersection between science and society as deputy director of the UCSF P30 EaRTH Center (Environmental Research and Translation for Health). After a bachelor's degree in Physics from Harvard, she entered stem cell biology as a PhD student at Stanford in the lab of Irving Weissman. She trained as a postdoc in developmental genetics with Kathryn Anderson at Sloan Kettering Institute. Her research has been recognized by an NIH New Innovator Award (DP2), an award from the W.M. Keck Foundation for Biomedical Research and she was recently appointed as a Chan Zuckerberg Biohub Investigator.

## Speaker Bios

### James Turner, PhD

*Director at the Francis Crick institute and a Wellcome Trust Investigator*



James Turner is Assistant Research Director at the Francis Crick institute and a Wellcome Trust Investigator, working on mammalian sex chromosome biology. He identified the mechanisms causing infertility in the most common sex chromosome abnormalities Turner syndrome (XO), Jacob syndrome (XYY) and Klinefelter syndrome (XXY). He also devised the first therapeutic approaches to reverse germ cell loss in these conditions. He identified multiple components of the germ cell surveillance pathways that protect offspring from genome instability and aneuploidy. He overturned several dogmas in the sex chromosome field, for instance showing that the X chromosome, previously assumed to be the female-specialised counterpart to the male Y chromosome, contains hundreds of genes regulating sperm formation. He has championed the use of marsupials to resolve major unanswered questions in sex chromosome evolution and epigenetics. He discovered the non-coding RNA Rsx, the long-sought after marsupial equivalent of the eutherian X-inactivation initiating RNA Xist. He also identified Xsr, the Rsx-antisense RNA that may control imprinting of X-inactivation in marsupials. These discoveries provided a comparative system with which to dissect how non-coding RNAs regulate gene expression. Most recently, he created the first CRISPR-based system for generating all-male or all-female mouse litters, an achievement that will be of great relevance to research and agriculture. His achievements have been acknowledged by election as an EMBO member and a member of the Academy of Medical Sciences.

### Mitinori Saitou, MD, PhD

*Department Of Anatomy and Cell Biology, Graduate School Of Medicine, Kyoto University*



Mitinori Saitou received his M.D. from the Kyoto University Faculty of Medicine in 1995, and received his Ph.D. in 1999 for his study of the structure and function of tight junctions under Shoichiro Tsukita in the Kyoto University Graduate School of Medicine. He then moved to the Wellcome Trust/Cancer Research Campaign Institute (present name: Wellcome Trust/Cancer Research UK Gurdon Institute), where he worked as a postdoctoral research associate in Azim Surani's laboratory, focusing on the origin of the germ line in the mouse. He was appointed team leader at the RIKEN Center for Developmental Biology in 2003. He continued to work on the origin, properties and regulation of the germ line in the mouse. He was appointed professor at the Kyoto University Graduate School of Medicine in 2009. He was appointed director of the JST ERATO program in 2011. He was appointed professor at the Kyoto University Institute for Advanced Study (KUIAS) and director of the Institute for the Advanced Study of Human Biology (ASHBi) in 2018. His work focuses on the mechanism and in vitro reconstitution of germ cell development in mice, non-human primates, and humans.

## Andrew J. Modzelewski, PhD

*School of Veterinary Medicine, University of Pennsylvania*



Dr. Andrew J. Modzelewski (Dr. Modz) is an assistant professor in the Department of Biomedical Sciences who was recruited to Penn Vet last year. Dr. Modzelewski received his B.S. from Penn State University with a major in Biochemistry and Molecular Biology. Dr. Modz then went to Cornell University for his Ph.D. in Genetics, Genomics and Development with Dr. Paula Cohen where he developed an interest in reproduction and development with a special interest in non-coding RNAs. Andrew did his postdoc at the University of California at Berkeley with Dr. Lin He, an expert on miRNAs and Cancer, but shifted to early embryos and ancient viral elements (retrotransposons). Dr. Modz modified and developed various tools to study the phenomenon of Retrotransposon Reactivation that occurs in all mammalian preimplantation embryos. One of these tools is an electroporation based CRISPR/Cas9 delivery system called “CRISPR RNP Electroporation of Zygotes” (CRISPR-EZ). Despite being called “Junk DNA”, Dr. Modz published evidence of the first essential retrotransposon in mammalian preimplantation development, suggesting instead a “symbiotic” instead of parasitic relationship. At Penn, Dr. Modz plans to further study the developmental roles of retrotransposon reactivation in the early embryo and reproduction and extend this to instances of epigenetic breakdown that occurs in aging, disease, and cancer, where retrotransposons frequently re-emerge and potentially contribute to malignancy.

## Monica Mainigi, MD

*Hospital of the University Of Pennsylvania*



Dr. Mainigi is an Associate Professor in the Division of Reproductive Endocrinology and Infertility at the University of Pennsylvania. Her laboratory focuses on examining the interactions between per-implantation exposures and early placentation utilizing animal models, in vitro culture systems, and human tissues. Specifically, using Assisted Reproductive Technologies as a model, she has examined how specific interventions utilized during ART can lead to changes in placentation and adverse outcomes. Studying early implantation in humans is challenging. Therefore, to address these challenges, her laboratory has partnered with bioengineers in the laboratory of Dr. Dan Huh to utilize their organ-on-a-chip technology to model early placentation. Using this ‘implantation-on-a-chip’ device and primary human cells, they have found that uterine immune cells play a critical role in regulating early trophoblast invasion and spiral artery remodeling and that patients at risk for abnormal placentation may have changes in these immune cell populations. They are currently developing new protocols to use this device to examine how maternal cells may influence trophoblast differentiation using iPS derived trophoblasts. These studies will aid us understanding how the preexisting maternal environment can affect pregnancy outcomes and help us develop interventions to minimize these risks.

## Kathleen O’Neill, MD, MTR

*Department of Obstetrics and Gynecology, University of Pennsylvania*



Kate O’Neill is an assistant professor of Obstetrics and Gynecology in the Division of Reproductive Endocrinology and Infertility. She originally hails from Michigan and did her undergraduate studies at Duke University. After graduating from medical school at the University of Michigan she completed her residency in obstetrics and gynecology at Washington University in St. Louis’ Barnes-Jewish Hospital. She came to the University of Pennsylvania to receive fellowship training in Reproductive Endocrinology and Infertility and joined the faculty in 2017. She is an NIH-funded physician-scientist and her clinical and research interests include recurrent pregnancy loss, endometrial regeneration, and molecular characterization of the endometrial and myometrial niches. She is also Co-Principal Investigator of the Penn Uterus Transplant (UNTIL) Trial at the University of Pennsylvania. She lives in Haverford with her husband and three feral sons and enjoys food, bingeing Netflix series and refurbishing furniture.

## Kotaro Sasaki, MD, PhD

*School of Veterinary Medicine, University of Pennsylvania*



Dr. Sasaki is a group leader and the Assistant Professor in the Department of Biomedical Sciences at the University of Pennsylvania School of Veterinary Medicine and in the Department of Pathology and Laboratory Medicine at the University of Pennsylvania Perelman School of Medicine. He is a board certified anatomic pathologist, completed anatomic pathology residency at the University of Pittsburgh and renal pathology fellowship at the University of Washington. Prior to joining the University of Pennsylvania, he completed a postdoc training at Mitunori Saitou Lab at Kyoto University. Dr. Sasaki’s research is focused on the development of human germline and urogenital organs. His team’s major research accomplishment includes 1) the discovery of the nascent amnion as the origin of primate germline, 2) first reconstitution of human primordial germ cell and prospermatogonial development using pluripotent stem cells, 3) identification of the origin of human gonadal and adrenal lineage and 4) the reconstitution of human adrenal specification using pluripotent stem cells. These discoveries lay the foundation for understanding molecular basis of human infertility, reproduction and endocrinology. Dr. Sasaki’s research has been continuously supported by a number of research awards, including HRFF Cure formula award, NIH NIDA brain initiative, and Open Philanthropy Transformative Basic Science Award.