BANBURY CENTER

BANBURY CENTER EXECUTIVE DIRECTOR'S REPORT

Since 1978, Cold Spring Harbor Laboratory's Banbury Center has convened impactful discussion meetings that allow small groups of experts to debate important issues and inspire new thinking. Meetings are organized around issues and challenges in the biosciences that benefit from the Center's unique style of discussion: emerging issues in need of strategy, established fields in need of review, controversial subjects calling for compromise or consensus, and areas in which diverse stakeholders/sectors need to engage or collaborate.

Activities

It was another productive year at Banbury, with more than 50 events using the estate, including traditional Banbury meetings, Meetings and Courses Program (Workshop on Leadership in Bioscience; Workshop on Pancreatic Cancer; Vision: A Platform for Linking Circuits, Perception, and Behavior; Neural Data Science; Workshop on Autism Spectrum Disorders; Neuroscience of Addiction; Scientific Writing Retreat); Watson School of Biological Sciences courses (Immunology, Physiology of the Cell); and laboratory retreats.

The Center welcomed 475 expert participants in 2019—72% participating in their first Banbury meeting. Women represented 40% of total participants as well as 37% of meeting organizers. Experts were drawn from academia (76%), industry (9%), not-for-profit organizations (8%), U.S. and foreign governments (5%), and publishing or writing (1%). We continue to have global reach, with experts representing five continents, 20 nations, and 32 U.S. states. International attendees constituted 24% of total Banbury meeting participants.

Banbury meetings in 2019 spanned six thematic areas: cancer, neuroscience, technology, public health, plant biology, and science policy; many individual meeting topics touched on more than one of these themes. More than 60% centered on developing strategies for emerging fields or innovating in existing fields, whereas more than a quarter aimed to bridge divides across sectors, disciplines, and communities, and just more than 10% tackled challenging policy issues.

Cancer

Cancer is a common theme for Banbury convenings, bringing together groups to examine the latest research as well as emerging concepts. In March, experts in *Cancer Fibroblasts and Therapies* examined roles for these cells in tumor progression and response to treatment. Also in March, *Cancer Immunotherapy: Where to Go Next* participants reviewed the current state of immunotherapy agents, with discussions of new approaches to translational research in this area. The following month, clinicians and researchers met to ask, *Glioblastoma: Why Is Impactful Science So Hard to Translate?* During their two and a half days, the group explored major obstacles to translating the "bench" to the "bedside." We ended our 2019 cancer meetings, and the meetings season as a whole, with December's *The Nervous System in Cancer*. This truly interdisciplinary meeting convened neuroscientists, cancer biologists, clinicians, academia, and industry to chart the course for a new field: cancer neuroscience.

Neuroscience

In neuroscience, four Banbury meetings tackled questions spanning foundational research to issues in translation, practice, and policy. Our first meeting of the 2019 season, *Computational*

Psychiatry, used a series of breakout groups to develop recommendations for improving the use of computational psychiatry methods to address clinical problems. Further targeting mental health practice, our *Bridging the Research-to-Practice Chasm in Digital Mental Health* meeting convened a diverse group of stakeholders to identify the major obstacles to implementation of digital tools in U.S. mental health care and to agree to recommendations to overcome these challenges. Shifting further into translational research, March's *Integrated Control of Feeding and Energy Balance by Hypothalamic and Hindbrain Circuits* explored the intersection of brain systems involved in weight regulation, taste, and illness and mapped out important next steps for research. Finally, in October, experts gathered for *CaMKII and Its Role as a Self-Tuning Structural Protein at the Synapse*, sharing their latest research and inspiring new ideas and collaborations.

Technology

Two 2019 meetings centered on technology development, with very different applications. In March, we reconvened a 2018 group to continue discussions of *DNA for Digital Storage*. Experts drawn from diverse disciplines and sectors, who may not have a consistent place to connect, were able to discuss progress in the field as well as new or persisting challenges. At September's *Liquid Biopsies* meeting, the focus was on this rapidly developing technology for diagnosing cancer and monitoring treatment. Companies developing this technology, as well as translational researchers and clinicians, discussed new research and future strategies.

Public Health

Banbury's history convening discussions around public health issues continued with two meetings. In May, a highly international group convened at the Center to discuss *Intermediate Indicators for Impact: The Art and Science of Effective Definition and Use of Prevention Indicators in the HIV Response*. The meeting brought together experts experienced with collecting and analyzing data, those responsible for using the analyses and knowledge, as well as those affected by resulting programs to consider opportunities for the future of the global HIV response. Similarly considering future outlooks, November's *Microbiology of the Built Environment* meeting reviewed ongoing work studying microbes living on and inside built structures that can be linked to human health, focusing on strategies to ensure long-term momentum for this intersectional field.

Plants

Further drawing from the microbiology theme, but shifting from humans and buildings to plants, April's *The Plant Microbiota* meeting convened plant and microbial scientists to review the latest advances in plant–microbial interactions research, as well as implications for plant biotechnology and food security.

Science Policy

With an eye toward science policy, two meetings centered on the growing movement of science and health products into the hands of consumers and the ethical challenges that have resulted. October's *Reconceptualizing the Challenges of Direct-to-Consumer Health Products* built on a 2018 meeting that focused on DTC neuroscience, but expanded to include a broader suite of products. The group considered issues of safety and regulatory challenges, as well as how these products are transforming the physician–patient relationship. That same month, the Center welcomed expert stakeholders to explore *Emerging Issues of Privacy, Trust, and Societal Benefit from Consumer Genomics*. The discussions of the use of genetic genealogy databases by law enforcement investigating violent crimes were especially timely, following recent apprehension of the Golden State Killer in

Rita Allen Foundation Scholars Symposium participants walk to the conference room.

part through use of one such database, and also coinciding with release of a Department of Justice Interim Policy on forensic genetic genealogy.

Collaborations with Foundations

Finally, we were delighted to collaborate with three excellent foundations for events aiming to celebrate and support researchers, and to develop strategy. In August, the 2019 *Rita Allen Foundation Scholars Symposium* was held at Banbury, celebrating the current scholars' research and inspiring new connections. The *Boehringer Ingelheim Fellows Retreat* returned in September for several days of training in all aspects of scientific communication. The Lustgarten Foundation also returned to the Conference Room for their 2019 Scientific Meeting, providing an opportunity for the Scientific Advisory Board, as well as Foundation-supported investigators, to discuss research and strategy.

Outcomes and Impact

It can be difficult to quantify the impact that Banbury meetings have on science and society. Often, Banbury meetings inspire new ideas that lead to discovery or new directions, instigate new connections that build to productive partnerships, or permit sensitive discussions that build understanding and consensus. As we attempt to better track the short-, medium-, and long-term impacts of the Center, we have begun a coordinated effort to follow up meetings at regular intervals enquiring about quantifiable outputs and outcomes (e.g., new collaborations, papers, funding, facilities, policy changes, and fields) as well as individual anecdotes and testimonies as to how past participants view the impact of a specific meeting on the field. Although still in the process of collecting these data, we have compiled recent policy outcomes and new publications[1] resulting from Banbury Center meetings. Among these are changes to FDA and CDC guidelines on Lyme disease diagnostics, which resulted from discussions at a 2016 Banbury meeting and are poised to have major impact in Lyme detection.

Support

Funding continues to be a major hurdle in supporting Banbury meetings, as topics often lie at new intersections of science and technology or deal with delicate ethical or policy issues. We are

[1]See lists at end of Director's Report.

ever grateful to the organizations and individuals that provide the financial support to enable Banbury to convene global leaders. In 2019, Banbury secured financial support from not-for-profit organizations (54%) and the private sector (26%). The CSHL Corporate Sponsor Program remains a critical resource for cutting-edge meetings and contributed 19% of funding for Banbury meetings.

The Team

The Center is successful thanks to a team of professionals who ensure that the estate and programs are running at a high level. Michelle Corbeaux expertly manages the Center's finances, working closely with Development's Michael Gurtowski and Cat Donaldson to manage a quality Corporate Sponsor Program. In 2019, we lost Jasmine Breeland to graduate school after serving as Banbury's inaugural Communications and Special Projects Coordinator. We were lucky to welcome Allison Eichler, who took the reins and has ensured continuity in Banbury's communications. Basia Polakowski continues to oversee our three residence buildings, ensuring our guests feel welcome and comfortable, along with our housekeepers, Miriam and Maria, supervised by Claudia Schmid and Patricia McAdams. The Culinary Services team, led by Jim Hope and overseen by Christina DeDora, keeps guests well fed, while Bill Dickerson and the entire Audiovisual staff led by Ed Campodonico ensure technology supports rather than distracts. Finally, Jose Peña-Corvera, Paulo Krizanovski, and Juan Colocho skillfully maintain 55 acres of impeccable grounds, and the entire Facilities team quite literally keeps us running.

Rebecca Leshan
Executive Director

2019 Policy Changes Resulting from Banbury Meetings

Mead P, Petersen J, Hinckley A. 2019. Updated CDC recommendation for serologic diagnosis of Lyme disease. *MMWR Morb Mortal Wkly Rep* **68:** 703. doi:10.15585/mmwr.mm6832a4external icon

U.S. Food and Drug Administration (July 29, 2019). FDA clears new indications for existing Lyme disease tests that may help streamline diagnoses [Press Release]. Retrieved from www.fda.gov/news-events/press-announcements/fda-clears-new-indications-existing-lyme-disease-tests-may-help-streamline-diagnoses

2019 Publications Resulting from Banbury Meetings

Amaravadi RK, Kimmelman AC, Debnath J. 2019. Targeting autophagy in cancer: recent advances and future directions. *Cancer Discovery* **9:** 1167–1181. doi:10.1158/2159-8290.CD-19-0292

Greider CW, Sheltzer JM, Cantalupo NC, Copeland WB, Dasgupta N, Hopkins N, Jansen JM, Joshua-Tor L, McDowell GS, Metcalf JL, et al. 2019. Increasing gender diversity in the STEM research workforce. *Science* **366:** 692–695. doi:10.1126/science.aaz0649

Jamieson KH, McNutt M, Kiermer V, Sever R. 2019. Signaling the trustworthiness of science. *Proc Natl Acad Sci* **116:** 19231–19236. doi:10.1073/pnas.1913039116

Mirabelli CK, Nusse R, Tuveson DA, Williams BO. 2019. Perspectives on the role of Wnt biology in cancer. *Sci Signal* **12:** eaay4494. doi:10.1126/scisignal.aay4494

Njølstad PR, Andreassen OA, Brunak S, Børglum AD, Dillner J, Esko T, Franks PW, Freimer N, Groop L, Heimer H, et al. 2019. Roadmap for a precision-medicine initiative in the Nordic region. *Nat Genet* **51:** 924–930. doi:10.1038/s41588-019-0391-1

Ward H, et al., Guest Eds. 2019. Special Issue: Maximizing the impact of HIV prevention technologies in sub-Saharan Africa [Supplement]. *J Int AIDS Soc* **22**.

Wexler A, Reiner PB. 2019. Oversight of direct-to-consumer neurotechnologies. *Science* **363:** 234–235. doi:10.1126/science.aav0223

Wurtzel ET, Vickers CE, Hanson AD, Millar AH, Cooper M, Voss-Fels KP, Nikel PI, Erb TJ. 2019. Revolutionizing agriculture with synthetic biology. *Nat Plants* **5:** 1207–1210. doi:10.1038/s41477-019-0539-0

In Press

Browning M, Carter CS, Chatham C, Den Ouden H, Gillen CM, Baker JT, Chekroud AM, Cools R, Dayan P, Gold J, et al. 2020. Realizing the clinical potential of computational psychiatry: report from the Banbury Center Meeting, February 2019. *Biol Psychiatry* **88:** e5–e10. doi:10.31234/osf.io/5qbxp

Gomes-Solecki M, Arnaboldi PA, Backenson PB, Benach JL, Cooper CL, Dattwyler RJ, Diuk-Wasser M, Fikrig E, Hovius JW, Laegreid W, et al. 2020. Protective immunity and new vaccines for Lyme disease. *Clinical Infectious Diseases* **70:** 1768–1773. doi:10.1093/cid/ciz872

Monje M, Borniger JC, D'Silva NJ, Deneen B, Dirks PB, Fatahi F, Frenette PS, Garzia L, Gutmann DH, Hanahan D, et al. 2020. Roadmap for the emerging field of cancer neuroscience. *Cell* **181:** 219–222. doi:10.1016/j.cell.2020.03.034

Sahai E, Astsaturov I, Cukierman E, DeNardo DG, Egeblad M, Evans RM, Fearon D, Greten FR, Hingorani SR, Hunter T, et al. 2020. A framework for advancing our understanding of cancer-associated fibroblasts. *Nat Rev Cancer* **20:** 174–186. doi:10.1038/s41568-019-0238-1

BANBURY CENTER MEETINGS

Dates	*Title*	*Organizer(s)*
February 3–6	Computational Psychiatry	M. Browning, M. Frank, Q. Huys, M. Paulus
March 3–5	DNA for Digital Storage II	E. Birney, Y. Erlich, N. Goldman, J-F. Lutz
March 10–13	Cancer Fibroblasts and Therapies	C. Jørgensen, E. Puré, D. Tuveson
March 16–19	Cancer Immunotherapy: Where to Go Next	I. Mellman, M. Merad
March 31–April 3	Integrated Control of Feeding and Energy Balance by Hypothalamic and Hindbrain Circuits	L. Heisler, M. Myers
April 7–10	Glioblastoma: Why Is Impactful Science So Hard to Translate?	P. Dirks, E. Maher, W. Weiss
April 14–17	The Plant Microbiota	J. Dangl, P. Schulze-Lefert, J. Vorholt
May 12–15	Intermediate Indicators for Impact: The Art and Science of Effective Definition and Use of Prevention Indicators in the HIV Response	C. Holmes, N. Kilonzo, M. Mahy
August 13–15	Rita Allen Foundation Scholars Symposium	E. Christopherson
September 8–11	Liquid Biopsies	L. Diaz, V. Velculescu
September 13–18	Communicating Science—Boehringer Ingelheim Fellows Retreat	K. Achenbach, S. a Schedler, C. Walther
October 6–8	Bridging the Research-to-Practice Chasm in Digital Mental Health	P. Areán, D. Mohr
October 14–16	Reconceptualizing the Challenges of Direct-to-Consumer Health Products	T. Caulfield, L. Turner, A. Wexler
October 19–22	Emerging Issues of Privacy, Trust, and Societal Benefit from Consumer Genomics	Y. Erlich, A.L. McGuire
October 27–30	CaMKII and Its Role as a Self-Tuning Structural Protein at the Synapse	Y. Hayashi, J. Hell
November 3–6	Microbiology of the Built Environment	J. Green, R Kolter, J. Peccia
November 10–12	Lustgarten Foundation Scientific Advisory Board Meeting	R. Vizza, K. Kaplan, D. Tuveson
December 10–13	The Nervous System in Cancer	S. Knox, M.L. Monje, T. Wang

BANBURY CENTER MEETINGS

Computational Psychiatry

February 3–6

ARRANGED BY
M. Browning, University of Oxford, United Kingdom
M. Frank, Brown University, Providence, Rhode Island
Q. Huys, University College London, United Kingdom
M. Paulus, Laureate Institute for Brain Research, Tulsa, Oklahoma

FUNDED BY
The Society of Biological Psychiatry; The William K. Warren Foundation; The Carney Institute for Brain Science at Brown University

Although there has been a great deal of progress in the field of computational psychiatry over recent years, much of this progress has occurred in addressing foundational mechanisms of brain and behavior, and their alterations in patient populations, but without having a direct impact on treatment. The goal of this meeting was to bridge that gap by facilitating the process by which computational models can be used to address real-world clinical questions in psychiatry.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction to Meeting, Goals, Outputs, Structure: **M. Browning,** University of Oxford, United Kingdom
M. Frank, Brown University, Providence, Rhode Island
Q. Huys, University College London, United Kingdom
M. Paulus, Laureate Institute for Brain Research, Tulsa, Oklahoma
A. Churchland, Cold Spring Harbor Laboratory

D. Pizzagalli, R. Goldstein

Q. Huys, C. Carter, C. Hartley, M. Paulus

SESSION 1A: Breakout Groups I

Group 1: Questions and Study Designs

C. Chatham, F. Hoffmann–La Roche Ltd., Basel, Switzerland
A. Chekroud, Spring Health/Yale University, New York
J. Gold, University of Maryland School of Medicine, Baltimore
Q. Huys, University College London, United Kingdom
J. Krystal, Yale School of Medicine, New Haven, Connecticut
M. Phillips, University of Pittsburgh, Pennsylvania
A. Powers, Yale University School of Medicine, New Haven, Connecticut

Group 2: Infrastructure and IT

J. Baker, Harvard University, Belmont, Massachusetts
C. Carter, University of California, Davis, Sacramento
K. Enno Stephan, University of Zürich & ETH Zürich, Switzerland
M. Ferrante, National Institute of Mental Health, Rockville, Maryland
R. Goldstein, Icahn School of Medicine at Mount Sinai, New York
J. Mourao-Miranda, University College London, United Kingdom
M. Paulus, Laureate Institute for Brain Research, Tulsa, Oklahoma

Group 3: Optimizing the Task

R. Cools, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
P. Dayan, Max Planck Institute for Biological Cybernetics, Tübingen, Germany
H. Den Ouden, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
M. Frank, Brown University, Providence, Rhode Island
C. Hartley, New York University, New York
J. Roiser, University College London, United Kingdom
K. Schmack, Cold Spring Harbor Laboratory
M. Sebold, Charité–Universitätsmedizin Berlin, Germany

Group 4: Optimizing Selection between Tasks

M. Browning, University of Oxford, United Kingdom
B. Cuthbert, National Institute of Mental Health, Fitchburg, Wisconsin
C. Gillan, Trinity College Dublin, Ireland
A. Kepecs, Cold Spring Harbor Laboratory
R. Lawson, University of Cambridge, United Kingdom
D. Pizzagalli, Harvard University, Belmont, Massachusetts
D. Rindskopf, The Graduate Center, CUNY, New York
D. Schiller, Icahn School of Medicine at Mount Sinai, New York

A. Churchland, P. Dayan, Q. Huys, M. Browning, M. Paulus

K. Schmack, J. Krystal

SESSION 1B: Feedback Session 1

All Participants

SESSION 2: Breakout Groups II

Group 3, Plus Participants from Groups 1, 2

R. Cools, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
P. Dayan, Max Planck Institute for Biological Cybernetics, Tübingen, Germany
H. Den Ouden, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
M. Frank, Brown University, Providence, Rhode Island
C. Hartley, New York University, New York
J. Roiser, University College London, United Kingdom
K. Schmack, Cold Spring Harbor Laboratory
M. Sebold, Charité–Universitätsmedizin Berlin, Germany

Group 4, Plus Participants from Groups 1, 2

M. Browning, University of Oxford, United Kingdom
B. Cuthbert, National Institute of Mental Health, Fitchburg, Wisconsin
C. Gillan, Trinity College Dublin, Ireland
A. Kepecs, Cold Spring Harbor Laboratory
R. Lawson, University of Cambridge, United Kingdom
D. Pizzagalli, Harvard University, Belmont, Massachusetts
D. Rindskopf, The Graduate Center, CUNY, New York
D. Schiller, Icahn School of Medicine at Mount Sinai, New York

SESSION 3A: Breakout Groups III

Group 1, Plus Participants from Groups 3, 4

C. Chatham, F. Hoffmann–La Roche Ltd., Basel, Switzerland
A. Chekroud, Spring Health/Yale University, New York
J. Gold, University of Maryland School of Medicine, Baltimore
Q. Huys, University College London, United Kingdom
J. Krystal, Yale School of Medicine, New Haven, Connecticut
M. Phillips, University of Pittsburgh, Pennsylvania
A. Powers, Yale University School of Medicine, New Haven, Connecticut

Group 2, Plus Participants from Groups 3, 4

J. Baker, Harvard University, Belmont, Massachusetts
C. Carter, University of California, Davis, Sacramento
M. Ferrante, National Institute of Mental Health, Rockville, Maryland
R. Goldstein, Icahn School of Medicine at Mount Sinai, New York
J. Mourao-Miranda, University College London, United Kingdom
M. Paulus, Laureate Institute for Brain Research, Tulsa, Oklahoma
K.E. Stephan, University of Zürich/ETH Zürich, Switzerland

SESSION 3B: Feedback Session 2

All Participants

SESSION 4: Breakout Groups IV

Group 1, Plus Participants from Groups 2, 4

C. Chatham, F. Hoffmann–La Roche Ltd., Basel, Switzerland
A. Chekroud, Spring Health & Yale University, New York
J. Gold, University of Maryland School of Medicine, Baltimore
Q. Huys, University College London, United Kingdom
J. Krystal, Yale School of Medicine, New Haven, Connecticut
M. Phillips, University of Pittsburgh, Pennsylvania
A. Powers, Yale University School of Medicine, New Haven, Connecticut

Group 3, Plus Participants from Groups 2, 4

R. Cools, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
P. Dayan, Max Planck Institute for Biological Cybernetics, Tübingen, Germany
H. Den Ouden, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
M. Frank, Brown University, Providence, Rhode Island
C. Hartley, New York University, New York
J. Roiser, University College London, United Kingdom
K. Schmack, Cold Spring Harbor Laboratory
M. Sebold, Charité–Universitätsmedizin Berlin, Germany

SESSION 5: Breakout Groups V

Group 2, Plus Participants from Groups 1, 3

J. Baker, Harvard University, Belmont, Massachusetts
C. Carter, University of California, Davis, Sacramento
M. Ferrante, National Institute of Mental Health, Rockville, Maryland
R. Goldstein, Icahn School of Medicine at Mount Sinai, New York
J. Mourao-Miranda, University College London, United Kingdom
M. Paulus, Laureate Institute for Brain Research, Tulsa, Oklahoma
K.E. Stephan, University of Zürich/ETH Zürich, Zürich, Switzerland

Group 4, Plus Participants from Groups 1, 3

M. Browning, University of Oxford, United Kingdom
B. Cuthbert, National Institute of Mental Health, Fitchburg, Wisconsin

C. Gillan, Trinity College Dublin, Ireland
A. Kepecs, Cold Spring Harbor Laboratory
R. Lawson, University of Cambridge, United Kingdom
D. Pizzagalli, Harvard University, Belmont, Massachusetts
D. Rindskopf, The Graduate Center, CUNY, New York
D. Schiller, Icahn School of Medicine at Mount Sinai, New York

SESSION 6: Breakout Groups VI

Group 1

C. Chatham, F. Hoffmann–La Roche Ltd., Basel, Switzerland
A. Chekroud, Spring Health/Yale University, New York
J. Gold, University of Maryland School of Medicine, Baltimore
Q. Huys, University College London, United Kingdom
J. Krystal, Yale School of Medicine, New Haven, Connecticut
M. Phillips, University of Pittsburgh, Pennsylvania
A. Powers, Yale University School of Medicine, New Haven, Connecticut

Group 2

J. Baker, Harvard University, Belmont, Massachusetts
C. Carter, University of California, Davis, Sacramento
M. Ferrante, National Institute of Mental Health, Rockville, Maryland
R. Goldstein, Icahn School of Medicine at Mount Sinai, New York
J. Mourao-Miranda, University College London, United Kingdom
M. Paulus, Laureate Institute for Brain Research, Tulsa, Oklahoma
K. Enno Stephan, University of Zürich/ETH Zürich, Zürich, Switzerland

Group 3

R. Cools, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
P. Dayan, Max Planck Institute for Biological Cybernetics, Tübingen, Germany
H. Den Ouden, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands
M. Frank, Brown University, Providence, Rhode Island
C. Hartley, New York University, New York
J. Roiser, University College London, United Kingdom
K. Schmack, Cold Spring Harbor Laboratory
M. Sebold, Charité–Universitätsmedizin Berlin, Germany

Group 4

M. Browning, University of Oxford, United Kingdom
B. Cuthbert, National Institute of Mental Health, Fitchburg, Wisconsin
C. Gillan, Trinity College Dublin, Ireland
A. Kepecs, Cold Spring Harbor Laboratory
R. Lawson, University of Cambridge, United Kingdom
D. Pizzagalli, Harvard University, Belmont, Massachusetts
D. Rindskopf, The Graduate Center, CUNY, New York
D. Schiller, Icahn School of Medicine at Mount Sinai, New York

SESSION 7: Feedback Session 3

Chairperson: M. Paulus, Laureate Institute for Brain Research, Tulsa, Oklahoma

[*Groups present a summary of their recommendations*]

SESSION 8: Review and Finalization of Recommendations

Chairperson: Q. Huys, University College London, United Kingdom

SESSION 9: Meeting Wrap-Up

Chairpersons: M. Browning, University of Oxford, United Kingdom; **M. Frank,** Brown University, Providence, Rhode Island; **Q. Huys,** University College London, United Kingdom; **M. Paulus,** Laureate Institute for Brain Research, Tulsa, Oklahoma

DNA for Digital Storage II

March 3–5

ARRANGED BY
E. Birney, European Bioinformatics Institute, Hinxton, United Kingdom
Y. Erlich, Columbia University/MyHeritage, New York
N. Goldman, European Bioinformatics Institute, Hinxton, United Kingdom
J-F. Lutz, CNRS/Institut Charles Sadron, Strasbourg, France

FUNDED BY
CATALOG; Conagen Inc.; Microsoft Corporation; Twist Bioscience; with additional support from **Columbia University Data Science Institute**

A spring 2018 Banbury Center meeting convened experts from diverse sectors and disciplines to examine the use of DNA encoding for data storage. This 2019 Banbury meeting revisited the state of the field, including current knowledge (new and residual) limitations and opportunities for research and commercial exploitation.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: E. Birney, European Bioinformatics Institute, Hinxton, United Kingdom

SESSION 1: Information: Theoretic Progress

Chairperson: E. Birney, European Bioinformatics Institute, Hinxton, United Kingdom

N. Goldman, European Bioinformatics Institute, Hinxton, United Kingdom: DNA storage channel error rates.

K. Strauss, Microsoft, Redmond, Washington: Thoughts and recent advances in DNA data storage.

Z. Yakhini, IDC Herzliya, Herzliya, Israel: Composite DNA alphabets enable less synthesis cycles.

Y. Erlich, Columbia University/MyHeritage, New York, New York: On optimal encoding of files in asynchronous DNA synthesizers.

J. Huang, K. Strauss

E. Miller, E. Zadok, L. Ceze, D. Zielinski

SESSION 2: Synthesis Technologies

Chairperson: D. Zielinski, Institut Curie, Paris, France

H. Lee, Harvard Medical School, Boston, Massachusetts: Terminator-free enzymatic DNA synthesis.

J-F. Lutz, CNRS/Institut Charles Sadron, Strasbourg, France: Recent progress on abiotic digital polymers.

P. Cai, University of Manchester, United Kingdom: Synthetic genomics: from genetic parts to genomes.

R. Nolte, Radboud University, Nijmegen, the Netherlands: Encoding information into polymers: a supramolecular catalytic approach.

M. Somoza, University of Vienna, Austria: Large-scale photolithographic synthesis of DNA.

SESSION 3: Companies

Chairperson: N. Goldman, European Bioinformatics Institute, Hinxton, United Kingdom

B. Bramlett, Twist Bioscience, San Francisco, California: Considerations for media design.

H. Park, CATALOG, Cambridge, United Kingdom: Commercializing DNA-based data storage.

S. Palluk, Ansa Biotechnologies, Berkeley, California: De novo DNA synthesis using enzymes.

J. Huang, Nuclera Nucleics, Cambridge, United Kingdom: Enzyme-mediated DNA printer.

SESSION 4: Economics, Ecosystem, and the Storage Industry

Chairperson: K. Strauss, Microsoft, Redmond, Washington

E. Miller, University of California, Santa Cruz; E. Zadok, Stony Brook University, Stony Brook, New York: Glass and more: recent trends in data storage technologies.

D. Zielinski, Institut Curie, Paris, France: Communicating advances in DNA storage technology.

SESSION 5: Systems

Chairperson: J-F. Lutz, CNRS/Institut Charles Sadron, Strasbourg, France

R. Grass, ETH Zurich, Switzerland: Integration of DNA into materials.

L. Ceze, University of Washington, Seattle: End-to-end DNA data storage systems and near-molecule processing.

SESSION 6: Meeting Wrap-Up

Chairperson: Y. Erlich, Columbia University/MyHeritage, New York, New York

N. Goldman, Z. Yakhini

Cancer Fibroblasts and Therapies

March 10–13

ARRANGED BY **C. Jørgensen,** Cancer Research UK Manchester Institute, United Kingdom
E. Puré, University of Pennsylvania, Philadelphia
D. Tuveson, Cold Spring Harbor Laboratory

FUNDED BY **The Northwell Health/Cold Spring Harbor Laboratory Affiliation**

Cancer-associated fibroblasts (CAFs) are integral components of carcinomas, where they influence tumor progression and therapeutic response. Recent studies have revealed juxtacrine and paracrine interactions between CAFs and neoplastic cells that promote metabolic adaptation and tissue patterning. In addition, analyses have demonstrated subtypes of CAFs with different roles in the tumor microenvironment, including immune modulation. This meeting convened experts to discuss current understanding of CAF biology, with an emphasis on new approaches to probe the fundamental properties of CAFs and medical applications of CAF targeting.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: E. Puré, University of Pennsylvania, Philadelphia
D. Tuveson, Cold Spring Harbor Laboratory

SESSION 1: Matricellular Regulation and CAFs

Chairperson: D. Tuveson, Cold Spring Harbor Laboratory

V. Weaver, University of California, San Francisco: Tumor fibrosis, inflammation, and stromal fibroblast-mediated collagen cross-linking.

R. Hynes, Massachusetts Institute of Technology, Cambridge: Extracellular matrix vulnerabilities in cancer.

E. Cuckierman, Fox Chase Cancer Center, Philadelphia, Pennsylvania: Desmoplastic fibroblasts and self-produced ECMs protect pancreatic adenocarcinoma via metabolic support and innate immunosuppression.

Z. Werb, D. Tuveson

M. Egeblad, R. Hynes, T. Hunter, E. Sahai

SESSION 2: CAFs and Metastasis

Chairperson: T. Tlsty, University of California, San Francisco

Z. Werb, University of California, San Francisco: How mesenchymal cells promote breast cancer growth and metastasis.

E. Sahai, Francis Crick Institute, London, United Kingdom: The role of cancer-associated fibroblasts in modulating invasion and the immune system.

T. Tlsty, University of California, San Francisco: Identifying and targeting stromal states that contribute to cancer progression.

SESSION 3: The Permissive Niche and Tumor Development

Chairperson: F. Greten, Georg-Speyer-Haus, Frankfurt, Germany

E. Puré, University of Pennsylvania, Philadelphia: Involvement of a stromagenic switch in establishment of a tumor-hospitable environment.

A. Weeraratna, The Wistar Institute, Philadelphia, Pennsylvania: A wrinkle in TiME: how the aged tumor microenvironment drives melanoma progression.

S. Stewart, Washington University in St. Louis, Missouri: Age-related changes in the tumor microenvironment drives tumorigenesis.

SESSION 4: CAFs and Immune Regulation

Chairperson: R. Evans, Salk Institute for Biological Studies, La Jolla, California

D. Fearon, Cold Spring Harbor Laboratory: The immune suppressive pathway of cancer-associated fibroblasts.

F. Greten, Georg-Speyer-Haus, Frankfurt, Germany: CAFs and colon cancer.

SESSION 5: Fibroblast Heterogeneity

Chairperson: R. Evans, Salk Institute for Biological Studies, La Jolla, California

D. Tuveson, Cold Spring Harbor Laboratory: Fibroblast heterogeneity in pancreatic cancer.

F. Watt, King's College London, United Kingdom: Exploiting human skin fibroblast subpopulations to alleviate scarring.

M. Egeblad, Cold Spring Harbor Laboratory: Neutrophils orchestrate the establishment of a fibrotic, metastatic microenvironment.

SESSION 6: Reciprocal Interactions between Tumor Cells and CAFs

Chairperson: A. Weeraratna, The Wistar Institute, Philadelphia, Pennsylvania

T. Hunter, Salk Institute for Biological Studies, La Jolla, California: LIF, a stromal cell pancreatic cancer driver.

S. Powers, Stony Brook University, Stony Brook, New York: Discovery-driven exploration of breast cancer progression using mouse models and single-cell RNA-seq.

M. Sherman, Oregon Health and Science University, Portland: Determinants and consequences of pancreatic cancer stromal evolution.

SESSION 7: Regulatory Networks of Stromal Dysfunction

Chairperson: M. Sherman, Oregon Health and Science University, Portland

R. Evans, Salk Institute for Biological Studies, La Jolla, California: Epigenetic control of the stromal response.

R. Scherz-Shouval, Weizmann Institute of Science, Rehovot, Israel: Transcriptional stress networks underlying phenotypic plasticity in the tumor microenvironment.

R. Maki and D. Ramirez, Northwell Health, Lake Success, New York: Soft-tissue sarcoma: when the stroma is the cancer.

SESSION 8: Metabolic Regulation and CAFs

Chairperson: T. Janowitz, Cold Spring Harbor Laboratory

I. Astsaturov, Fox Chase Cancer Center, Philadelphia, Pennsylvania: CAFs as a source of lipids in pancreatic carcinogenesis.

A. Kimmelman, New York University Langone Medical Center, New York: Metabolic cross talk in pancreatic cancer.

SESSION 9: Reprogramming the Tumor Microenvironment

Chairperson: E. Cuckierman, Fox Chase Cancer Center, Philadelphia, Pennsylvania

D. DeNardo, Washington University School of Medicine in St. Louis, Missouri: Reprogramming the pancreatic tumor microenvironment to improve responses to therapy.

T. Janowitz, Cold Spring Harbor Laboratory: Interleukin-6-induced metabolic reprogramming in pancreatic cancer.

SESSION 10: Enhancing Cancer Treatment

Chairperson: E. Puré, University of Pennsylvania, Philadelphia

M. Kolonin, University of Texas, Houston: Fibroblasts from adipose tissue as a drug target in cancer progression to chemo resistance and metastasis.

S. Hingorani, Fred Hutchinson Cancer Research Center, Seattle, Washington: Stromal plasticity and perfidity in pancreas cancer.

D. Fearon, E. Cukierman

R. Jain, Harvard Medical School, Boston, Massachusetts: Reengineering the tumor microenvironment to enhance cancer treatment: bench to bedside.

SESSION 11: Meeting Wrap-Up

Chairpersons: E. Puré, University of Pennsylvania, Philadelphia; **D. Tuveson,** Cold Spring Harbor Laboratory

Cancer Immunotherapy: Where to Go Next

March 16–19

ARRANGED BY **I. Mellman,** Genentech, South San Francisco, California
M. Merad, Icahn School of Medicine at Mount Sinai, New York

FUNDED BY **Genentech; Cold Spring Harbor Laboratory;** with additional support from **AbbVie**

This Banbury meeting convened experts to critically review the mechanisms that control tumor response or underlie the lack of response to current immunotherapy agents. Key themes included main regulatory pathways that limit antitumor immunity; clinical benefit of novel immunotherapy agents alone or in combination; and novel approaches to accurately assess clinical and biomarker responses and the fundamental features of cancer immunity.

Welcoming Remarks: **R. Leshan,** Director, Banbury Center, Cold Spring Harbor Laboratory
I. Mellman, Genentech, South San Francisco, California
M. Merad, Icahn School of Medicine at Mount Sinai, New York

SESSION 1: Resistance Mechanisms to Current Checkpoint Inhibitors

Chairperson: I. Mellman, Genentech, South San Francisco, California

R. Ahmed, Emory University, Atlanta, Georgia: T-cell exhaustion and PD-1 therapy.

N. Hacohen, Massachusetts General Hospital, Boston: Drivers and resistors of tumor immunity.

SESSION 2: Tumor Antigen Immunity

Chairperson: D. Pardoll, Johns Hopkins University, Baltimore, Maryland

D. Pardoll, Johns Hopkins University, Baltimore, Maryland: Analysis of repertoire and function of anti-tumor T-cell responses elicited by checkpoint inhibition.

R. Seder, National Institute of Allergy and Infectious Disease, Bethesda, Maryland: Optimizing neoantigen-specific

L. Zitvogel, M. Merad, N. Hacohen

U. Sahin, U. Weiss

CD8 responses by intravenous delivery of a nanoparticle vaccine.

L. Delamarre, Genentech, South San Francisco, California: Neoantigens for personalized cancer immunotherapy.

U. Sahin, University Medical Center, Mainz, Germany: Personalized cancer immunotherapy.

SESSION 3: Tumor Microenvironment Modulation of Tumor Immunity

Chairperson: M. Merad, Icahn School of Medicine at Mount Sinai, New York

D. Lambrechts, VIB-KU Leuven Center for Cancer Biology, Belgium: Single-cell profiling of the pan-cancer tumor microenvironment during checkpoint immunotherapy.

M. Merad, Icahn School of Medicine at Mount Sinai, New York: Myeloid microenvironment of cancer lesions.

S. Demaria, Weill Cornell Medicine, New York, New York: Activation of the DNA damage response by radiotherapy enhances the expression and cross-presentation of immunogenic mutations to CD8 T cells.

D. Tuveson, Cold Spring Harbor Laboratory: Fibroblast subsets during pancreatic inflammation and cancer.

SESSION 4: Immune Cell Engineering

Chairperson: M. Sadelain, Memorial Sloan Kettering Cancer Center, New York, New York

M. Sadelain, Memorial Sloan Kettering Cancer Center, New York, New York: New directions in CAR T-cell engineering.

B. Brown, Icahn School of Medicine at Mount Sinai, New York: Antigen and antitumor responses.

SESSION 5: Microbiome: Biomarker or Therapeutic Immunity

Chairperson: L. Zitvogel, Gustave Roussy, Villejuif, France

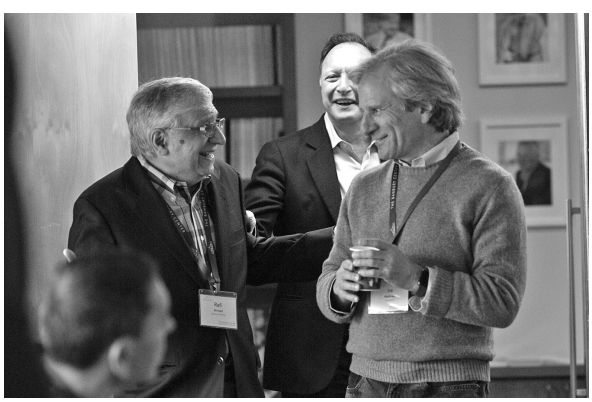
G. Trinchieri, National Cancer Institute, Bethesda, Maryland: Microbiota in cancer and cancer therapy.

L. Zitvogel, Gustave Roussy, Villejuif, France: Gut microbiome and tumor immunosurveillance.

SESSION 6: Systems Understanding of Therapeutic Immunity

Chairperson: D. Pe'er, Sloan Kettering Institute, New York, New York

D. Pe'er, Sloan Kettering Institute, New York, New York: A single-cell lens into immune eco-systems.



R. Ahmed, R. Seder, I. Mellman

B. Brown, A. Kamphorst

J. Heath, Institute for Systems Biology, Seattle, Washington: New single-cell methods and algorithms for cancer immunotherapy applications.

B. Greenbaum, Icahn School of Medicine at Mount Sinai, New York: Quantifying the emergence of non-self in tumors.

SESSION 7: Beyond Checkpoint Inhibitors

Chairperson: M. Merad, Icahn School of Medicine at Mount Sinai, New York

I. Mellman, Genentech, South San Francisco, California: Cancer immunotherapy beyond checkpoint inhibitors.

SESSION 8: Meeting Conclusions and Next Steps

Chairpersons: M. Merad, Icahn School of Medicine at Mount Sinai, New York; **I. Mellman,** Genentech, South San Francisco, California

Integrated Control of Feeding and Energy Balance by Hypothalamic and Hindbrain Circuits

March 31–April 3

ARRANGED BY **L. Heisler,** University of Aberdeen, United Kingdom
M. Myers, University of Michigan, Ann Arbor

FUNDED BY **Kallyope Inc.; MedImmune; Rhythm Pharmaceuticals;** with additional funding from the **Cold Spring Harbor Laboratory Corporate Sponsor**

This meeting convened experts to critically review recent findings about the hypothalamic and hindbrain systems that control food intake, their integration, and the mechanisms by which these mediate aversive and nonaversive anorexia and set overall energy balance. In addition to identifying important questions and next steps in research, participants considered how systems that convey information about taste, illness, and other contextual information interact with these circuits to contribute to the acute and long-term control of food intake and body weight.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: L. Heisler, University of Aberdeen, United Kingdom
M. Myers, University of Michigan, Ann Arbor

SESSION 1: Overview and Vagus

Chairperson: L. Heisler, University of Aberdeen, United Kingdom

H. Grill, University of Pennsylvania, Philadelphia: Neural mechanisms of feeding inhibition.

I. de Araujo, Icahn School of Medicine at Mount Sinai, New York: The vagus nerve and reward circuits.

S. Appleyard, Washington State University, Pullman: Modulation of the vagal-NTS synapse: changing how the gut talks to the brain.

T. Tan, D. Williams, S. Trapp, R.A. Travagli

D. Sandoval, A. Ferrante

A. Travagli, Pennsylvania State University, Hershey: Brainstem control of GI motility.

SESSION 2: The Nucleus Tractus Solitarius

Chairperson: H. Grill, University of Pennsylvania, Philadelphia

R. Ritter, Washington State University, Pullman: Central modulation of vagal afferent signaling in hindbrain to control of food intake.

S. Trapp, University College London, United Kingdom: The role of GLP-1-producing brainstem neurons in the control of food intake.

G. D'Agostino, University of Aberdeen, United Kingdom: Caudal brainstem CCKergic circuits: mapping, deconstruction, and functional interrogation.

SESSION 3: The Gut/Brain Axis and Taste

Chairperson: N. Thornberry, Kallyope Inc., New York, New York

H. Lee, Northwestern University, Evanston, Illinois: Wiring the taste system.

D. Sandoval, University of Michigan, Ann Arbor: The role of the gut/brain axis in the success of bariatric surgery.

P. Di Lorenzo, Binghamton University, New York: Effects of obesity and gastric bypass surgery on the neural code for taste in the nucleus of the solitary tract.

D. Small, Yale University, New Haven, Connecticut: Metabolic drivers of oral sensation and food reinforcement.

SESSION 4: Hindbrain Neurons as Drug Targets

Chairperson: M. Myers, University of Michigan, Ann Arbor

D. Williams, Florida State University, Tallahassee: Brain GLP-1 integrates satiety, reward, and response to stress.

L. Heisler, University of Aberdeen, United Kingdom: Targeting 5-HT2C receptors in the NTS to influence food intake.

R. Seeley, University of Michigan, Ann Arbor: The role of GFRAL neurons in the regulation of energy balance.

SESSION 5: Pharmacotherapies

Chairperson: A. McElvaine, American Diabetes Association, Arlington, Virginia

T. Tan, Imperial College London, United Kingdom: Gut hormones in combination: effects on appetite and metabolism.

M. Tschöp, Helmholtz Center, Neuherberg, Germany: Neuroendocrine polypharmacy targeting obesity and diabetes.

SESSION 6: Nausea, Aversion, and Links to the Forebrain

Chairperson: R. Seeley, University of Michigan, Ann Arbor

S. Luckman, The University of Manchester, United Kingdom: Gut–brain signaling: satiety and aversion.

C. Campos, University of Washington, Seattle: Chronic activation of hypothalamic AgRP neurons does not result in long-term hyperphagia and weight gain.

M. Myers, University of Michigan, Ann Arbor: Aversive and nonaversive hindbrain satiety circuits.

C. Blouet, University of Cambridge, United Kingdom: Leucine engages a hindbrain-to-forebrain neurocircuit to rapidly inhibit appetite and produce physiological satiety.

SESSION 7: Hypothalamic Aspects

Chairperson: C. Blouet, University of Cambridge, United Kingdom

A. Garfield, Rhythm Pharmaceuticals, Boston, Massachusetts: An MC4R agonist, setmelanotide, for the treatment of rare genetic disorders of obesity.

M. Schwartz, University of Washington, Seattle: Perineuronal nets and the hypothalamic feeding circuits they enmesh.

S. Panda, R. Ritter, I. de Araujo

D. Small, I. de Araujo

SESSION 8: Integrative Issues

Chairperson: D. Sandoval, University of Michigan, Ann Arbor

A. Ferrante, Columbia University Irving Medical Center, New York, New York: Defense against weight gain.

S. Panda, Salk Institute for Biological Studies, La Jolla, California: Interaction between diet quality and daily eating: fasting rhythms in health and disease.

SESSION 9: Meeting Wrap-Up

Chairpersons: L. Heisler, University of Aberdeen, United Kingdom; **M. Myers,** University of Michigan, Ann Arbor

Glioblastoma: Why Is Impactful Science So Hard to Translate?

April 7–10

ARRANGED BY **P. Dirks,** The Hospital for Sick Children, Toronto, Canada
E. Maher, UT Southwestern Medical Center, Dallas
W. Weiss, University of California, San Francisco

FUNDED BY **The Northwell Health/Cold Spring Harbor Laboratory Affiliation**

Glioblastoma (GBM) is the most common primary brain tumor and among the most lethal of cancers. Although scientific understanding and impact have been formidable over the past decade, the clinical translation of these insights remains disappointing. This meeting convened experts to discuss our current understanding of GBM biology and therapy, with an emphasis on identifying bottlenecks limiting the ability to successfully translate basic science discoveries into clinical care and on developing approaches to improve this bench-to-bedside transition.

Welcoming Remarks: **R. Leshan,** Director, Banbury Center, Cold Spring Harbor Laboratory
P. Dirks, The Hospital for Sick Children, Toronto, Canada
E. Maher, UT Southwestern Medical Center, Dallas
W. Weiss, University of California, San Francisco

SESSION 1: Genomics and Epigenomics

Chairperson: R. Verhaak, The Jackson Laboratory, Farmington, Connecticut

R. Verhaak, The Jackson Laboratory, Farmington, Connecticut: Adaptive changes of glioma during treatment.

P. Mischel, University of California, San Diego/Ludwig Institute for Cancer Research, La Jolla: In cancer, as in real estate, location matters: the role of extrachromosomal oncogene amplification in glioblastoma.

M. Suvà, Massachusetts General Hospital, Charlestown: Deciphering human gliomas by single-cell genomics.

B. Bernstein, J. Phillips, A. Mills, O. Becher

M. Suvà, E. Maher

J. Costello, University of California, San Francisco: GABP, a key to tumor cell immortality in TERT promoter mutant tumors.
B. Bernstein, Massachusetts General Hospital, Boston: Epigenetic mechanisms and therapeutic opportunities in glioblastoma.

SESSION 2: Pediatric Glioblastoma and DIPG

Chairperson: N. Jabado, McGill University Health Centre, Montreal, Quebec, Canada

M. Taylor, The Hospital for Sick Children, Toronto, Ontario, Canada: Childhood cerebellar tumors mirror conserved fetal transcriptional programs.
N. Jabado, McGill University Health Centre, Montreal, Quebec, Canada: Exploiting vulnerabilities generated by histone mutation.
M. Filbin, Dana-Farber Cancer Institute, Boston, Massachusetts: Resolving the developmental origins of pediatric high-grade gliomas in single cells.
M. Monje, Stanford University, California: Neuronal activity drives high-grade glioma growth.
O. Becher, Northwestern University, Chicago, Illinois: Learning from genetic mouse modeling of diffuse intrinsic pontine glioma.

SESSION 3: Stem Cells and Glioblastoma

Chairperson: P. Dirks, The Hospital for Sick Children, Toronto, Ontario, Canada

J. Rich, University of California, San Diego, La Jolla: Brain tumor stem cells.
S. Pollard, Cancer Research UK Edinburgh, Edinburgh, United Kingdom: Regulation of neural stem-cell self-renewal mechanisms in glioblastoma.
P. Dirks, The Hospital for Sick Children, Toronto, Ontario, Canada (on behalf of Robert Bachoo): Transcriptional networks drive gliomagenesis.
A. Demopoulos, Northwell Health, Lake Success, New York: Role of subventricular zone in gliomagenesis.

SESSION 4: Microenvironment

Chairperson: W. Weiss, University of California, San Francisco

J. Phillips, University of California, San Francisco: GBM heterogeneity and extracellular regulation of oncogenic signaling.
S. Parrinello, University College London, United Kingdom: Microenvironmental regulation of glioblastoma invasion.

M. Monje, N. Jabado, S. Pollard, M. Filbin, G. Bergers, E. Maher

M. Gilbert, W. Kaelin

M. Symons, Feinstein Institute for Medical Research, Manhasset, New York: Overcoming glioblastoma intratumor heterogeneity and therapeutic resistance using nanoparticle-mediated delivery of miR-34a.

G. Bergers, VIB-KU Leuven Center for Cancer Biology, Belgium: Studying and targeting the tumor microenvironment in intra-heterogeneous glioblastoma.

SESSION 5: Modeling

Chairperson: L. Parada, Memorial Sloan Kettering Cancer Center, New York, New York

L. Parada, Memorial Sloan Kettering Cancer Center, New York, New York: Mouse models of GBM: cancer stem cells and therapeutic opportunities.

E. Holland, University of Washington, Seattle: Big data and mouse models.

W. Kaelin, Dana-Farber Cancer Institute/HHMI, Boston, Massachusetts: Targeting IDH mutant gliomas.

Y. Li, University of Toronto, Ontario, Canada: Modeling human neural development and diseases in neurons and brain organoids.

SESSION 6: Clinical

Chairperson: E. Maher, UT Southwestern Medical Center, Dallas

M. Schulder, Zucker School of Medicine at Hofstra/Northwell, Lake Success, New York: Intraoperative imaging and the impact of surgical resection in patients with glioblastoma.

J. Boockvar, Lenox Hill Hospital/Zucker School of Medicine at Hofstra/Northwell, New York: New strategies to overcome the blood–brain barrier to deliver chemotherapeutics in human GBM.

D. Haas-Kogan, Dana-Farber Cancer Institute, Boston, Massachusetts: Challenges to rational incorporation of novel agents into multimodality therapy of pediatric gliomas.

M. Gilbert, National Cancer Institute, Bethesda, Maryland: Challenges in implementing correlative biology in brain tumor clinical trials.

SESSION 7: Meeting Wrap-Up

Chairpersons: P. Dirks, The Hospital for Sick Children, Toronto, Ontario, Canada; **E. Maher,** UT Southwestern Medical Center, Dallas; **W. Weiss,** University of California, San Francisco

The Plant Microbiota

April 14–17

ARRANGED BY **J. Dangl,** University of North Carolina/HHMI, Chapel Hill
P. Schulze-Lefert, Max Planck Institute for Plant Breeding Research, Cologne, Germany
J. Vorholt, ETH Zürich, Switzerland

FUNDED BY **Cold Spring Harbor Laboratory Corporate Sponsor Program; Indigo Ag; Syngenta; KWS SAAT SE;** with additional funding from **2Blades Foundation**

Growing interest in the plant microbiota is being spurred by basic, curiosity-driven research that seeks to understand the principles underlying microbiota assembly and the impact of the microbiota on the plant host. There is also an increasing awareness that knowledge gained can be harnessed for rational bioprospecting and the discovery of agriculturally useful molecules, genes, and inoculants in plant-associated microbes. This Banbury meeting gathered plant and microbial scientists to discuss the latest advances in (1) microbiota assembly and the plant innate immune system, (2) host colonization and mechanisms of interbacterial communication, (3) metabolic interdependence of the plant host and its associated microbes, (4) nutrient mobilization and nutritional functions provided by root-associated microbes, (5) microbial interkingdom interactions and microbiota homeostasis, (6) invasion and persistence in microbial consortia, and (7) commensal functions in pathogen protection.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: P. Schulze-Lefert, Max Planck Institute for Plant Breeding Research, Cologne, Germany

D. Weigel, J. Vorholt, E. Kemen

S.Y. He, P. Schulze-Lefert

SESSION 1: Big Picture Microbiomes

Chairperson: J. Vorholt, ETH Zürich, Switzerland

S. Tringe, DOE Joint Genome Institute, Walnut Creek, California: Sequence-based interrogation of plant microbiomes.

V. Sunderesan, University of California, Davis: Host–microbiome interactions in rice roots.

M. Wagner, University of Kansas, Lawrence: Patterns and consequences of breeding-induced microbiome variation in maize.

S. Kembel, University of Quebec at Montreal, Canada: The biogeography of phyllosphere plant–microbe associations.

D. Weigel, Max Planck Institute, Tübingen, Germany: Coexistence of *Arabidopsis thaliana* and *Pseudomonas foliar* pathogens over different temporal and spatial scales.

SESSION 2: Phyllosphere

Chairperson: S. Tringe, DOE Joint Genome Institute, Walnut Creek, California

J. Vorholt, ETH Zürich, Switzerland: The leaf microbiota: disassembling and rebuilding to explore plant microbe interactions.

E. Kemen, University of Tübingen, Germany: Understanding dynamics in leaf microbial communities.

B. Wolfe, Tufts University, Medford, Massachusetts: Linking patterns with processes in the Napa cabbage phyllosphere.

SESSION 3: Abiotic Stress and the Microbiome

Chairperson: E. Kemen, University of Tübingen, Germany

S. Lebeis, University of Tennessee, Knoxville: Under pressure: surviving selective pressure in the root-soil interface.

D. Coleman-Derr, USDA/ARS, Albany, California: The effects of drought and development on the root microbiome.

A. Shade, Michigan State University, East Lansing: Resuscitation and recruitment of rhizosphere microbiota during plant stress.

SESSION 4: Metabolic Control of Microbiome Function

Chairperson: S. Hacquard, Max Planck Institute for Plant Breeding Research, Cologne, Germany

K. Schläppi, University of Bern, Switzerland: Plant secondary metabolites drive rhizosphere microbiome traits.

S. Tringe, K. Schläppi

P. Teixiera, V. Sundaresan

SESSION 5: Plant Immune System and the Microbiome

Chairperson: S. Lebeis, University of Tennessee, Knoxville

P. Teixeira, University of North Carolina, Chapel Hill: Colonization of *Arabidopsis* roots by a bacterial microbiome is associated with suppression of a specific sector of the plant immune response.

C. Haney, University of British Columbia, Vancouver, Canada: Mechanisms in microbial regulation of plant growth and defense.

S. Yang He, Michigan State University/HHMI, East Lansing: Genetic control of dysbiosis in *Arabidopsis.*

P. Schulze-Lefert, Max Planck Institute for Plant Breeding Research, Cologne, Germany: Strain-specific interference of root commensals with the plant innate immune system.

C. Pieterse, Utrecht University, the Netherlands: The root microbiome and plant immunity: an IRONic love story.

SESSION 6: Multi-Kingdom Interactions

Chairperson: P. Schulze-Lefert, Max Planck Institute for Plant Breeding Research, Cologne, Germany

B. Koskella, University of California, Berkeley: The role of phyllosphere bacteria and bacteriophage viruses in shaping pathogen colonization and disease of host plants.

L. Kinkel, University of Minnesota, Saint Paul: Cross-kingdom microbial interactions in plant microbiome systems.

S. Hacquard, Max Planck Institute for Plant Breeding Research, Cologne, Germany: Structural and functional architectures of multi-kingdom microbial consortia colonizing plant roots.

SESSION 7: General Discussion and Meeting Wrap-Up

Chairpersons: J. Vorholt, ETH Zürich, Switzerland; **Paul Schulze-Lefert,** Max Planck Institute for Plant Breeding Research, Cologne, Germany

Intermediate Indicators for Impact: The Art and Science of Effective Definition and Use of Prevention Indicators in the HIV Response

May 12–15

ARRANGED BY **C. Holmes,** Georgetown University, Washington, D.C.
N. Kilonzo, National AIDS Control Council of Kenya, Nairobi
M. Mahy, UNAIDS, Geneva, Switzerland

FUNDED BY **The Bill & Melinda Gates Foundation**

This workshop brought together those experienced with collecting and analyzing data with those responsible for using the knowledge generated, as well as those affected by the programs, to explore how indicators and metrics can be optimized to impact the HIV epidemic over the coming decades.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: C. Holmes, Georgetown University, Washington, D.C.
N. Kilonzo, National AIDS Control Council of Kenya, Nairobi
M. Mahy, UNAIDS, Geneva, Switzerland

SESSION 1: Setting the Stage: What Should We be Measuring? Overview of Indicator Development and Use

Chairpersons: G. Dallabetta, Bill & Melinda Gates Foundation, Washington, D.C.; **M. Morrison,** Bill & Melinda Gates Foundation, Seattle, Washington

C. Benedikt, UNAIDS, Geneva, Switzerland: HIV prevention: setting the stage on our understanding of prevention.

N. Kilonzo, National AIDS Control Council of Kenya, Nairobi: Overview of development and use of prevention indicators, country perspective.

P. Bhattacharjee, B. Rice, M. Marston

I. Benach, C. Benedikt, M. Mahy, M. Khasiani

M. Mahy, UNAIDS, Geneva, Switzerland: Indicator development, global stakeholder perspective.

SESSION 2: Current State of M&E in Prevention

Chairpersons: G. Dallabetta and M. Morrison, Bill & Melinda Gates Foundation, Seattle, Washington

B. Rice, London School of Hygiene & Tropical Medicine, London, United Kingdom: What does the prevention M&E landscape look like?

J. DePasse, Boston Consulting Group, Seattle Washington: HIV prevention indicators: variability between global stakeholders and countries.

J. Zhao, The Global Fund, Geneva, Switzerland: Measurement of HIV programs supported by The Global Fund.

G. Garnett, Bill & Melinda Gates Foundation, Seattle, Washington: Prevention cascade: use of cascade in action.

SESSION 3: Learnings from Local Experiences with Indicators

Chairperson: N. Kilonzo, National AIDS Control Council of Kenya, Nairobi

T. Kalua, Malawi Ministry of Health, Lilongwe: Case study: local challenges in indicator development.

M. Khasiani, National AIDS Control Council of Kenya, Nairobi: The complementing role of non-health facility indicators in HIV prevention: experiences from community and public sector reporting.

BREAKOUT SESSION I: What Are the Enablers to Overcome the Challenges of Data Collection and Valid Responses for HIV Prevention Indicators?

Group 1 Facilitator: S. Johnson, Genesis Analytics, Johannesburg, South Africa: Sexual behavior, patterns of condom use.

Group 2 Facilitator: P. Bhattacharjee, University of Manitoba, Nairobi, Kenya: Key populations (including size estimates).

SESSION 4: Unique Considerations for Prevention Metrics in HIV

Chairperson: G. Garnett, Bill & Melinda Gates Foundation, Seattle, Washington

R. Baggaley, N. Hasan, J. DePasse

J. Zhao, C. Holmes, M. Morrison

R. Baggaley, World Health Organization, Geneva, Switzerland: Monitoring prevention efforts in other fields: unique challenges of HIV prevention metrics.

J. Eaton, Imperial College London, United Kingdom; L. Johnson, University of Cape Town, South Africa: Modeling impact of new indicators in HIV.

M. Warren, AVAC, New York, New York: Unique considerations for prevention metrics in HIV: complexity with data collection, analysis, utilization, etc.

SESSION 5: Evidence behind Current Metrics in HIV Prevention

Chairperson: G. Garnett, Bill & Melinda Gates Foundation, Seattle, Washington

C. Holmes, Georgetown University, Washington, D.C.; B. Rice, London School of Hygiene & Tropical Medicine, United Kingdom: Understanding the evidence behind current HIV prevention metrics.

M. Marston, London School of Hygiene & Tropical Medicine, United Kingdom: Prevention metrics: highlights/findings from the alpha network.

WORKING SESSION: Metrics Prioritization

Facilitators: C. Holmes, Georgetown University, Washington, D.C.; **N. Kilonzo,** National AIDS Control Council of Kenya, Nairobi; **M. Mahy,** UNAIDS, Geneva, Switzerland

SESSION 6: Emerging Metrics and Methods for HIV Prevention

Chairperson: J. Eaton, Imperial College London, United Kingdom

N. Hasen, Population Services International, Washington, D.C.: Measuring, monitoring, and tracking sexual networks as a key to HIV prevention metrics.

C. Ryan, Centers for Disease Control and Prevention, Eswatini, Africa: New horizons in HIV prevention: use and potential directions of recency testing.

T. Smith, Cooper/Smith, Washington, D.C.: Novel data streams and triangulation methods for identifying risk, location target populations over time and space, and differentiating HIV prevention and care.

BREAKOUT SESSION II: Recommendations and Socialization

Group 1 Facilitators: C. Holmes, Georgetown University, Washington, D.C.; **N. Kilonzo,** National AIDS Control Council of Kenya, Nairobi; **M. Mahy,** UNAIDS, Geneva, Switzerland: Global stakeholder engagement.

Group 2 Facilitators: C. Holmes, Georgetown University, Washington, D.C.; **N. Kilonzo,** National AIDS Control Council of Kenya, Nairobi; **M. Mahy**, UNAIDS, Geneva, Switzerland: Country stakeholder engagement.

Group 3 Facilitators: C. Holmes, Georgetown University, Washington, D.C.; **N. Kilonzo,** National AIDS Control Council of Kenya, Nairobi; **M. Mahy,** UNAIDS, Geneva, Switzerland: Academic future directions.

SESSION 10: Closing and Next Steps

Chairpersons: C. Holmes, Georgetown University, Washington, D.C.; **N. Kilonzo,** National AIDS Control Council of Kenya, Nairobi; **M. Mahy,** UNAIDS, Geneva, Switzerland

Rita Allen Foundation Scholars Symposium

August 13–15

ARRANGED BY **E. Christopherson,** President and CEO, Rita Allen Foundation, Princeton, New Jersey

FUNDED BY **Rita Allen Foundation**

Banbury was pleased to welcome the Rita Allen Foundation for their first annual meeting of Rita Allen Foundation Scholars in 2019, which included current and former Scholars and other scientific leaders. The symposium generated lively discussions on cancer, neuroscience, immunology, and pain research, as well as on diversity and inclusion in the sciences and Rita Allen Foundation's work to connect science and society.

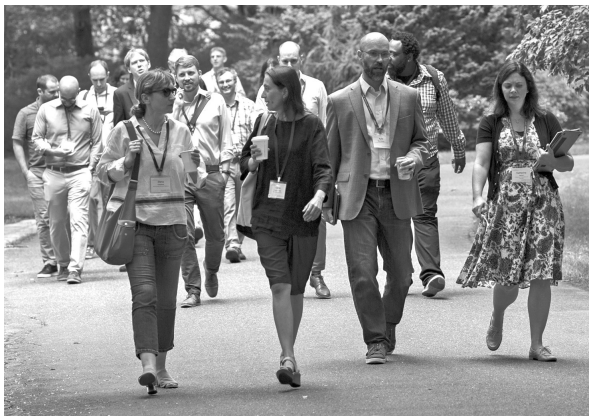
Welcoming Remarks: **E. Christopherson,** President and CEO, Rita Allen Foundation, Princeton, New Jersey; **B. Stillman,** President and CEO, Cold Spring Harbor Laboratory and Rita Allen Scholar, New York

Keynote Address: From Mice to Molecules: **The Genetics,** Development, and Function of Tails
H. Hoekstra, Harvard University, Cambridge, Massachusetts

Introduced by E. Gracheva, Yale University School of Medicine, New Haven, Connecticut

FLASH TALKS

Chairperson: R. Sharif-Naeini, McGill University, Montreal, Quebec, Canada
M. Banghart, University of California, San Diego, La Jolla
M. Burton, University of Texas at Dallas, Richardson
J. Clowney, University of Michigan, Ann Arbor
P. Grace, University of Texas MD Anderson Cancer Center, Houston
P. Greer, University of Massachusetts Medical School, Worcester



H. Lai, UT Southwestern Medical Center, Dallas
V. Luca, Moffitt Cancer Center, Tampa, Florida
J. McCall, Washington University in St. Louis, Missouri
L. O'Connell, Stanford University, California
J. Parker, California Institute of Technology, Pasadena

Keynote Address: The Will and the Ways
S. Zárate, Howard Hughes Medical Institute, Washington, D.C.

Introduced by D. Fiedler, Leibniz-Institute for Molecular Pharmacology, Berlin, Germany

FLASH TALKS AND SCHOLAR TALKS

Chairperson: R. Seal, University of Pittsburgh, Pennsylvania
C. Paulsen, Yale University, New Haven, Connecticut
V. Tawfik, Stanford University, California
L. Zhao, The Rockefeller University, New York, New York
M. Boyce, Duke University, Durham, North Carolina: Cell signaling through protein glycosylation.
M. Hammell, Cold Spring Harbor Laboratory: Retrotransposon reactivation in neurodegenerative diseases.
K. Baumbauer, University of Kansas Medical Center, Kansas City: Persistence of pain following spinal cord injury may be established in the acute phase of injury.

Keynote Address: Co-evolution of DNA Replication Origin Specificity and Transcriptional Gene Silencing.
B. Stillman, Cold Spring Harbor Laboratory

Introduced by M. Boyce, Duke University, Durham, North Carolina

SCHOLAR TALKS

Chairperson: E. Gracheva, Yale University School of Medicine, New Haven, Connecticut
D. Fiedler, Leibniz-Institute for Molecular Pharmacology, Berlin, Germany: Inositol pyrophosphate signaling revealed with chemical tools.
K. Hanlon, Presbyterian College School of Pharmacy, Clinton, South Carolina: Neuroprotective role of macrophages within dorsal root ganglia.
R. Daneman, University of California, San Diego, La Jolla: Blood–brain barrier regulation of brain function and behavior.
K. Meyer, Duke University School of Medicine, Durham, North Carolina: Detecting mRNA methylation and its role in gene expression regulation.

SCHOLAR TALKS

Chairperson: W. Greenleaf, Stanford University, California
E. Gracheva, Yale University School of Medicine, New Haven, Connecticut: Molecular adaptations to the unique lifestyle in mammalian hibernators.
Y. Kozorovitskiy, Northwestern University, Evanston, Illinois: A neuromodulatory meta-plasticity hypothesis for rapidly acting antidepressant effects.
B. Li, University of North Carolina, Chapel Hill: Discovering bacterial metabolites that modulate host biology.

K. Foley, L. O'Connell

H. Hoekstra, S. Zárate

P. Grace, M. Burton, M. Banghart

SCHOLAR TALKS

Chairperson: M. Boyce, Duke University, Durham, North Carolina

R. Sharif-Naeini, McGill University, Montreal, Quebec, Canada: TACAN: a novel ion channel necessary for pain sensing.

J. Wilusz, University of Pennsylvania, Philadelphia: Unexpected mechanisms that control the outputs of protein-coding genes.

SCHOLAR TALKS

Chairperson: R. Seal, University of Pittsburgh, Pennsylvania

L. Ding, Columbia University, New York, New York: Understanding the fetal liver hematopoietic stem-cell niche.

S. Davidson, University of Cincinnati, Ohio: Using viable human neural tissues to improve validity for pain medicine.

K. Schlacher, University of Texas MD Anderson Cancer Center, Houston: DNA replication instability in disease, cancer, and inflammation.

A. Khoutorsky, McGill University, Montreal, Quebec, Canada: Remodeling of spinal extracellular matrix modulates the development of pain hypersensitivity.

Keynote Address: How to Succeed in Your Academic Career.
K. Davidson, Northwell Health, New York

Introduced by R. Sharif-Naeini, Montreal, Quebec, Canada

CLOSING REMARKS

E. Christopher, Rita Allen Foundation, Princeton, New Jersey

Liquid Biopsies

September 8–11

ARRANGED BY **L. Diaz,** Memorial Sloan Kettering Cancer Center, New York, New York
V. Velculescu, Johns Hopkins University, Baltimore, Maryland

FUNDED BY **The Mark Foundation for Cancer Research; Genentech**

Liquid biopsies, the analysis of cells and nucleic acids from blood samples, are poised to create major impact for cancer care. Before liquid biopsies can become commonplace in the clinic, however, several issues will need resolution. This Banbury discussion meeting convened experts and stakeholders best positioned to tackle these challenges in order to stimulate collaboration and identify potential solutions.

Welcoming Remarks: **R. Leshan,** Director, Banbury Center, Cold Spring Harbor Laboratory
M. Cleary, CEO, The Mark Foundation for Cancer Research, New York, New York

Introduction and Meeting Objectives: **L. Diaz,** Memorial Sloan Kettering Cancer Center, New York, New York
V. Velculescu, Johns Hopkins University, Baltimore, Maryland

SESSION 1: Approaches and Technology

Chairperson: V. Velculescu, Johns Hopkins University, Baltimore, Maryland

M. Murtaza, Translational Genomics Research Institute, Phoenix, Arizona: Improving accuracy and precision for liquid biopsies using personalized targeted digital sequencing.

L. Diaz, M. Cleary, V. Velculescu, E. Heitzer, C.J. Lin

V. Anagnostou, G. Meijer

A. Moffitt, Cold Spring Harbor Laboratory: Sensitive and quantitative detection of patient-specific cancer variants in blood.

K-T. Varley, Huntsman Cancer Institute, University of Utah, Salt Lake City: Targeted sequencing of mutations and methylation in ctDNA using patch capture.

D. Landau, Weill Cornell Medicine/New York Genome Center, New York: Genome-wide mutational integration for ultrasensitive ctDNA detection.

E. Heitzer, Medical University of Graz, Graz, Austria: Moving beyond DNA sequence: nucleosome occupancy profiling of plasma DNA.

R. Scharpf, Johns Hopkins University, Baltimore, Maryland: Modeling fragmentation patterns of cell-free DNA.

SESSION 2: Circulating Tumor Cells and Other Sample Sources

Chairperson: R. Bish, The Mark Foundation for Cancer Research, New York

C. Alix-Panabières, University Medical Centre of Montpellier, Montpellier, France: Functional study of circulating tumor cells.

K. Pantel, University Medical Center Hamburg-Eppendorf, Hamburg, Germany: Clinical application of circulating tumor cells as liquid biopsy in cancer patients.

M. Cleary and Ryan Schoenfeld, The Mark Foundation for Cancer Research, New York, New York: Announcement of liquid biopsies RFP.

SESSION 3: Biomarker Applications

Chairperson: L. Diaz, Memorial Sloan Kettering Cancer Center, New York, New York

J. Phallen, Johns Hopkins University School of Medicine, Baltimore, Maryland: Circulating tumor DNA as a biomarker for cancer.

R. Fijneman, Netherlands Cancer Institute, Amsterdam, the Netherlands: Circulating tumor DNA as a biomarker in colorectal cancer: turning research into care.

C. Andersen, Aarhus University Hospital, Denmark: Investigations of the potential clinical utility of minimally invasive circulating tumor DNA analysis in the management of colorectal cancer.

SESSION 4: Treatment Monitoring

Chairperson: R. Schoenfeld, The Mark Foundation for Cancer Research, New York, New York

V. Anagnostou, Johns Hopkins University School of Medicine, Baltimore, Maryland: Liquid biopsy approaches for rapid determination of response to immune checkpoint blockade.

M. Sausen, Bristol-Myers Squibb, Pennington, New Jersey: Noninvasive detection of microsatellite instability and high tumor mutation burden in cancer patients treated with PD-1 blockade.

A. Leal, Johns Hopkins University, Baltimore, Maryland: Matched white blood cell and cell-free DNA analyses for the detection of minimal residual disease in patients with cancer.

K-T. Varley

SESSION 5: Clinical Translation

Chairperson: N. Dracopoli, Delfi Diagnostics, Washington, D.C.

M. Berger, Memorial Sloan Kettering Cancer Center, New York, New York: Clinical ctDNA profiling to guide treatment selection.

E. Carpenter, University of Pennsylvania School of Medicine, Philadelphia: Clinical use of liquid biopsy for the management of advanced non-small-cell lung cancer.

J. Lin, Freenome, South San Francisco, California: Use of tumor-informed ctDNA for minimal residual disease testing and monitoring in lung, breast, colorectal, and bladder cancers.

H. Jørgen Nielsen, University of Copenhagen/Hvidovre Hospital, Copenhagen, Denmark: Development of blood-based cancer screening concepts.

G. Meijer, Netherlands Cancer Institute, Amsterdam, the Netherlands: ctDNA on the way to implementation in the Netherlands.

Communicating Science—Boehringer Ingelheim Fellows Retreat

September 13–18

ARRANGED BY **K. Achenbach,** Boehringer Ingelheim Fonds, Mainz, Germany
S. Schedler, Boehringer Ingelheim Fonds, Mainz, Germany
C. Walther, Boehringer Ingelheim Fonds, Mainz, Germany

FUNDED BY **Boehringer Ingelheim Fonds**

The Boehringer Ingelheim Fonds has an international fellowship program supporting outstanding Ph.D. students. Among the opportunities provided to fellows is rigorous training in communication through an annual retreat. It was a great pleasure to have them return in 2019 for interactive instruction in matters such as oral presentations and writing papers; this year's retreat marked the 11th such visit to Banbury.

Opening Remarks: C. Walther, Boehringer Ingelheim Fonds, Mainz, Germany

Introduction to the Bottom Line: A. Katsnelson, Science writer and editor, Northampton, Massachusetts: Ground rules for writing to be read and understood.

W. Tansey, Vanderbilt University, Nashville, Tennessee: Preparing and delivering a scientific talk.

Deadline Writing Assignment 1: PowerPoint Presentations

A. Katsnelson, Science writer and editor, Northampton, Massachusetts: Discussion and questions on writing assignment 1.

Deadline Writing Assignment 2: PowerPoint Presentations

A. Katsnelson, Science writer and editor, Northampton, Massachusetts: On cover letters and how to deal with editor/reviewer comments; Discussion of writing assignment 2.

T. Janowitz, Cold Spring Harbor Laboratory: Bench to bedside and back again: reflections of a physician scientist.

M. Krzywinski, BC Cancer Agency, Vancouver, British Columbia, Canada: Design of scientific concept and data figures.

C. Walther, Boehringer Ingelheim Fonds, Mainz, Germany: All about BIF.

Bridging the Research-to-Practice Chasm in Digital Mental Health

October 6–8

ARRANGED BY **P. Areán,** University of Washington, Seattle
D. Mohr, Northwestern University, Chicago, Illinois

FUNDED BY **Cold Spring Harbor Laboratory Corporate Sponsor Program; Microsoft**

Digital mental health (DMH) interventions using web and mobile technologies have consistently demonstrated effectiveness in more than 100 randomized controlled trials conducted over two decades. This Banbury meeting established an interdisciplinary work group to define the path toward successful, sustainable DMH implementation. Participants (1) outlined the grand challenges facing digital mental health implementation; (2) identified short- (one to three years) and mid-range (three to five years) goals that can move us toward sustainable implementation; and (3) identified immediate tasks (6–12 months) that participants agreed to that will move the field of digital mental health forward.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: P. Areán, University of Washington, Seattle
D. Mohr, Northwestern University, Chicago, Illinois

J. Torous, M. De Choudhury

C. Hartwell, N. Leibowitz

SESSION 1: Perspectives I: Healthcare Systems

Chairperson: P. Areán, University of Washington, Seattle

H. Harbin, consultant, Baltimore, Maryland: Expanding access to digital behavioral interventions.

A. Bertagnolli, Optum Behavioral Health, San Francisco, California" Digital mental health: implementation challenges.

T. Histon, Kaiser Permanente, Oakland, California: Project Chamai: digital mental health tools to support emotional wellness needs.

M. Cunningham-Hill, Northeast Business Group on Health, New York: Leveraging digital mental health to increase access in the employer space.

F. Azocar, Optum, San Francisco, California: An assessment tool for the evaluation of iCBT programs for use in a managed behavioral health organization.

SESSION 2: Perspectives II: Public Health

Chairperson: D. Mohr, Northwestern University, Chicago, Illinois

N. Titov, Mindspot Clinic, Macquarie University, Sydney, New South Wales, Australia: Delivering digital mental health services across Australia: challenges, lessons, and opportunities.

S. Schueller, University of California, Irvine: Implementation of digital mental health across California: the Help@Hand Project.

T. Nguyen, Mental Health America, Alexandria, Virginia: Early digital interventions for individuals with untreated mental health.

SESSION 3: Perspectives III: Company Perspectives

Chairperson: P. Areán, University of Washington, Seattle

N. Leibowitz, Talkspace, New York, New York: Digital mental health startup challenges: from research to implementation.

D. Richards, SilverCloud Health, Dublin, Ireland: Implementing iCBT into routine care: the SilverCloud experience.

C. Hartwell, Bridge Builders Collaborative, St. Paul, Minnesota: The investment landscape in mental wellness.

SESSION 4: Perspectives IV: Users

Chairperson: D. Mohr, Northwestern University, Chicago, Illinois

M. Czerwinski, Microsoft Research, Redmond, Washington: Using technology for health and wellbeing.

P. Areán, University of Washington, Seattle: Use of human-centered design in development of technology tools for research and practice.

D. Mohr, Northwestern University, Chicago, Illinois: Design for care managers and health systems.

T. Choudhury, Cornell University/HealthRhythms, Ithaca, New York: Closing the sensing-to-intervention loop for behavioral health.

SESSION 5: Harnessing Technological Affordances

Chairperson: P. Areán, University of Washington, Seattle

M. De Choudhury, Georgia Institute of Technology, Atlanta: Challenges and opportunities of social media.

T. Histon, D. Richards, P. Chrisp

J. Torous, Harvard Medical School, Boston, Massachusetts: Evaluation and regulation of mental health apps.

C. Nebeker, University of California, San Diego, La Jolla: Ethical, legal/regulatory, and social implications of digital mental health.

P. Chrisp, National Institute for Health and Care Excellence, Manchester, United Kingdom: Digital health technologies and the evidence ecosystem.

SESSION 6: Synthesis, Planning, and Next Steps

Chairpersons: P. Areán, University of Washington, Seattle; **D. Mohr,** Northwestern University, Chicago, Illinois

Reconceptualizing the Challenges of Direct-to-Consumer Health Products

October 14–16

ARRANGED BY **T. Caulfield,** University of Alberta, Edmonton, Canada
L. Turner, University of Minnesota Center for Bioethics, Minneapolis
A. Wexler, University of Pennsylvania, Philadelphia

FUNDED BY **Cold Spring Harbor Laboratory Corporate Sponsor Program**

Health products and services are increasingly moving from the realm of medical professionals into the domain of consumers. To date, questions about safe and responsible marketing have largely remained within individual professional domains. Yet, it may be beneficial to conceptualize these questions as part of a larger social phenomenon. This Banbury meeting brought together an interdisciplinary group of physicians, bioethicists, legal scholars, health and science policy researchers, and communications scholars to rethink the challenges of DTC health products and services.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: A. Wexler, University of Pennsylvania, Philadelphia
L. Turner, University of Minnesota, Minneapolis
T. Caulfield, University of Alberta, Edmonton, Canada

SESSION 1: Historical Background

Chairperson: L. Turner, University of Minnesota, Minneapolis

S. Woloshin, Dartmouth Institute for Health Policy and Clinical Practice, Lebanon, New Hampshire: The rise of DTC medical marketing and services.

B. Southwell, A.M. Navar, E. Suhay, C. Funk

T. Caulfield, R. Redberg

SESSION 2: DTC Health Technologies: Information

Chairperson: S. Joffe, University of Pennsylvania, Philadelphia

C. Bloss, University of California, San Diego, La Jolla: The rise of direct-to-consumer genomics and implications for the future.

R. Redberg, University of California, San Francisco: DTC heart rate monitors.

M. Kyweluk, University of Pennsylvania, Philadelphia: An ethnography of direct-to-consumer ovarian reserve testing.

SESSION 3: DTC Health Technologies: Interventions

Chairperson: P. Zettler, Ohio State University, Columbus

L. Turner, University of Minnesota, Minneapolis: Direct-to-consumer marketing of unproven stem cell interventions: ethical concerns and regulatory responses.

V. Manchaiah, Lamar University, Beaumont, Texas: Direct-to-consumer hearing devices: an overview.

A. Wexler, University of Pennsylvania, Philadelphia: Studying users of direct-to-consumer neurotechnology and orthodontics.

SESSION 4: Public Understanding of Science

Chairperson: M. Kyweluk, University of Pennsylvania, Philadelphia

C. Funk, Pew Research Center, Washington, D.C.: Public perspectives on medical science.

B. Southwell, RTI International, Research Triangle Park, North Carolina: Public understanding of risk in direct-to-consumer advertising.

A. Marie Navar, Duke University, Durham, North Carolina: The dangerous intersection of DTC marketing and medical misinformation: lessons from vaccines and statins.

E. Suhay, American University, Washington, D.C.; Opportunities and risks in commercial science communication with the public.

SESSION 5: Government Regulation

Chairperson: A. Wexler, University of Pennsylvania, Philadelphia

P. Zettler, Ohio State University, Columbus: FDA and DTC health technologies.

SESSION 6: Alternatives to Government Regulation

Chairperson: T. Caulfield, University of Alberta, Edmonton, Canada

L. Brett, National Advertising Division, New York, New York: Self-regulation and advertising for direct-to-consumer health products.

B. Patten, Truth in Advertising, Madison, Connecticut: Going viral: deceptive marketing in the health and wellness industry.

A. Zarzeczny, University of Regina, Saskatchewan, Canada: Direct-to-consumer health markets and the roles of physicians: can professional regulation keep up?

SESSION 7: Impact on Patient–Physician Relationships

Chairperson: L. Turner, University of Minnesota, Minneapolis

S. Joffe, University of Pennsylvania, Philadelphia: The changing nature of autonomy in contemporary health care.

A. Levine, Georgia Institute of Technology, Atlanta: Rethinking authority and trust in the global DTC health marketplace.

SESSION 8: Issues on the Horizon

Chairperson: B. Patten, Truth in Advertising, Madison, Connecticut

S. Woloshin, B. Southwell

B. Patten, E. Suhay

J. Snyder, Simon Fraser University, Burnaby, British Columbia, Canada: Crowd control: crowdfunding for unproven DTC medical intervention.

T. Caulfield, University of Alberta, Edmonton, Canada: Marketing the microbiome: DTC and gut hype.

SESSION 9: Discussion, Meeting Wrap-Up, and Next Steps

Chairpersons: A. Wexler, University of Pennsylvania, Philadelphia; **T. Caulfield,** University of Alberta, Edmonton, Canada; **L. Turner,** University of Minnesota, Minneapolis

Emerging Issues of Privacy, Trust, and Societal Benefit from Consumer Genomics

October 19–22

ARRANGED BY **Y. Erlich,** Columbia University/MyHeritage, New York, New York
A.L. McGuire, Baylor College of Medicine

FUNDED BY **Cold Spring Harbor Laboratory Corporate Sponsor Program; MyHeritage**

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: A.L. McGuire, Baylor College of Medicine
Y. Erlich, Columbia University/MyHeritage

SESSION 1: Stakeholder Perspectives I: Companies

Chairperson: A. McGuire, Baylor College of Medicine

Y. Erlich, Columbia University/MyHeritage
C. Rogers, GEDmatch
C. Ball, Ancestry DNA, LLC
S. Kahn, LunaPBC
S. Elson, 23andMe
C. Bormans, Gene by Gene

SESSION 2: Stakeholder Perspectives II: Law Enforcement

Chairperson: T. Callaghan, Federal Bureau of Investigation

T. Hunt, U.S. Department of Justice
S. Kramer, Federal Bureau of Investigation
J. Shimp, Federal Bureau of Investigation
B. Budowle, Center for Human Identification
C. Fitzpatrick, Identifinders International
L. Napolitano, Florida Department of Law Enforcement
C.C. Moore, DNA Detectives/Parabon Nanolabs

SESSION 3: Stakeholder Perspectives III: Consumers

Chairperson: L. Lyman Rodriguez, Geisinger National Precision Health

C. Guerrini, Baylor College of Medicine

Y. Erlich, S. Elson

A. McGuire, C. Guerrini

B. Bettinger, The Genetic Genealogist
V. Potkin, Innocence Project
V. Eidelman, American Civil Liberties Union

SESSION 4: When Things Go Wrong

Chairperson: B. Wible, Science

I. Rawlins, U.S. Navy
P. Ney, University of Washington
Y. Erlich, Columbia University/MyHeritage
E. Tromer, Columbia University/Tel Aviv University

SESSION 5: Policy and Ethics

Chairperson: Y. Erlich, Columbia University/MyHeritage

L. Lyman Rodriguez, Geisinger National Precision Health
T. Callaghan, Federal Bureau of Investigation
N. Ram, University of Maryland Carey School of Law
E. Murphy, New York University
L. Brody, National Human Genome Research Institute
M. Fullerton, University of Washington School of Medicine

SESSION 6: Synthesis and Next Steps

Chairpersons: Y. Erlich, Columbia University/MyHeritage; **A. McGuire,** Baylor College of Medicine

E. Murphy, T. Callaghan, V. Potkin

B. Wible, S. Kramer, E. Tromer

CaMKII and Its Role as a Self-Tuning Structural Protein at the Synapse

October 27–30

ARRANGED BY **Y. Hayashi,** Kyoto University, Japan
J. Hell, University of California, Davis

FUNDED BY **Cold Spring Harbor Laboratory Corporate Sponsor Program; Kyoto University;** with additional support from **O'HARA & Co.** and **Sutter Instruments**

The Ca^{2+}/calmodulin-dependent protein kinase CaMKII is the most abundant noncytoskeletal protein at the synapse. Despite a number of studies on CaMKII function, many unexplained findings and open questions remain. This Banbury meeting convened experts to stimulate discussion, seeded new ideas, and facilitated collaboration in ways that will accelerate new discoveries about CaMKII regulation at both the basic and translational levels.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: Y. Hayashi, Kyoto University, Japan
J. Hell, University of California, Davis

SESSION 1: The Bigger Picture

Chairperson: Y. Hayashi, Kyoto University, Japan

M. Kennedy, California Institute of Technology, Pasadena: CaMKII as a central element in the biochemical network regulating excitatory synapses.

R. Yasuda, K. Zito

R. Tsien, J. Hell

H. Schulman, Stanford University School of Medicine/Panorama Research Institute, Palo Alto, California: CaMKII structure/function informs genetic and other diseases.

R. Nicoll, University of California, San Francisco: Is CaMKII a memory molecule?

R. Tsien, New York University Neuroscience Institute, New York: Function of CaMKII in Hebbian and homeostatic plasticity.

SESSION 2: Cell Biology

Chairperson: H. Bito, University of Tokyo, Japan

L. Griffith, Brandeis University, Waltham, Massachusetts: Local translation of CaMKII in *Drosophila*.

R. Colbran, Vanderbilt University, Nashville, Tennessee: Roles of CaMKII-associated proteins in CaMKII signaling.

P. De Koninck, Université Laval, Quebec, Canada: Dendritic signaling by CaMKII supporting synaptic plasticity.

R. Yasuda, Max Planck Florida Institute for Neuroscience, Jupiter: Mechanisms of CaMKII activation in single dendritic spines.

SESSION 3: Role in Synaptic Plasticity I

Chairperson: J. Hell, University of California, Davis

K. Zito, University of California, Davis: Signaling through NMDAR and CaMKII in spine structural plasticity.

U. Bayer, University of Colorado Anschutz Medical Campus, Aurora: The CaMKII/DAPK1 competition in the LTP/LTD decision and beyond.

H. Murakoshi, National Institute for Physiological Science, Okazaki, Japan: Optogenetic induction of synaptic plasticity at single synapses by photoactivatable CaMKII.

SESSION 4: In Vivo Perspectives

Chairperson: K. Roche, National Institute of Neurological Disorders and Stroke, Bethesda, Maryland

G. van Woerden, Erasmus Medical Center, Rotterdam, the Netherlands: Novel insight in the developmental role of CAMK2A in learning, memory and plasticity, and neurodevelopmental disorders.

Y. Hayashi, Kyoto University, Japan: Structural role of CaMKII.

M. Stratton, University of Massachusetts, Amherst: The mechanism of CaMKII regulation: from equilibrium to oscillations.

E. Grandi, University of California, Davis: Modeling CaMKII signaling in the heart.

SESSION 5: Role in Synaptic Plasticity II

Chairperson: K. Zito, University of California, Davis

T. Hosokawa, Kyoto University, Japan: Reconstitution of synaptic long-term potentiation in vitro.

M. Zhang, Hong Kong University of Science and Technology, China: Activity-dependent formation of CaMKII and PSD condensates via phase separation.

K. Roche, National Institute of Neurological Disorders and Stroke, Bethesda, Maryland: Regulation of synaptic NMDA receptors by CaMKII phosphorylation.

L. Griffith

M. Dell'Acqua, University of Colorado School of Medicine, Aurora: Cross-talk between CaMKII, PKA and calcineurin signaling during NMDA receptor-dependent LTD.

J. Hell, University of California, Davis: Postsynaptic signaling by CaMKII.

SESSION 6: Structure

Chairperson: M. Stratton, University of Massachusetts, Amherst

J. Kuriyan, University of California, Berkeley: Phosphorylation control in CaMKII.

S. Vogel, National Institutes of Health, Rockville, Maryland: Using Förster resonance energy transfer (FRET) spectroscopy and fluorescence correlation spectroscopy (FCS) to study conformational changes associated with Venus-tagged CaMKII activation and T-site interactions.

SESSION 7: Meeting Wrap-Up

Chairpersons: Y. Hayashi, Kyoto University, Japan; **J. Hell,** University of California, Davis

Microbiology of the Built Environment

November 3–6

ARRANGED BY **J. Green,** University of Oregon/Phylagen, Inc., Eugene
R. Kolter, Harvard Medical School, Boston, Massachusetts
J. Peccia, Yale University, New Haven, Connecticut

FUNDED BY **Alfred P. Sloan Foundation**

In recent years, microbiome research has grown rapidly as the mutualisms, antagonisms, and beneficial or pathogenic effects of these communities are revealed and linked to human health consequences. This meeting convened experts to examine the critical, cross-sector, and cross-disciplinary issues associated with the microbiology of the built environment, as well as the underlying challenges of long-term momentum for the field and strategies for continued progress.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor

Introduction and Meeting Objectives: J. Ausubel, The Rockefeller University, New York, New York
J. Green, University of Oregon/Phylagen, Inc., Eugene

SESSION 1: Health Impacts

Chairperson: V. Loftness, Carnegie Mellon University, Pittsburgh, Pennsylvania

V. Loftness, Carnegie Mellon University, Pittsburgh, Pennsylvania: The importance of access to nature for human health and sustainability (and the unknowns relative to microbiomes).

A. Prussin, K. Bibby, F. Ling, C. Fernandez Marco, J. Siegel, L. Marr

R. Colwell, G. Anderson

E. Matsui, University of Texas, Austin: Animals and their allergens and microbes: implications for asthma disparities.

J. Portnoy, Children's Mercy Hospitals and Clinics, Kansas City, Missouri: Indoor allergen assessment and interventions to control asthma.

A. Hoisington, Air Force Institute of Technology, Wright-Patterson AFB, Ohio: The built environment and mental health.

J. Handelsman, University of Wisconsin, Madison: Novel approaches to sourcing antibiotics and resistance genes from the environment.

SESSION 2: Approaches for the Study of Indoor Microbes I

Chairperson: G. Andersen, Lawrence Berkeley National Laboratory, California

R. Knight, University of California, San Diego, La Jolla: Integrative omics approaches for linking built environment microbiology to human health.

G. Andersen, Lawrence Berkeley National Laboratory, California: RNA as a proxy for microbial activity in the indoor environment.

SESSION 3: Water and Microbes in Built Environments

Chairperson: F. Ling, Washington University in St. Louis, Missouri

F. Ling, Washington University in St. Louis, Missouri: Process-based and data-driven approaches to understand water microbiome dynamics.

A. Pruden, Virginia Tech, Blacksburg: Waterborne microbiomes: bridging the gap between environmental and public health.

R. Colwell, University of Maryland, College Park: Providing healthy water in urban environments.

K. Bibby, University of Notre Dame, Indiana: Bringing viral indicators indoors.

SESSION 4: Fungi/Molds in Built Environments

Chairperson: D. Betancourt, Environmental Protection Agency, Research Triangle Park, North Carolina

D. Betancourt, Environmental Protection Agency, Research Triangle Park, North Carolina: An EPA pilot study characterizing fungal and bacterial populations at home with flooding events at the Martin Pena Channel Community, San Juan, Puerto Rico.

J. Peccia, Yale University, New Haven, Connecticut: Advances in using fungal ecology to diagnose water-damaged homes.

T. Reponen, University of Cincinnati, Ohio: Measured versus observed mold and the development of children's asthma.

B. Sothern, Microecologies, Inc., New York, New York: Mold allergic diseases and asthma: assessing validity and usefulness of indoor air sampling as a tool for health-protective advice to occupants.

SESSION 5: Microbial Exposure and Control

Chairperson: W. Bahnfleth, Penn State University, University Park, Pennsylvania

W. Bahnfleth, Penn State University, University Park, Pennsylvania: Optical radiation for control of microbes in air and on surfaces.

E. Hartmann, Northwestern University, Evanston, Illinois: The impact of antimicrobial chemicals on microbial viability and antibiotic resistance.

W. Nazaroff, University of California, Berkeley: Indoor bioaerosol dynamics: microbial exposure consequences.

A.J. Prussin, Virginia Tech, Blacksburg: Viral aerosols in the built environment.

J. Siegel, University of Toronto, Ontario, Canada: Intentionally manipulating the indoor microbiome: challenges and opportunities.

R. Kolter, J. Green

T. Reponen, J. Portnoy

SESSION 6: Approaches for the Study of Indoor Microbes II

Chairperson: L. Marr, Virginia Tech, Blacksburg

L. Marr, Virginia Tech, Blacksburg: Humidity, microbiology, microchemistry, and exposure in droplets and aerosols.

G. Mainelis, Rutgers University, New Brunswick, New Jersey: Challenges and successes in bioaerosol sampling to investigate microbiology of the built environment.

K. Van Den Wylmelenberg, University of Oregon, Eugene: Design the unseen.

SESSION 7: Meeting Wrap-Up and Next Steps

Chairpersons: P. Olsiewski, Alfred P. Sloan Foundation, New York, New York; **R. Kolter,** Harvard Medical School, Boston, Massachusetts; **J. Ausubel,** The Rockefeller University, New York, New York

Lustgarten Foundation Scientific Advisory Board Meeting

November 10–12

ARRANGED BY **K. Kaplan,** Lustgarten Foundation, Woodbury, New York
D. Tuveson, Cold Spring Harbor Laboratory
R. Vizza, Lustgarten Foundation, Woodbury, New York

FUNDED BY **The Lustgarten Foundation**

Banbury was pleased to welcome back the Lustgarten Foundation for their 2019 Scientific Meeting, which provided an opportunity for the Scientific Advisory Board, as well as Foundation-supported investigators, to discuss research and strategy, evaluate performance, provide feedback for improvement, strengthen collaboration, and identify new ideas to bolster progress in the field.

J. Abbruzzese, Duke Cancer Institute, Durham, North Carolina
S. DeGarabedian, The Lustgarten Foundation, Woodbury, New York
R. Evans, Salk Institute for Biological Studies, La Jolla, California
D. Fearon, Cold Spring Harbor Laboratory
F. Froeling, Cold Spring Harbor Laboratory
C. Fuchs, Yale School of Medicine, New Haven, Connecticut
T. Hunter, Salk Institute for Biological Studies, La Jolla, California
T. Jacks, Koch Institute at MIT, Cambridge, Massachusetts
E. Jaffee, Johns Hopkins School of Medicine, Baltimore, Maryland
K. Kaplan, The Lustgarten Foundation for Pancreatic Cancer Research, Woodbury, New York
D. Kelsen, Memorial Sloan Kettering Cancer Center, New York, New York
R. Mayer, Dana-Farber Cancer Institute/Harvard University, Boston, Massachusetts
M. Muzumdar, Yale Cancer Center, New Haven, Connecticut
J. O'Brien, The Lustgarten Foundation, Woodbury, New York
S. Park, Johns Hopkins University, Baltimore, Maryland
A. Parker, Thrive Earlier Detection, Cambridge, Massachusetts
D. Plenker, Cold Spring Harbor Laboratory
E. Sawey, Lustgarten Foundation, Woodbury, New York
D. Tuveson, Cold Spring Harbor Laboratory
M. Vander Heiden, Massachusetts Institute of Technology, Cambridge
R. Vizza, The Lustgarten Foundation for Pancreatic Cancer Research, Woodbury, New York
B. Vogelstein, Sidney Kimmel Cancer Center at Johns Hopkins University, Baltimore, Maryland
B. Wolpin, Dana-Farber Cancer Institute, Boston, Massachusetts
A. Yuille, Johns Hopkins University, Baltimore, Maryland

The Nervous System in Cancer

December 10–13

ARRANGED BY **S. Knox,** University of California, San Francisco
M.L. Monje, Stanford University, California
T. Wang, Columbia University, New York, New York

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The nervous system critically modulates development, homeostasis, and plasticity. A similarly powerful role for neural regulation of the cancer microenvironment is emerging. Neurons promote the growth of cancers in many tissue types. Parallel mechanisms shared in development and cancer suggest that neural modulation of the tumor microenvironment may prove a universal theme, although the mechanistic details of such modulation remain to be discovered for many malignancies. This meeting convened experts to discuss both local and systemic cross talk between the nervous system and cancer, and the emerging principles of cancer neuroscience.

Welcoming Remarks: R. Leshan, Director, Banbury Center, Cold Spring Harbor Laboratory

Introduction and Meeting Objectives: S. Knox, University of California, San Francisco
M. Monje, Stanford University, California
T. Wang, Columbia University, New York, New York

An Exoneural Platform in Drug Discovery: J. Hurov, Cygnal Therapeutics, Cambridge, Massachusetts

B. Deneen, S. Hervey-Jumper

P. Frenette, L. Trotman

SESSION 1: Neural Regulation of Development, Plasticity, and Regeneration

Chairperson: S. Knox, University of California, San Francisco

A. Lloyd, University College London, United Kingdom: Links between peripheral nerve regeneration and cancer.

H. Hondermarck, The University of Newcastle, Callaghan, New South Wales, Australia: Nerve dependence: from regeneration to cancer.

S. Knox, University of California, San Francisco: Neuronal control of glandular development, regeneration, and cancer.

R. Segal, Harvard University, Boston, Massachusetts: Cancer, chemotherapy, and nerves.

M. Taylor, University of Toronto, Ontario, Canada: Identifying the lineages of origin for childhood brain cancers.

SESSION 2: Neural–Immune Interactions

Chairperson: D. Gutmann, Washington University in St. Louis, Missouri

K. Tracey, The Feinstein Institute for Medical Research, Manhasset, New York: Neural signaling regulating immunity.

X. Sun, University of California, San Diego, La Jolla: Neural control of lung function and pathogenesis.

E. Sloan, Monash University, Parkville, Victoria, Australia: Neural remodeling of the tumor microenvironment.

D. Gutmann, Washington University in St. Louis, Missouri: Low-grade glioma ecosystem biology.

SESSION 3: Neural Regulation of Primary Brain Cancers

Chairperson: M. Monje, Stanford University, California

M. Monje, Stanford University, California: Neuronal activity regulates the proliferation of normal and malignant glia.

L. Garzia, McGill University, Montreal, Quebec, Canada: Electrical activity regulates medulloblastoma pathogenesis.

P. Dirks, The Hospital for Sick Children, Toronto, Ontario, Canada: Neuromodulators and the control of brain tumor cell proliferation.

F. Winkler, Universität Heidelberg, Germany: Glioma: a brain in the brain.

SESSION 4: Neural Regulation of Endo-/Ectodermal Cancers

Chairperson: T. Wang, Columbia University, New York, New York

T. Wang, Columbia University, New York, New York: The role of nerves in gastric cancer.

F. Fattahi, University of California, San Francisco: Derivation of peripheral nervous system lineages from human pluripotent stem.

J. Saloman, University of Pittsburgh, Pennsylvania: Neuroplasticity and neuroimmune interactions in pancreatic tumorigenesis.

R. White, Columbia University Medical Center, New York, New York: Targeting the parasympathetic nervous system in pancreatic adenocarcinoma.

N. D'Silva, University of Michigan, Ann Arbor: Nerves and cancer: a dynamic interaction.

SESSION 5: Neural Regulation of Metastasis

Chairperson: H. Hondermarck, The University of Newcastle, Callaghan, New South Wales, Australia

P. Frenette, Albert Einstein College of Medicine, Bronx, New York: Nerves at the forefront of hematopoietic stem cell migration, aging, and cancer.

D. Hanahan, Ecole Polytechnique Fédérale de Lausanne, Switzerland: Glutamate-stimulated NMDAR signaling drives cancer invasion and brain metastasis.

SESSION 6: Cancer Regulation of Neuronal Activity

Chairperson: B. Deneen, Baylor College of Medicine, Houston, Texas

M. Monje (*back to camera*), N. D'Silva

A. Lantermann, P. Frenette

B. Deneen, Baylor College of Medicine, Houston, Texas: Merging functional genomics and the neuroscience of brain tumors.

C. Magnon, INSERM, Fontenay-aux-Roses, France: Role of the central nervous system in the development of cancer.

S. Hervey-Jumper, University of California, San Francisco: Glioma-neuron synapses enriched within intratumoral functional connectivity network hubs influences language plasticity in adult IDH-wt glioblastoma.

J. Borniger, Stanford University, California: Distal modulation of subcortical neural activity by cancer in the periphery.

SESSION 7: Meeting Summary, Wrap-Up, and Next Steps

Chairperson: C. Jhappen, National Cancer Institute, Rockville, Maryland