

Publications of the Week
Gasdermin D Pore Structure Reveals Preferential Release of Mature Interleukin-1

First Author: Shiyu Xia | Senior Authors: Jianbin Ruan and Hao Wu (pictured)
 Nature | Boston Children's Hospital, Harvard Medical School, Brigham and Women's Hospital, and the Broad Institute



Inflammasomes activate caspase-1 and other inflammatory caspases that cleave gasdermin D (GSDMD). Caspase-1 also cleaves inactive precursors of the interleukin (IL)-1 family to generate mature cytokines such as IL-1 β and IL-18. Cleaved GSDMD forms transmembrane pores to enable the release of IL-1 and to drive cell lysis through pyroptosis. The authors reported cryo-electron microscopy structures of the pore and the prepore of GSDMD. [Abstract](#)

Single-Cell Analysis of FOXP3 Deficiencies in Humans and Mice Unmasks Intrinsic and Extrinsic CD4⁺ T Cell Perturbations

First Author: David Zemmour | Senior Authors: Diane Mathis and Christophe Benoist (pictured)
 Nature Immunology | Harvard Medical School and Boston Children's Hospital



Forkhead box P3 (FOXP3) deficiency in mice and in patients with immune dysregulation polyendocrinopathy enteropathy X-linked (IPEX) syndrome results in fatal autoimmunity by altering regulatory T (T_{reg}) cells. CD4⁺ T cells in patients with IPEX syndrome and FOXP3-deficient mice were analyzed by single-cell cytometry and RNA-sequencing, revealing heterogeneous T_{reg}-like cells, some very similar to normal T_{reg} cells, others more distant. [Abstract](#)

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Awards
Valhalla Foundation Makes \$3.4 Million Grant to the Whitehead Fellows Program

Whitehead Institute



Since 1984, the prestigious Whitehead Fellows Program has enabled extraordinarily talented young scientists to launch independent labs right out of graduate school, instead of joining a senior researcher's lab. The first Valhalla Foundation Fellow will be Dr. Toblioba Oni (pictured), who joined the Institute in February as a Whitehead Fellow. Dr. Oni is a cell biologist whose graduate research focused on pancreatic cancer. [Read More](#)

Top Collegiate Inventors Awarded 2021 Lemelson-MIT Student Prize

MIT News



Following a year that demonstrated the importance and practical applications of scientific advancement and invention, the Lemelson-MIT Program has announced seven winners of its annual 2021 Lemelson-MIT Student Prize. Winners include Dr. Nicole Black (pictured) from Harvard University, who invented a tunable, biomimetic eardrum graft that allows the eardrum to essentially heal itself. [Read More](#)

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Local News
Organ Chips, Organoids, and the Animal Testing Conundrum

Nature Reviews Materials



Nature Reviews Materials spoke with Dr. Donald Ingber, Founding Director of the Wyss Institute for Biologically Inspired Engineering at Harvard University, about the animal testing conundrum and the importance of human-relevant models in biomedical research. Dr. Ingber explained why we still use animal models and why he thinks reviewers should demand validation in a human-relevant model rather than in an animal model. [Read More](#)

Large Collaboration Creates Cell Atlas of COVID-19 Pathology

Broad Institute



Single-cell analysis of autopsy samples from COVID-19 patients shows how the lungs repeatedly tried, and failed, to repair themselves. "You really feel the tragedy of the disease when you see that result," said Dr. Aviv Regev (pictured), co-senior author of the study and a core institute member at the Broad Institute of MIT and Harvard when the study began. "The lung tries everything at its disposal, and it still can't fix itself." [Read More](#)

How B Cells Fight SARS-CoV-2

Broad Institute



A study of antibody-producing B cells from patients who recovered from COVID-19 reveals a new cross-reactive antibody and what makes some B cells more effective at neutralizing the virus. "We found that not all B cells are the same, and that some are super antibody-producers. The findings offer insight into how to design antibodies that can neutralize several coronaviruses," said Dr. Ramnik Xavier (pictured), co-senior author of the study. [Read More](#)

Research News: Lung Precancer Pathology

Boston University



A recently published study from the Varelas laboratory has identified new mechanisms contributing to the development of precancer lesions in lung airways. Precancer lesions that arise in airways are associated with chronic lung damage, such as that induced by cigarette smoke, and such lesions are predisposed to transitioning into lung squamous cell carcinoma, a poorly treatable subtype of non-small cell lung cancers. [Read More](#)

Scientists Create First-of-Its-Kind 3D Organoid Model of the Human Pancreas

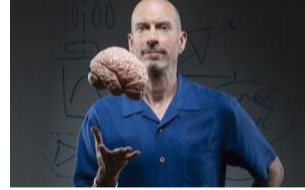
Beth Israel Deaconess Medical Center



Researchers at the Cancer Research Institute at Beth Israel Deaconess Medical Center have successfully created the first 3D organoid models of the pancreas from human stem cells. Unlike previous platforms for the study of pancreatic cancer, this first-of-its-kind organoid model includes both the acinar and ductal structures that play a critical role in the majority of pancreatic cancers. The work was led by Dr. Senthil Muthuswamy (pictured, far left). [Read More](#)

Anesthesia Doesn't Simply Turn Off the Brain, It Changes Its Rhythms

The Picower Institute



Simultaneous measurement of neural rhythms and spikes across five brain areas in animals reveals how propofol induces unconsciousness. Electrically stimulating the thalamus restores synchrony of the brain's normal higher frequency rhythms and activity levels, waking the brain back up and restoring arousal. "What we show is that propofol dramatically changes and controls the dynamics of the brain's rhythms," said co-senior author Dr. Earl Miller (pictured). [Read More](#)

They Call It a 'Women's Disease.' She Wants to Redefine It.

The New York Times



Dr. Linda Griffith (pictured) founded her lab with the goal of helping researchers solve endometriosis, a chronic disorder in which tissue similar to that which normally lines the uterus instead grows outside it. The disease strikes one in 10 women, as well as trans men and nonbinary people who menstruate. Her mission is to change the conversation, from one of women's pain to one of biomarkers, genetics and molecular networks. [Read More](#)

Five from MIT Elected to American Academy of Arts and Sciences for 2021

MIT News



Five MIT faculty members are among more than 250 leaders from academia, business, public affairs, the humanities, and the arts elected to the American Academy of Arts and Sciences. This includes Dr. Li-Huei Tsai (pictured), whose laboratory is interested in elucidating the pathogenic mechanisms underlying neurological disorders that impact learning and memory. [Read More](#)

DNA: From Blueprint to Blank Slate

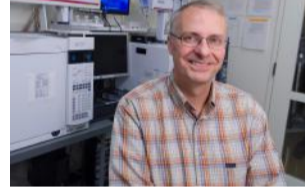
Wyss Institute



DNA has come a long way since it was first described in 1866 by Swiss chemist Friedrich Miescher. So much so, in fact, that in 2003 the US Congress designated April 25th National DNA Day to commemorate the successful completion of the Human Genome Project that year, and the discovery of DNA's double helix structure in 1953. Since then, DNA has become an incredibly valuable tool for healthcare, agriculture, and even data storage. [Read More](#)

MIT's Vander Heiden on Delineating Science from Engineering

The Cancer Letter



The boundary between basic science and engineering has been the subject of animated discussions in cancer research for quite some time. Where does science end and engineering begin? Is that boundary porous? Dr. Matthew Vander Heiden (pictured), an oncologist and cancer researcher who recently became Director of the MIT Koch Institute for Integrative Cancer Research, gives insight into where these discussions may take cancer physicians and scientists. [Read More](#)

Using CRISPR as a Research Tool to Develop Cancer Treatments

MIT News



KSQ Therapeutics uses technology created at MIT to study the role of every human gene in disease biology. By observing the effect of turning on and off individual genes, KSQ can decipher their role in diseases like cancer. "Now we can look at every single gene, and therefore there are new aspects of biology and disease to discover, and some of these have clinical value," said Co-Founder Dr. David Sabatini (pictured). [Read More](#)

Hunger Cues

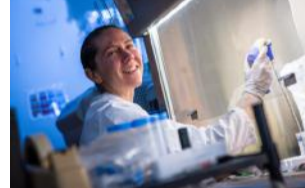
Harvard Medical School



Research by Drs. Stephen Liberles (pictured) and Nao Horio at Harvard Medical School illuminates the neurobiology that underlies food attraction and how hungry mice choose to pay attention to one object in their environment over another. The investigators homed in on a signaling molecule called neuropeptide-Y, which is secreted by hunger-regulating neurons into the thalamus. [Read More](#)

Study Uncovers Potent Immunotherapy Approach to Ovarian Cancer Treatment

Dana-Farber Cancer Institute



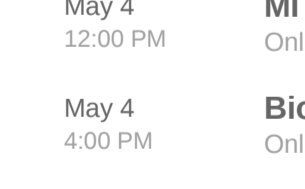
"In clinical trials, checkpoint inhibitors haven't had as much success against high-grade serous ovarian cancer (HGSOC) as other types of cancer," said Dana-Farber's Dr. Sarah Hill (pictured), the senior author of the study. "To learn why that is, we need to better understand these drugs' molecular mechanism of action in HGSOC and pinpoint the immune cells they target." [Read More](#)

Engineering Disease Fighters

Harvard-MIT Health Sciences and Technology



With synthetic biology and AI, Dr. Jim Collins (pictured) takes on this pandemic — and the next. "As the pandemic unfolded in February and early March 2020, more and more people wanted to do what they could to help out," said Dr. Collins. "As a lab director, I began working to figure out how we could best contribute to fighting the pandemic." In many ways, he was perfectly positioned to take on the crisis. [Read More](#)

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- May 4 12:00 PM **MIT's Brains on Brains**
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- May 4 4:00 PM **Biology Colloquium Series (Dr. Beronda Montgomery)**
Online
- May 4 7:00 PM **Using Fundamental Biology to Counter Climate Change**
Online
- May 13 4:00 PM **MIT Colloquium on the Brain and Cognition with Dr. Betty Hong, Caltech**
Online
- May 17 1:00 PM **Symposium: Engineering Cancer Immunotherapy**
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