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Genomics Meets Exposomics Advancing Gene by Environment Science

Mendel Museum in Brno, Czech Republic | October 20-21, 2025

Meeting Report

By L. Michelle Bennett, LMBennett Consulting, LLC



In Brief

In October 2025, researchers gathered at the Mendel Museum in Brno—the birthplace of genetics—to explore the integration of genomics and exposomics. The meeting, inspired by the city's own layered history of transformation, brought together leaders from across scientific domains to chart a path toward understanding how genes and environment jointly shape health. Through focused presentations, deep discussion, and intentionally designed time for connection, participants built shared understanding and identified key priorities for advancing exposome research within biomedical science. The resulting framework will inform a forthcoming white paper and ongoing collaborations aimed at accelerating discovery across disciplines.

Brno—Where Integration Begins

When we gathered in Brno, Czech Republic, to explore how genomics and exposomics might come together, it was hard not to feel the weight—and inspiration—of place. Brno is a city built through integration: medieval, Baroque, and modernist layers meeting in one living landscape. It's a city that shows what happens when eras, ideas, and aesthetics coexist rather than compete.

Our meeting took place at the Augustinian Abbey of St. Thomas, where Gregor Mendel conducted his now-legendary pea plant experiments more than 160 years ago. In the courtyard where Mendel once tended his plants, the field of genetics quietly began. He saw order hidden within variation—laws of inheritance that would not be recognized until long after his death. Standing there, surrounded by the same walls that sheltered his work, felt both grounding and galvanizing: we were not just meeting in Brno; we were meeting at the birthplace of genetics itself.

A few blocks away lies the Labyrinth beneath the Cabbage Market—a network of cellars and passageways once hidden from view. That underground world is an apt metaphor for exposomics, a field still charting the unseen layers of human experience: the exposures, interactions, and influences that shape biology from the outside in. Genomics maps what is coded, exposomics seeks what is lived.

At the Old Town Hall, a crocodile—Brno's famous “dragon”—hangs from the rafters, a relic of folklore and imagination. It's a reminder that new knowledge often begins in misunderstanding, and that progress depends on curiosity as much as certainty. And above the city, Špilberk Castle stands as both fortress and former prison—proof that structures built to protect ideas can, if left closed too long, confine them. Together, these elements—Abbey, Labyrinth, Dragon, Castle—embody the spectrum of integration we came to discuss. Like Brno itself, science advances when it allows diverse ideas, eras, and disciplines to meet, to question, and to evolve together.

At the Abbey, we brought together leaders from genomics and exposomics to begin that process of integration—to explore how two complementary perspectives might together illuminate the full landscape of health and disease. What follows is a walk through that meeting: the conversations that unfolded, the connections that began, and the collective sense that we stand at a threshold—where the next generation of discovery will depend, as it did in Mendel's garden, on learning to see patterns across boundaries.

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NEXUS Reflections “Genomics Meets Exposomics” Conference

By: Gary Miller, PhD, Columbia University
NEXUS MPI



The goal of the Conference “Genomics Meets Exposomics: Advancing Gene x Environment Science” held October 20-21, 2025, at the Mendel Museum in Brno, Czech Republic was to develop an action plan for the advancement of gene by environment studies to better understand human disease. Advances in sequencing technologies have revealed countless discoveries of the genetic drivers of human disease, but for most chronic diseases, genetics can only account for a portion of the variability. A broad range of environmental, behavioral and social factors are known to contribute to human disease. Recent advances in



exposomics, designed to systematically analyze the physical, chemical, biological, and social factors that influence disease, now position the research community to systematically perform gene-by-environment experiments.

The need for this conference was sparked by the "Integrating Exposomics into the Biomedical Enterprise" meeting convened at the Barbary Center of Cold Spring Harbor Laboratories in December 2023. At this gathering a group of scientists developed a unified definition of the exposome that could be embraced by investigators across the world and identified key challenges that needed to be overcome. The resulting paper was published in 2025 (Barbary Exposomics Consortium, 2025).

The 2025 Mendel Museum Meeting "Genomics Meets Exposomics" complemented the Barbary Meeting by providing deeper engagement with those in the genetics community and European scientists to address the critical need of merging methods, techniques, and expertise in exposomics and genomics to provide a foundation for systematic gene-by-environment studies. NEXUS MPI Gary Miller, PhD, Columbia University, who co-organized the Barbary Meeting with Michelle Bennett, PhD., LM Bennett Consulting, met with Jana Klánová, PhD., Masaryk University, RECETOX, in Brno in 2023 to discuss plans for the Barbary Meeting, which Dr. Klánová attended. At that time, the two proposed holding a follow-up meeting to Barbary at the Mendel Museum (over lunch that included pea soup). In 2024, a contingent from NIEHS traveled to Brno to visit Masaryk University and RECETOX, as well as to tour the Mendel Museum facilities. All agreed that the Mendel Museum was the ideal location for the 2025 meeting.

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Higher Resolution of Exposome-by-Genome Interactions: unifying genomic and exposomic science in search of relevant phenotypic variation

By: Chirag J. Patel, PhD, Harvard University
NEXUS MPI/ NEXUS Exposomics Data Science Hub



Mendel and me. h/t Gary Miller

Last month, researchers from genomics, epidemiology, environmental health, and computational biology met at the Mendel Museum in Brno—quite literally in the garden where Gregor Mendel first uncovered the rules of inheritance. Gathering in this symbolic space, we explored the future of exposome-by-genome science and asked how our community can build next-generation tools for understanding human variation. What emerged was a unified message: the time has come to bring the rigor, scale, and structure of genomics to the exposome and execute on *ExWASs*: conducting exposure-wide analyses in the same spirit that re-focused the genetics community.

Mendel: A reminder that inheritance has two halves

Genomics has transformed biomedical science because it developed standards: reference genomes, coordinated pipelines, shared cohorts, transparent methods. Exposomics—the study of environmental exposures and their biological impact—has lacked comparable structure.



Mendel's Principles: one of the ways that it works.

At the meeting, new scientific findings highlighted why we need that structure. For example, work discussed by Kári Stefánsson showed that even canonical genetic loci such as *FADS1* behave very differently depending on ancestry, geography, and diet. Longitudinal proteomic analyses, such as those applied to the FOURIER trial, also demonstrated that protein signatures change with therapy and environmental influence.

This is the exposome in action: **dynamic, context-dependent, and biologically meaningful.**

[Continue Reading](#)

Exposing and Finding the Heritability

By: Greg Gibson, PhD, Georgia Institute of Technology



Geneticist Greg Gibson, PhD, Georgia Institute of Technology reflected after attending the October 2025 Genomics meets Exposomics Meeting in his Substack article "Exposing and Finding the Heritability"

[Read the article here](#)

Spotlight

Michael Snyder, Ph.D. Stanford University



Michael Snyder is the Stanford Ascherman Professor and Chair of Genetics and the Director of the Center of Genomics and Personalized Medicine. A global leader in genomics and other omics, he has expanded his work to include exposomics and wearables with a variety of innovative approaches and studies, including this [pivotal paper](#) in *Cell*. Dr. Snyder received his Ph.D. at the California Institute of Technology and completed postdoctoral training at Stanford University. He is a leader in the field of functional genomics and metagenomics, and one of the major participants of the [ENCODE project](#).

Learn more

His laboratory study was the first to perform a large-scale functional genomics project in any organism, and has developed many technologies in genomics and proteomics. These including the development of RNA-Seq, proteome chips, high-resolution tiling arrays for the entire human genome, methods for global mapping of transcription factor (TF) binding sites (ChIP-chip now replaced by ChIP-seq), and paired-end sequencing for mapping of structural variation in eukaryotes. His laboratory pioneered de novo genome sequencing of genomes using high-throughput technologies and remote microsampling for deep data profiling. These technologies have been used for characterizing genomes, proteomes and regulatory networks. Seminal findings from the Snyder laboratory include the discovery that much more of the human genome is transcribed and contains regulatory information than was previously appreciated (e.g. lncRNAs and TF binding sites), and a high diversity of transcription factor binding occurs both between and within species. He launched the field of personalized medicine by combining different state-of-the-art “omics” technologies to perform the first longitudinal, detailed integrative personal omics profile (iPOP) of a person, and his laboratory pioneered the use of wearables technologies (smart watches and continuous glucose monitoring) for precision health. He is a cofounder of many biotechnology companies, including Personalis, SensOrnics, Qbio, January, Iollo, January AI, Mirvie and Flirtrine.

Fun Fact: Although Dr. Snyder wasn't able to attend the Genomics Meets Exposomics meeting in Brno, he arrived later in the week to give the Mendel Lecture and visit with the RECETOX team at Masaryk University. Dr. Krystal Pollitt, Dr. Gary Miller, Dr. Jana Klanova, Dr. Elliott Price, and Dr. Helge Hecht shared updates on NEXUS and EIRENE with Dr. Snyder.



Dr. Snyder presenting the Mendel Lecture at the Mendel Museum.



Dr. Klanova giving Dr. Snyder a tour of the Masaryk University Biobanking Facility, which houses the largest sample set in the Czech Republic.



Dr. Snyder's Presentation



Dr. Elliott Price explains the exposomics workflow used by RECETOX to Dr. Snyder, Dr. Pollitt, Dr. Klanova, and Dr. Bennett.



Dinner in Brno with Dr. Snyder and members of EIRENE and NEXUS.

Read the full spotlight

🎙 NEXUS Podcast

Season 1 | Episode 3 A Conversation with Dr. Ewan Birney

In this episode NEXUS MPI Chirag Patel, PhD, Harvard University sits down with [Ewan Birney](#), PhD, Interim Executive Director of the [European Molecular Biology Laboratory \(EMBL\)](#) where they discuss the work being completed at EMBL, and the intersection between genomics and exposomics.

The objective of the NEXUS Podcast is to bring together stakeholders of the field of exposomics to foster dialogue around key topics, further the understanding, facilitate the advancement of the field of exposomics along with identifying ways that exposomics can support other scientific fields.

Listen to the episode on Spotify!



Visit the NEXUS Youtube Channel

NEXUS In the Scientific Community



Exposomics highlighted in the University of Toronto Commencement Ceremony

October 30, 2025
Toronto, Canada

NEXUS Chem Bio Analytical Sciences Hub Co-lead, Krystal Pollitt, PhD, P.Eng., Yale University, delivered the commencement address at her alma mater, the University of Toronto in October. In her speech, Dr. Pollitt spoke to graduates from the School of Graduate Studies (SGS); Faculty of Applied Science & Engineering, and John H. Daniels Faculty of Architecture, Landscape, and Design highlighting the field of exposomics specifically the ideas of Dr. Christopher Wild 20 years ago. Dr. Wild suggested a need for an environmental complement to the genome, a way to comprehensively measure all our exposures together throughout our lives. Dr. Pollitt comments that "Chemical engineering taught me to approach complex challenges and uncertainty systematically, and my work has centred on developing technologies that measure the exposome to address what seemed impossible in 2005. Through interdisciplinary collaboration and bold innovation, Wild's vision is becoming reality..."

[Listen to Dr. Krystal Pollitt's speech here](#)

[Learn more about Dr. Krystal Pollitt](#)



[Read "The exposome at twenty: a personal account"](#)

On the twentieth anniversary of introducing the term "exposome", Dr. Christopher Wild reflects on the history of exposomics in a personal account. In this paper, Dr. Wild discusses his journey in developing the field, the need for exposomics as a complement to the human genome, along with his vision for future directions of the field.



SETAC North America Annual Meeting

November 16-20, 2025
Portland, Oregon

At the [SETAC Annual Meeting](#) Jeremy Koelmel, PhD, associate research scientist at Yale University and member of the NEXUS Chem Bio Analytical Sciences Hub, along with John Bowden, PhD, University of Florida held a full-day workshop which provided a comprehensive exploration of targeted and non-targeted PFAS analysis. This training courses had an emphasis on non-targeted approaches. Participants examined the fundamentals of PFAS, including PFAS structural motifs, classifications, and available databases with corresponding meta-data. This expert-led session covered sample handling, extraction, available standards, acquisition methods, quality control, and data-processing and interpretation. After covering the topics, the workshop challenged participants with PFAS analysis trivia, and had teams collaborate to mine PFAS from online datasets, culminating in a collective examination of findings. The workshop concluded with a discussion on available resources for the community and provide in-depth SOPs, tutorials and other resources to participants get the most out of their samples. Overall, this workshop offered valuable skills and knowledge for researchers and other stakeholders at all career levels.



Dr. Koelmel presentation of "Non Targeted and Targeted PFAS Analysis Using LC-HRMS/MS"

[Learn more about the workshop](#)

NEXUS In The News



An estimated 90% of diseases have environmental triggers. These researchers want to build a framework of prevention

[Read Article Here](#)



Genomics Meets Exposomics: Historic Meeting Ushers in a New Age of Human Health Discovery

[Read Article Here](#)

[NEXUS in the News](#)



Upcoming Events

NEXUS Community Events

Towards a Human Exposome

Cell Atlas

December 9, 2025 | Virtual Webinar
7:30-9:00am EST



TOWARDS A HUMAN EXPOSOME ATLAS

The webinar series 'Towards a Human Exposome Cell Atlas', co-hosted by UNESCO, the Global Exposome Forum, and the Human Cell Atlas will explore how connecting the Exposome and the Human Cell Atlas can advance global health understanding and impact.

This first session, December 9, 2025, will focus on endocrine disruptors and examine opportunities and challenges in combining single cell mapping (HCA) and exposomics to advance the Human Exposome Project and human health in general.

[Register for the webinar](#)

Advancing Exposomics in Population Health Research: Recent Insights and Development

December 18, 2025 | Virtual Webinar
4:00-5:45 PM HKT / 9:00-10:45 AM UKT

[Register for the webinar](#)



HHEAR Exposomics Webinar Series

December 16, 2025 | Virtual Webinar
2:00 PM - 3:00 PM EST



The final webinar in the HHEAR Exposomics webinar series as Dr. Elena Colicino from Icahn School of Medicine at Mount Sinai discusses mixture analysis, windows of exposure, and children's health. Mounting evidence indicates that environmental exposures during pregnancy and early infancy can leave long-term effects on how the immune system develops and functions. Here we will show the associations between chemical exposures and aspects of the immune system, highlighting novel mixture modeling approaches to improve risk assessment.

[Register for the webinar](#)

Advancing Exposome Research in Neurological Disorders and Stroke

January 13-14, 2026 | Rockville, MD



This workshop hosted by The National Institute of Neurological Disorders and Stroke will center on understanding the interaction of exposome factors and their composite effect across the lifespan on neurological disorders and on neurological resilience. It will also provide a platform for idea exchange, collaboration, and networking. Keynote speakers include Robert O. Wright, M.D., M.P.H., Icahn School of Medicine at Mount Sinai and NEXUS MPI Gary W. Miller, Ph.D., Columbia University.

[Learn more](#)

AAAS Meeting: How the Human Exposome Will Unlock Better Health and Medicine

February 14, 2026 | Phoenix, AZ



At the AAAS Annual Meeting, the Exposome will be featured during a discussion panel "How the Human Exposome Will Unlock Better Health and Medicine" organized by NEXUS Collaborator Thomas Hartung, MD, PhD, Johns Hopkins University, co-organized by Aidan Gilligan, SciCom - Making Sense of Science, and the discussion will be moderated by Clive Cookson, Financial Times Kingdom. Panelists include NEXUS MPI Gary Miller, PhD, Columbia University, NEXUS Collaborator Fenna Sillé, PhD, Johns Hopkins University and Rémi Quirion, PhD, Chief Scientist of Québec. This panel brings together architects of the Exposome Moonshot Forum, an event setting the foundation for The Human Exposome Project, to give a mapping progress update. Speakers will discuss how newly established exposomic committees are maximizing science at scale via inherent advantages such as the convergence of artificial intelligence, advanced sensors, metabolomics, and big data analytics. They will show how this consortium is embracing the challenge of implementing science and policy at scale for the benefit of society. Speakers will also discuss the craft of feeding in complex advice into policymaking on hotly contested new technologies.

[Learn more](#)

Global Exposome Summit

April 27-29, 2026 | Sitges, Spain



The Global Exposome Summit 2026 will promote international research and coordination on the exposome. It will bring together researchers, policymakers, industry, funders, and other stakeholders working on advancing human health through exposome research and practice. The International Human Exposome Network (IHEN) and the Global Exposome Forum (GEF) are joining forces to organize the Global Exposome Summit 2026.

Abstract submissions are now open, the deadline is December 22, 2025.

[Learn more](#)

[Call for Abstracts](#)

Bordeaux Exposome Symposium

June 17-19, 2026 | Bordeaux, France



The Bordeaux Symposium hosted and organized by Mount Sinai Icahn School of Medicine Institute for Exposomic Research will convene leading scientists and trainees dedicated to advancing the integration of environmental exposures into research on Alzheimer's Disease and Related Dementias (AD/ADRD). Drawing on a global network of researchers with complementary expertise in exposomics, data science, and neurodegenerative disease, the meeting provides a powerful foundation for discovery.

Travel Awards Available for Early Career Researchers and Trainees.

[Learn more](#)

ISES 2026 Annual Meeting

October 4-8, 2026 | Vancouver, Canada



The ISES 2026 Annual Meeting aims to explore groundbreaking research in exposure science, epidemiology, toxicology, and risk assessments, and will be bringing together researchers, students, academics, government and private sector attendees from around the world in the exposure field.

Stay tuned for more registration details!

[Learn more](#)

[Visit the NEXUS Calendar](#)

Community Podcasts

MendelPod Podcast

"From GWAS to EWAS: Chirag Patel and Gary Miller on the Rise of Exposomics"

[mendelPod.com](#)

Featuring: Gary Miller, PhD, Columbia University and Chirag Patel, PhD, Harvard University

[Listen to the Episode](#)

In this episode, Dr. Miller and Dr. Patel discuss with Theral Timpson why the genome alone can't answer the biggest questions in human health, along with the fields need for exposome-wide association studies (EWAS) to systematically search for environmental drivers, among much more!

ACT Tox Chats



Human and Environmental Health
Topic: Next Generation Risk Assessment

Featuring: Gary Miller, PhD, Columbia University

[Listen to the Episode](#)

"In this episode, Aimee Altemus and Adelaide Frimpong speak with Dr. Gary Miller of Columbia University, a widely recognized leader in exposome research. Dr. Miller discusses how the exposome—the full spectrum of environmental exposures throughout a lifetime—is transforming our approach to human and environmental health. He highlights how exposomics, data science, and toxicology contribute to Next Generation Risk Assessment strategies to more accurately predict disease risk and guide public health strategies. From innovative technologies to ethical implications, this conversation offers a compelling look at the future of health science in a complex and rapidly changing world."

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