

## David Nirenberg Named 10th Director of IAS



David Nirenberg

The Institute for Advanced Study has appointed David Nirenberg as its 10th Director and Leon Levy Professor. Most recently dean of the Divinity School at the University of Chicago and professor of medieval history, Nirenberg—at IAS—assumes leadership of one of the world’s preeminent centers for theoretical research in the sciences and humanities.

A seasoned administrator and innovator, Nirenberg was founding director of the Neubauer Collegium for Culture and Society (2011–14), Dean of the Social Sciences (2014–17), and Executive Vice Provost at the University of Chicago (2017–18).

“David’s administrative accomplishments, like the Institute itself, transcend cultural and disciplinary boundaries, providing new frameworks of knowledge to understand society and to realize the power of collective curiosity,” said Nancy Peretsman, IAS Board Vice Chair and Chair of the

eight-member Director Search Committee. “David offers the leadership qualities to ensure that IAS remains a significant center for basic research as it approaches its centennial. We are thrilled to welcome David as our next Director.”

Serving as Deborah R. and Edgar D. Jannotta Distinguished Service Professor of Social Thought, History, Divinity, Romance Languages and Literatures, and the College at the University of Chicago, Nirenberg explores a wide-range of ideas about communication, exchange, and social relations.

“The appointment of a humanities scholar is a bold choice, which departs from several decades of Directors trained in science and mathematics, but reaffirms in the strongest sense the importance of cross-disciplinary collaboration at IAS,” said Charles Simonyi, IAS Board Chair. “An energetic and astute leader, David understands that the Institute is a public good in service of society: to be a haven for scholars with a long view ready to share the fruits of their curiosity.”

As founding director of the Neubauer Collegium for Culture and Society at the University of Chicago, Nirenberg championed a program that afforded both funding and space to catalyze collaborations across every division, school, and affiliated laboratory at the university. By uniting practitioners across fields, the collegium enables novel investigations and new forms of thinking based on the cross-pollination of ideas.

“Since the Institute’s creation in 1930, discoveries by its Faculty have transformed fields from mathematics and physics to anthropology and art history. The Institute has also served the nation and the world through the constant performance of its founding values: that discriminations by gender and race are inimical to excellence, that scholars and ideas must move freely if fundamental knowledge is to flourish, and that when knowledge flourishes, humanity benefits” said Nirenberg. “Both these tasks—discovery and the defense of these values—feel as urgent today as they were at the founding of this marvelous institution that I am so proud to be joining.”

(Continued on page 4)

## Political Theorist Wendy L. Brown Joins Faculty of the Institute for Advanced Study

Wendy L. Brown, one of the preeminent political theorists of her generation, has joined the Institute for Advanced Study as the UPS Foundation Professor in the School of Social Science. Brown’s foundational insights into neoliberalism, authoritarianism, feminism, sovereignty, progress, and tolerance, among other signature concepts, have revolutionized understandings of democracy and the modern powers that challenge it. Brown was previously the Class of 1936 First Chair of Political Science at the University of California, Berkeley. Her appointment to the IAS Faculty is effective July 1, 2021.



Wendy Brown

“An architect of ideas with an exceptional range of interests, Wendy is a wonderful addition to the IAS Faculty,” stated Robbert Dijkgraaf, IAS Director and Leon Levy Professor. “Her research transcends disciplinary boundaries and has advanced the fields of law, politics, economics, and history, among many others, but most of all provides new frameworks for understanding the wide-ranging complexities of society.”

Brown was previously a Member (2001–02) and Visitor (1992–93) in the School of Social Science. As part of the Faculty, she will lead the School’s special theme year on “Political Mobilizations and Social Movements” for the

(Continued on page 10)

## Lessons from the Social Condensers

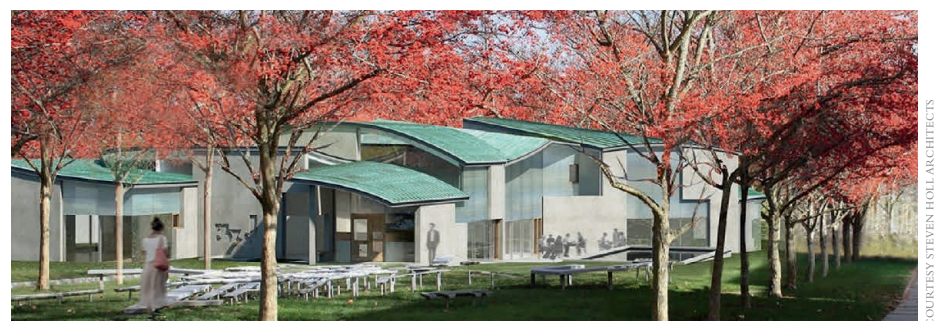
*Form as Function in the Rubenstein Commons*

BY ANNA BOKOV

The new Rubenstein Commons building at the Institute for Advanced Study, designed by Steven Holl Architects, stands in stark contrast to the explicitly functionalist forms of other modern buildings on campus: the Member housing, designed by Marcel Breuer, or even the welcoming but austere (what’s known as “brutalist”) spaces of the dining hall, designed by Robert Geddes.

As an architectural historian, I think of architecture in epistemological terms. It is my second nature to question the ideas and origins that might have

(Continued on page 6)



A rendering of Rubenstein Commons, from the front

# News of the Institute Community

NIMA ARKANI-HAMED, Professor in the School of Natural Sciences, has been awarded the 2022 J. J. Sakurai Prize for Theoretical Particle Physics by the American Physical Society.

YVE-ALAIN BOIS, Professor in the School of Historical Studies, has completed *Ellsworth Kelly, Catalogue Raisonné of Paintings, Reliefs and Sculpture, Volume Two, 1954–1958*. It is the second of a planned five volumes published by *Cahiers d'Art*.

CAMILLO DE LELLIS, IBM von Neumann Professor in the School of Mathematics, has been awarded the Antonio Feltrinelli Prize for Mathematics, Mechanics and Applications by the Accademia Nazionale dei Lincei. Additionally, ELIA BRUË, Member in the School, has been awarded the academy's Gioacchino Iapichino Prize.

DIDIER FASSIN, James D. Wolfensohn Professor, has authored *Death of a Traveller: A Counter Investigation* (Polity, 2021), translated from French by Rachel Gomme. Additionally, Fassin was elected as a member of the Academia Europaea for 2021.

JONATHAN HASLAM, George F. Kennan Professor in the School of Historical Studies (2015–21) has authored *The Spectre of War: International Communism and the Origins of World War II* (Princeton University Press, 2021).

SABINE SCHMIDTKE, Professor in the School of Historical Studies, was elected a Corresponding Member Abroad of the Austrian Academy of Sciences.

MATIAS ZALDARRIAGA, Richard Black Professor in the School of Natural Sciences, and MARC KAMIONKOWSKI, Member (1991–95) in the School, have been awarded the 2021 Gruber Cosmology Prize by the Gruber Foundation and International Astronomical Union.

JONATHAN ISRAEL, Professor Emeritus in the School of Historical Studies, has authored *Revolutionary Jews from Spinoza to Marx: The Fight for a Secular World of Universal and Equal Rights* (University of Washington Press, 2021).

ARNOLD J. LEVINE, Professor Emeritus in the School of Natural Sciences; STEVEN ALTSCHULER, Mathematics Member (1992–93); and BENJAMIN GREENBAUM, Natural Sciences Member (2008–13) and Visitor (2017–21), have received 2021 ASPIRE Awards from the Mark Foundation.

MICHAEL WALZER, Professor Emeritus in the School of Social Science, has contributed an essay to *The Ethics of Policing: New Perspectives on Law Enforcement* (New York University Press, 2021), a volume edited by Ben Jones.

ROBERT DIJKGRAAF, IAS Director and Leon Levy Professor, has been appointed to serve on the Simons Foundation's board of directors. Additionally, the Simons Foundation appointed DAVID SPERGEL, Member (1985–88) and Visitor (2014) in the School of Natural Sciences, as President.

KEISHA N. BLAIN, Member in the School of Social Science, has authored *Until I Am Free: Fannie Lou Hamer's Enduring Message to America* (Beacon Press, 2021). Additionally, she coauthored *Four Hundred Souls: A Community History of African America, 1619–2019* (One World, 2021), which appeared on the 2022 shortlist for the Andrew Carnegie Medals for Excellence in Fiction and Nonfiction.

JACOB GATES FOSTER, Member in the School of Social Science, and his collaborators received a 2021 Datasets & Benchmarks Best Paper Award from NeurIPS for their paper “Reduced, Reused and Recycled: The Life of a Dataset in Machine Learning Research.”

DOUGLAS J. FLOWE, Member in the School of Historical Studies, received the 2021 Littleton-Griswold Prize for his book *Uncontrollable Blackness: African American Men and Criminality in Jim Crow New York* (University of North Carolina Press, 2020).

ELLIOTT H. LIEB, Visitor in the School of Natural Sciences, has received the 2022 American Physical Society Medal for Exceptional Achievement in Research.

SARAH PELUSE, Veblen Research Instructor in the School of Mathematics, and HONG WANG, Member (2019–21) in the School, have received the 2022 Maryam Mirzakhani New Frontiers Prize. Additionally, TAKURO MOCHIZUKI, Member (2001–03) in the School, has received the 2022 Breakthrough Prize in Mathematics.

IRIS MONTERO-SOBREVILLA, Member in the School of Historical Studies, has won the 2021 Robert F. Heizer Article Award for “The Disguise of the Hummingbird: On the Natural History of Huitzilopochtli in the Florentine Codex” (*Ethnohistory, Volume 67, Number 3*).

EMMY MURPHY, Visitor and recent von Neumann Fellow in the School of Mathematics and JOHN PARDON, Visitor (2016–17) in the School have been awarded the MCA Prize by the Mathematical Council of the Americas.

CARLOS KENIG, Distinguished Visiting Professor (2003–04) in the School of Mathematics, has been awarded the Solomon Lefschetz Medal.

TONIANN PITASSI, Visiting Professor in the School of Mathematics, has been awarded the 2021 EATCS Award conferred by the European Association for Theoretical Computer Science.

The Spektrum-Roentgen-Gamma orbital X-ray observatory, associated institutions, and partners received the 2021 Marcel Grossmann Institutional Award. RASHID SUNYAEV, Maureen and John Hendricks Distinguished Visiting Professor in the School of Natural Sciences, accepted the award on behalf of the Space Research Institute of the Russian Academy of Sciences.

PAMELA BARMASH, Member (2008–09) in the School of Historical Studies, has published *The Laws of Hammurabi: At the Confluence of Royal and Scribal Traditions* (Oxford University Press, 2021).

LUCAS BESSIRE, Member (2012–13) in the School of Social Science, has authored *Running Out: In Search of Water on the High Plains* (Princeton University Press, 2021).

JEAN-MICHEL BISMUT, Member (1984, 1994) in the School of Mathematics, and JEFF CHEEGER, Member (1972, 1977–78, 1995) in the School, have received the 2021 Shaw Prize in Mathematics.

SIMON CARON-HUOT, Member (2009–14) in the School of Natural Sciences, has been awarded the CAP Herzberg Medal by the Canadian Association of Physicists.

GAO CHEN, Member (2017–19) in the School of Mathematics, has been awarded the 2021 Green Orange Award by the Dharma Academy.

KYLE CRANMER, Visitor (2011) and Junior Visiting Professor (2018) in the School of Natural Sciences, will become the next director of the American Family Insurance Data Science Institute at the University of Wisconsin–Madison.

TERENCE HWA, Member (1993–94) in the School of Natural Sciences, has been awarded the 2022 Max Delbruck Prize in Biological Physics by the American Physical Society.

LAURENCE RALPH, Member (2012–13) in the School of Social Science, has been awarded the 2021 Robert B. Textor and Family Prize for Excellence in Anticipatory Anthropology for *The Torture Letters: Reckoning with Police Violence* (University of Chicago Press, 2020).

SARA SEAGER, Member (1999–2002) in the School of Natural Sciences, has been appointed officer to the Order of Canada.

NIKHIL SRIVASTAVA, Member (2010–11) and Visitor (2012) in the School of Mathematics, has been awarded the 2022 Ciprian Foias Prize in Operator Theory by the American Mathematical Society.

## CONTENTS

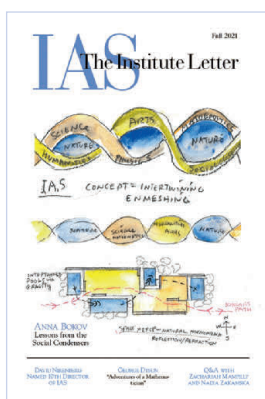
- 2 News of the Institute Community
- 3 Carl P. Feinberg Appointed to Board of Trustees  
IAS Welcomes 271 Scholars for 2021–22 Academic Year  
Q&A with Nadia Zakamska
- 4 Paving a Way: Scholars in the Streets at the Institute for Advanced Study
- 5 Hubble Data Confirms Galaxies Lacking Dark Matter  
Astronomers Model Formation of Planets in Binary Star Systems
- 8 Adventures of a Mathematician
- 9 Paths to Math
- 10 Q&A with Zachariah Cherian Mampilly

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## COVER IMAGE

Natural phenomena are intertwined with science, physics, humanities, and art—corresponding with the Institute's mission.

Watercolor sketch from the architectural competition  
Courtesy Steven Holl

## Carl P. Feinberg Appointed to Board of Trustees



Carl Feinberg

The Institute for Advanced Study has named Carl P. Feinberg—entrepreneur, investor, and philanthropist—to its Board of Trustees effective October 30, 2021.

Feinberg is a prolific benefactor of the Institute and visionary funder of world-leading programs and scholars in theoretical physics. Earlier this year, he endowed the Carl P. Feinberg Cross-Disciplinary Program in Innovation at the Institute for Advanced Study, led by Nima Arkani-Hamed.

In 2016, he endowed a Professorship of Theoretical Physics, currently held by Juan Maldacena.

Feinberg joined the Friends of the Institute in 2002, and continues to engage regularly in the intellectual and cultural life of IAS. In recognition of his annual support of the Institute through the Friends program, five early-career scholars in the School of Natural Sciences have been named Carl P. Feinberg Founders' Circle Members: Alexandre Streicher (2021–22), Adam Levine (2020–21), Sebastian Mizera (2019–20), Thomas Rudelius (2017–18, 2018–19), and Ellis Ye Yuan (2016–17).

Feinberg has a deep appreciation for the values of IAS and is an unwavering champion of pure basic research. Through his appointment to the Board, he will lend his investment knowledge, business acumen, and intellectual curiosity to the Institute.

Feinberg is currently CEO of Critica PPE, LLC. He was the Founder and CEO of Relational Architects International, an enterprise software vendor whose products are part of the fabric of modern commerce. Feinberg also chairs Parker Infrastructure Partners, LLC, which brings iconic mega projects, like the Tappan Zee and Goethals Bridge replacements and the Port of Miami Tunnel, to fruition.

He is a member of the Director's Advisory Cabinet at the Kavli Institute for Theoretical Physics at UC Santa Barbara; serves on the Board of Visitors of McDonald Observatory at the University of Texas and the Board of Trustees of Family Connections NJ, a non-profit community-based counseling, mentoring and family service agency; and is a member of the Economic Club of New York.

He graduated from the University of Pennsylvania in 1971 with a B.S. in Biology. ■

## IAS Welcomes 271 Scholars for 2021–22 Academic Year

Following a year and a half of digital seminars, remote collaboration, and a phased return to campus, the Institute for Advanced Study begins its 2021–22 academic year with a continuation of in-person activities. The Institute plans to welcome 271 new and returning scholars and scientists to campus, representing 114 academic institutions and hailing from 38 countries. Approximately half of visiting scholars will be international.

Wendy Brown, appointed in July as UPS Foundation Professor in the School of Social Science, begins her first term on the IAS Faculty. One of the preeminent political theorists of her generation, she is leading the School's special theme year on "Political Mobilizations and Social Movements" with James D. Wolfensohn Professor Didier Fassin and in collaboration with Harold F. Linder Professor Alondra Nelson, who serves as Deputy Director for Science and Society for the White House Office of Science and Technology Policy.

"I am thrilled to be able to welcome a brilliant and esteemed group of scholars to campus this year, and I am deeply thankful to everyone in our community who continues to support safe spaces and our ability to offer an in-person campus experience," stated Robbert Dijkgraaf, IAS Director and Leon Levy Professor. "The pandemic has taught us a great deal about ourselves and opened up new channels of collaboration. I am eager to see how these lessons and tools will be applied at the Institute to forge a brighter and more informed future."

Research at IAS is conducted across four Schools—Historical Studies, Mathematics, Natural Sciences, and Social Science—to push the boundaries of human knowledge through interdisciplinary collaboration and intellectual risk-taking.

During the 2021–22 academic year, the School of Mathematics is hosting a special program on the h-principle and its applications to problems in analysis and geometry, organized by IBM von Neumann Professor Camillo De Lellis and Distinguished Visiting Professor László Székelyhidi.

IAS scholars are selected by the permanent Faculty in a highly competitive process for their bold ideas, innovative methods, and deep research questions. ■



The images inside each letter are original artworks by Robbert Dijkgraaf, IAS Director and Leon Levy Professor, corresponding to IAS holiday cards from 2013–21.

### Q&A with Nadia Zakamska Member, School of Natural Sciences

Nadia Zakamska, returning Member in the School of Natural Sciences, is an astrophysicist studying a variety of astronomical wonders, ranging from extrasolar planets to extragalactic astronomy. Her current research focuses on long-standing

puzzles in the evolution and dynamics of binary stars and on the discovery of binaries of compact stellar remnants.

Zakamska completed her Ph.D. at Princeton University (2001–05), then was a John N. Bahcall Fellow and NASA Spitzer Fellow at the IAS (2005–10), a Kavli Fellow at Stanford University (2010–11) and is now a professor at Johns Hopkins University. Her last long-term visit at the IAS was in 2016 as D. Lunder and A. Ezekowitz Junior Visiting Professor.

*This Q&A has been edited for length and clarity.*

**What question(s) within your field do you most want to answer and why?**

I am an opportunist, and my interests are driven by advances in astronomical instrumentation and surveys. I think about what kinds of new and exciting data are newly available or will be available shortly, and then I get excited about the questions that can be addressed with this data. Therefore, the

questions that most interest me change every few years as the field goes forward and new opportunities and facilities open up. Some of them are "big picture" questions that have baffled the field for decades, and some are just topics of personal curiosity.

For about ten years, I have worked primarily on the cosmic evolution of supermassive black holes and their host galaxies. Such black holes are present in centers of most, if not all, massive galaxies including ours and are now understood to play a major role in galaxy formation. Together with my research group, I obtained some of the key first observations illustrating how exactly this connection occurs and elucidated the physics of the processes involved. When cosmic gas falls into the black hole, it emits copious light before its final plunge, producing a so-called quasar—an extremely powerful source of radiation visible out to great distances. The pressure from this radiation pushes out the remaining galactic gas and launches so-called galactic winds. We obtained observations of such quasar-driven winds across the electromagnetic spectrum and discovered some of the

most extreme winds in the universe. I am now eagerly anticipating the upcoming launch\* of the James Webb Space Telescope. Its unprecedented sensitivity and

*(Continued on page 11)*



Nadia Zakamska

\* Launch took place on December 25, 2021

While dean of the Division of the Social Sciences at the University of Chicago, Nirenberg led efforts to create the Computational Social Science program and to establish the Center for International Social Science Research and the Committee on Quantitative Social Science. These endeavors shared the goal of accelerating the diffusion of new methodologies across disciplinary boundaries and expanding possibilities for discovery.

“I grew up in a Spanish-speaking household in upstate New York, sparking my lifelong attraction to conversations across languages and cultures. As a Visitor at the Institute in 1996, I remember feeling as if I had suddenly found home. My experience was typical: the Institute’s polyglot conversations change every scholar who enters them, creating new connections and enabling discovery,” said Nirenberg. “Are there ways to give the global scholarly community more access to that transformative power? Can we extend those conversations to new publics? Those are questions that the Institute has been and will be thinking a great deal about.”

Nirenberg was born to immigrant parents from Argentina who eventually settled in Albany, NY. He graduated with an A.B. (1986) from Yale University and earned his M.A. (1989) and Ph.D. (1992) from Princeton University’s Department of History. Nirenberg was a visiting scholar in the IAS School of Historical Studies (1996–97).

“David is obviously a world-renowned historian, whose incredible range of expertise includes religions in medieval Europe, the history of race, and most recently the history of math and physics,” said Myles Jackson, Professor in the School of Historical Studies. “His expansive breadth of knowledge of numerous fields and topics, many of which are directly relevant to the IAS, greatly impressed all of us on the committee. His erudition and his extensive administrative experience make him the perfect scholar to be the Institute’s next director.”

Nirenberg is the author of numerous books and articles on Christians, Jews, and Muslims of medieval Europe and the Mediterranean. His wide-ranging scholarship has informed the work of social scientists and historians, providing deep insights into present-day challenges of racism, Anti-Semitism, hate speech, and inequality.

In his first book, *Communities of Violence: Persecution of Minorities in the Middle Ages* (Princeton University Press, 1996), Nirenberg explores the concept of religious violence in the Middle Ages. Drawing on research from fourteenth-century France and the Crown of Aragon (now part of eastern Spain), he reveals the “associative and dissociative” effects of religious violence and the ways in which such conflict has shaped coexistence among medieval communities.

With a more macro focus in *Anti-Judaism: The Western Tradition* (W.W. Norton, 2013), Nirenberg considers how foundational anti-Judaism is to the history of the West. In *Neighboring Faiths: Christianity, Islam, and Judaism, Medieval and Modern* (University of Chicago Press, 2014), Nirenberg draws a direct link between the history of Muslims, Christians, and Jews in the Middle Ages and their relations in the present.

With a mathematician (Ricardo Nirenberg) for a father, David learned early on how to consider subjects from the perspective of different disciplines. The pair jointly authored the book *Uncountable: A Philosophical History of Number and Humanity from Antiquity to the Present* (University of Chicago Press, 2021), which explores the claims that underpin different forms of knowledge and seeks to understand the powers and limits of the sciences and the humanities.

“I couldn’t think of a better choice to hand over the baton. I have come to know David as an eminent scholar, creative thinker, and thoughtful academic leader with an impressive track record of success. He has a deep connection to the core values of IAS of joining together excellence, diverse perspectives, and the limitless possibilities of the shared pursuit of knowledge,” said Robbert Dijkgraaf, current IAS Director and Leon Levy Professor. “This appointment will add many new dimensions to the intellectual life at the Institute that I hope to enjoy personally for many years to come. It is thanks to the tremendous effort of Trustees and Faculty that we can look forward to welcoming David as our next Director.”

Nirenberg has held academic positions at institutions including Rice University (1992–2000); Johns Hopkins University (2000–06) where he founded the Stulman Center for Jewish Studies in (2001–02); and the University of Chicago (2006–present). As a faculty member, center director, executive vice provost, and dean, Nirenberg played a leading role in successful solicitation of approximately \$275 million.

His Board appointments include the Argonne National Laboratory (2017–20), a multidisciplinary science and engineering research center dedicated to sustainable energy solutions and research with a positive global impact, and the National Opinion Research Center (2014–present), an independent research institution delivering reliable data and rigorous analysis to public and private entities. He is also an Associate of the Human Sciences section of the German Max-Planck-Gesellschaft for the Advancement of Science.

In addition to winning excellence-in-teaching awards at Johns Hopkins and Rice University, Nirenberg has received various prizes and honors, including the Historikerpreis from the city of Münster and the Laing Prize from University of Chicago Press in 2017, an honorary doctorate from the University of Haifa (2016), the Ralph Waldo Emerson Prize from Phi Beta Kappa (2014), the John Nicholas Brown Prize from the Medieval Academy of America (2000), and the Herbert Baxter Adams Prize (1999) and Premio del Rey Prize (1997) from the American Historical Association.

He received visiting fellowships from numerous institutions, including the Wissenschaftskolleg zu Berlin; the Center for Advanced Study in the Behavioral Sciences, Palo Alto, CA; the École des Hautes Études en Sciences Sociales; the Consejo Superior de Investigaciones Científicas; and the Institute for Advanced Study, Princeton, NJ.

Nirenberg is an elected member of the American Academy of Arts and Sciences, History and Philosophy/Religion sections (2016), and the Medieval Academy of America (2015).

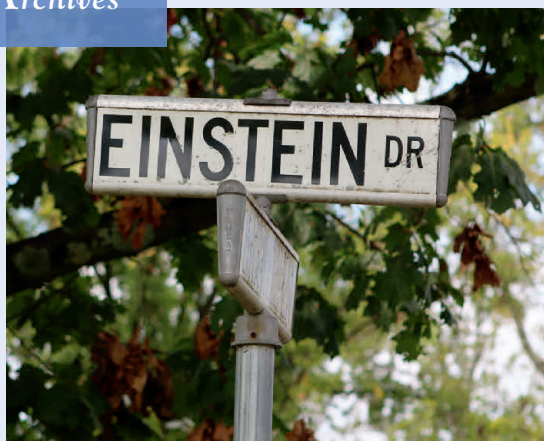
Nirenberg is married to Soñia Torallas Tovar, a professor of Classics and Near Eastern Languages and Civilizations and member of the Oriental Institute at the University of Chicago. He has a son, Alexander Nirenberg, and stepdaughter, Eira Nylander Torallas.

The eight-member director search committee included four IAS Trustees (Nancy Peretsman, Chair; Mark Heising; John Overdeck; Shirley Tilghman) and four Faculty (Didier Fassin, Myles Jackson, Juan Maldacena, and Akshay Venkatesh), representing each of the IAS Schools. A ratification vote of Nirenberg’s directorship took place on Saturday, October 30, 2021, during a meeting of the full Board of Trustees. ■

“AS A VISITOR AT THE INSTITUTE IN 1996, I REMEMBER FEELING AS IF I HAD SUDDENLY FOUND HOME. MY EXPERIENCE WAS TYPICAL: THE INSTITUTE’S POLYGLOT CONVERSATIONS CHANGE EVERY SCHOLAR WHO ENTERS THEM, CREATING NEW CONNECTIONS AND ENABLING DISCOVERY”

from the  
Archives

## Paving a Way: Scholars in the Streets at the Institute for Advanced Study



Visitors navigating the Institute for Advanced Study for the first time may be surprised to find themselves lingering on Einstein Drive or driving through Veblen Circle. There are scholars in the streets of the Institute for Advanced Study. These roads serve as an important reminder of the historic scholars that paved a way for the groundbreaking research that happens today on the Institute campus. The roads here allow us to navigate the storied history of the Institute for Advanced Study from its foundation in 1930 to today.

A bit more detail in remembrance of the lives and legacies of those scholars is available here: [www.ias.edu/news/2021/paving-way](http://www.ias.edu/news/2021/paving-way).

Each road name features a brief biography of its

scholarly namesake. Those interested in learning more about the scholars in question or about the construction and development of the Institute are advised to visit the Institute’s Shelby White and Leon Levy Archives Center located in the Historical Studies and Social Science Library.

The Shelby White and Leon Levy Archives Center sustains the shared history at the center of the Institute for Advanced Study, collecting, preserving, and providing access to materials that document the work of our scholars, supporters, and administrative staff. The archives center strives to create opportunities to engage with the Institute’s past and to work collectively toward the Institute’s future. ■

# Hubble Data Confirms Galaxies Lacking Dark Matter

The most accurate distance measurement yet of ultra-diffuse galaxy (UDG) NGC1052-DF2 (DF2) confirms beyond any shadow of a doubt that it is lacking in dark matter. The newly measured distance of 22.1 +/-1.2 megaparsecs was obtained by an international team of researchers led by Zili Shen and Pieter van Dokkum of Yale University and Shany Danieli, a NASA Hubble Fellow at the Institute for Advanced Study.

“Determining an accurate distance to DF2 has been key in supporting our earlier results,” stated Danieli. “The new measurement reported in this study has crucial implications for estimating the physical properties of the galaxy, thus confirming its lack of dark matter.”

The results, published in *Astrophysical Journal Letters* on June 9, 2021, are based on 40 orbits of NASA’s Hubble Space Telescope, with imaging by the Advanced Camera for Surveys and a “tip of the red giant branch” (TRGB) analysis, the gold standard for such refined measurements. In 2019, the team published results measuring the distance to neighboring UDG NGC1052-DF4 (DF4) based on 12 Hubble orbits and TRGB analysis, which provided compelling evidence of missing dark matter. This preferred method expands on the team’s 2018 studies that relied on “surface brightness fluctuations” to gauge distance. Both galaxies were discovered with the Dragonfly Telephoto Array at the New Mexico Skies observatory.

“We went out on a limb with our initial Hubble observations of this galaxy in 2018,” van Dokkum said. “I think people were right to question it because it’s such an unusual result. It would be nice if there were a simple explanation, like a wrong distance. But I think it’s more fun and more interesting if it actually is a weird galaxy.”

In addition to confirming earlier distance findings, the Hubble results indicated that the galaxies were located slightly farther away than previously thought, strengthening the case that they contain little to no dark matter. If DF2 were closer to Earth, as some astronomers claim, it would be intrinsically fainter and less massive, and the galaxy would need dark matter to account for the observed effects of the total mass.

Dark matter is widely considered to be an essential ingredient of galaxies, but this study lends further evidence that its presence may not be inevitable. While dark matter has yet to be directly observed, its gravitational influence is like a glue that holds galaxies together and governs the motion of visible matter. In the case of DF2 and DF4, researchers were able to account for the motion of stars based on stellar mass alone, suggesting a lack or absence of dark matter. Ironically, the detection of galaxies deficient in dark matter will likely help to

reveal its puzzling nature and provide new insights into galactic evolution.

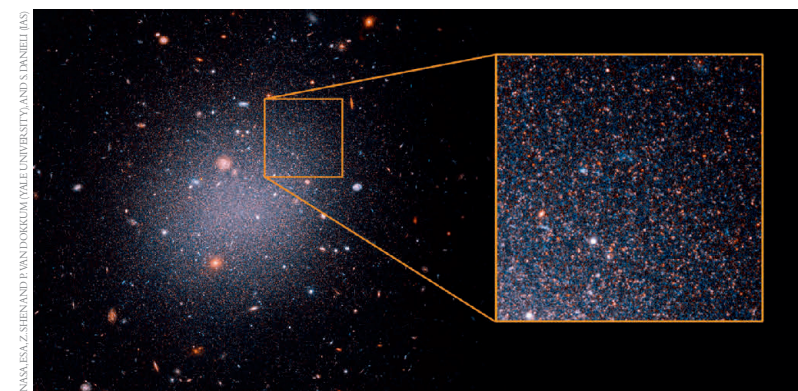
While DF2 and DF4 are both comparable in size to the Milky Way galaxy, their total masses are only about one percent of the Milky Way’s mass. These ultra-diffuse galaxies were also found to have a large population of especially luminous globular clusters.

This research has generated a great deal of scholarly interest, as well as energetic debate among proponents of alternative theories to dark matter, such as Modified Newtonian dynamics (MOND). However, with the team’s most recent findings—including the relative distances of the two UDGs to NGC1052—such alternative theories seem less likely. Additionally, there is now little uncertainty in the team’s distance measurements given the use of the TRGB method. Based on fundamental physics, this method depends on the observation of red giant

stars that emit a flash after burning through their helium supply that always happens at the same brightness.

“There’s a saying that extraordinary claims require extraordinary evidence, and the new distance measurement strongly supports our previous finding that DF2 is missing dark matter,” stated Shen. “Now it’s time to move beyond the distance debate and focus on how such galaxies came to exist.”

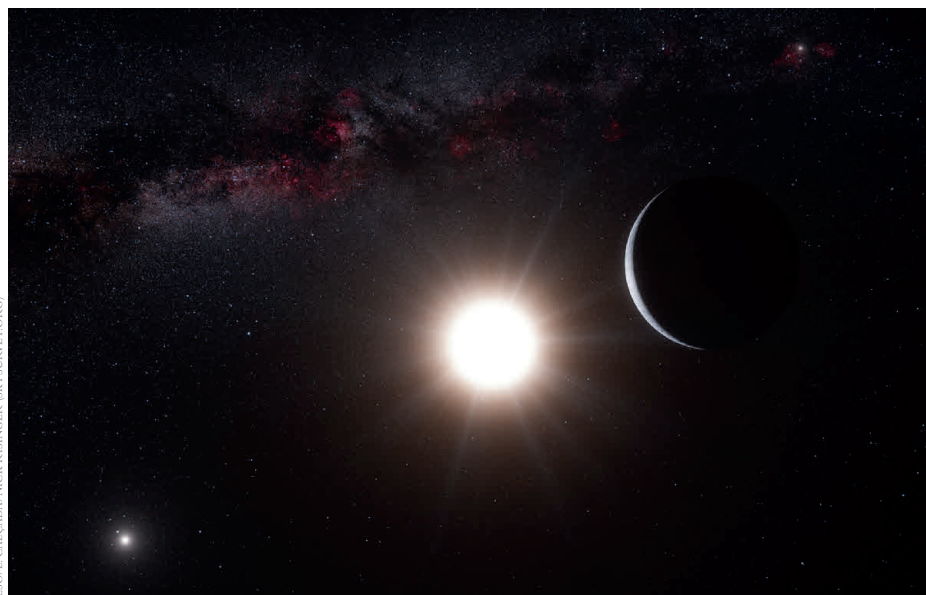
Moving forward, researchers will continue to hunt for more of these oddball galaxies, while considering a number of questions such as: How are UDGs formed? What do they tell us about standard cosmological models? How common are these galaxies, and what other unique properties do they have? It will take uncovering many more dark matter-less galaxies to resolve these mysteries and the ultimate question of what dark matter really is. ■



NGC1052-DF2

DARK MATTER IS WIDELY CONSIDERED TO BE AN ESSENTIAL INGREDIENT OF GALAXIES, BUT THIS STUDY LENDS FURTHER EVIDENCE THAT ITS PRESENCE MAY NOT BE INEVITABLE.

## Astronomers Model Formation of Planets in Binary Star Systems



Artist’s impression of a planet orbiting the star Alpha Centauri B

Any *Star Wars* fan can recall the iconic horizon on Tatooine, a planet with two suns.

Roman Rafikov of the School of Natural Sciences, visiting from the University of Cambridge, with co-author Kedron Silsbee of the Max Planck Institute for Extraterrestrial Physics, has brought this Hollywood scene several steps closer to

reality, producing the most realistic model to date of planet formation in binary star systems.

The research paper, published in *Astronomy & Astrophysics* on July 12, 2021, considers binary systems in which a smaller companion star orbits a parent star at a distance similar to the orbit of Uranus around the sun. Alpha Centauri is one example of such a system.

PLANET FORMATION IN BINARY SYSTEMS IS MORE COMPLICATED, BECAUSE THE COMPANION STAR ACTS LIKE A GIANT EGGBEATER, DYNAMICALLY EXCITING THE PROTO-PLANETARY DISC.

“Planet formation in binary systems is more complicated, because the companion star acts like a giant eggbeater, dynamically exciting the protoplanetary disc,” said Rafikov.

The researchers found that for planets to form in these systems, their building blocks need to start off at least 10 kilometers in diameter before they are able to grow via mutual collisions into full-sized planets. Furthermore, the disk of dust, ice, and gas surrounding the star during the planetary growth phase needs to be relatively circular.

This research brings the study of planet formation in binaries to a new level of realism and explains how such planets, a number of which have been detected, could have formed. ■

informed the design decisions in a given project. What temporal and cultural connections can be made? What precedents across history and geography come to mind? What design principles can be uncovered?

Observing this project under construction brought a number of associations to the fore, from the unexplored dimensions of cubist sculptures to the colliding forms of constructivist structures. Holl’s inspiring form-finding process made me think of some of the radical explorations in art and architecture of the early twentieth century—the period that I have been working on for the past decade, looking specifically at the links between experimental pedagogy and innovative design. This topic is central to my new book, *Avant-Garde as Method, Vkhutemas and the Pedagogy of Space, 1920–1930* (Park Books, 2020), published during my time here at IAS.

Thinking of every building as an opportunity to experiment and advance the field of architecture is something that Steven Holl shares with many of the avant-garde protagonists. Like Nikolay Ladovsky (architect, educator, leader of the Rationalist movement, and one of the protagonists of my book) a hundred years ago, Holl seems to be forging deeper connections—or intertwining, as he calls it—which go beyond mechanical programming, bringing to life the intuitive, experiential, and phenomenological aspects of architecture.

In fact, the concept of “intertwining” was central to the design proposal. For Holl, it has a two-fold meaning. First, it aims to intersect the sciences and the humanities, promoting exchange between different disciplinary silos. Second, intertwining fuses architecture and nature by treating light as a material and organizing the entire plan in sync with seasonal changes, turning the building into a fine-tuned horological instrument that registers light and space through time.

The other concept central to the design, according to Holl, is that of the “social condenser.” The question that he asked was “What are the ideal conditions for new thinking emerging today? What is thinking together?” In other words, how does architectural space foster collective activity? The underlying philosophy behind the concept of social condenser is that spatial form not only affects human experience but conditions human behavior, and can have a powerful psychological, ideological, and even educational impact: essentially, that architectural form can induce and promote social function.

As the building materialized it became clear, even from the outside, that Rubenstein Commons was challenging one of the most common tenets of modern architecture, that form follows function. In fact, I would argue, it is part of a different tradition in architectural thinking, where form is not a derivative of function but instead functions as its generator. My goal is to situate some of the underlying ideas behind the Rubenstein Commons within a larger historical context—specifically by examining the notion of the social condenser and questioning the intertwined relationship between form and function that has been foundational for modern architecture for much of the twentieth century and continues to be in the twenty first.

### The Architecture of Rubenstein Commons

The IAS, of course, has its own set of radical foundational principles, central among them is “the unobstructed pursuit of knowledge” and continuous

“advancement” of its frontiers. Or as Robbert Dijkgraaf puts it, curiosity-driven groundbreaking research.

“The pursuit of knowledge for its own sake is not a product that can be made to order,” founding Director Abraham Flexner argued. As he keenly observed, Institute scholars are “like poets and musicians, [who] have won the right to do as they please and to accomplish most when enabled to do so.” This kind of research—like artistic creativity—benefits from a “special environment.”

The Rubenstein Commons is an embodiment of the Institute’s mission of “bringing great minds together” (as was eloquently put by David Rubenstein at the groundbreaking ceremony on March 14, 2018), and is an interpretation of Flexner’s idea of “community” as the interconnectedness of social and physical form.

Holl proposed an open, one-level plan, which combines several loosely-defined zones with clear visual connections. This type of spatial organization allows one to use the space in multiple ways—from individual repose to collaborative interaction, and, of course, for a variety of collective events. With its picturesque aggregation of billowing roofscapes (for those percolating thought bubbles) and the cluster of intersecting (or intertwining) spaces, the new commons building seems to invite one inside for further inquiry.

The playful geometry of its forms lets the mind wander and search for associations with manmade and natural phenomena around it. If you are a mathematician, you might be reading into the patterns of light dancing across the ceiling (reflected from the pools through the prismatic glass). For a historian, its complex forms might bring a sense of wonder but also connections with patterns of the past. Ultimately, its architecture inspires the experience both within and outside one’s field of knowledge.

Echoing the founding tenet of the Institute about the usefulness of useless knowledge (in this case, one might say the usefulness of unscripted space) in Holl’s project, each area

does not necessarily have a prescribed use or set of activities. Here, space is not a passive agent but a “material of architecture,” to quote Ladovsky, which facilitates human experience and inspires social interaction.

### Workers’ Club as Social Condenser

The term “social condenser” was coined by Constructivist architects in the late 1920s, about a decade after the Bolshevik revolution. They sought to construct a new “social type,” where “all the elements and parts of a building, without exception, stem from their social and technical function.”<sup>1</sup> Constructivists applied this concept to a range of architectural and urban structures, including “communal housing, workers’ clubs, palaces of labor, administrative buildings, and even factories.” All of these were supposed to become “conductors and condensers of socialist culture.”<sup>2</sup>

Most consistently, the concept of social condenser was tested and interpreted

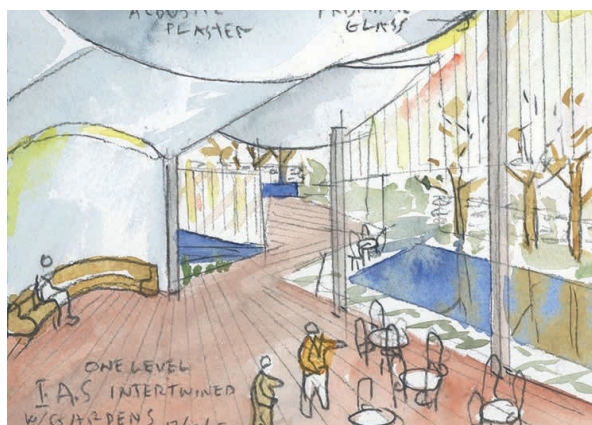
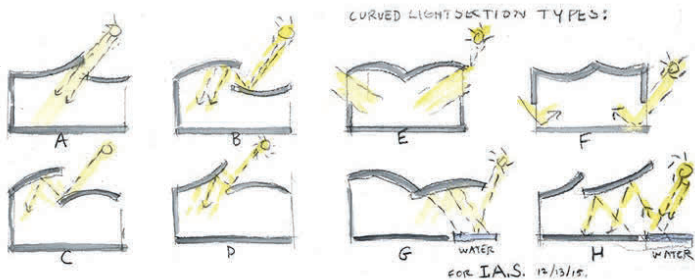
(Continued on page 7)



A virtual look inside Rubenstein Commons, featuring patterns of light and prismatic glass

## THE PLAYFUL GEOMETRY OF ITS FORMS LETS THE MIND WANDER AND SEARCH FOR ASSOCIATIONS WITH MANMADE AND NATURAL PHENOMENA AROUND IT.

COURTESY STEVEN HOLL (LEFT, MIDDLE);  
COURTESY STEVEN HOLL ARCHITECTS (RIGHT)



Sketches showing the variety of ways light reflects within Rubenstein Commons (left); a sketch depicting the intertwining inner spaces of Rubenstein Commons (middle); glass features at the back of Rubenstein Commons (right)

in the typology known as the workers' club. This group of projects, both built and unbuilt, tended to have a characteristically expressive dynamic form meant to 'conduct and condense' a host of collective activities. While public assembly, performance, and education were historically the major functions of a workers' club, it was neither a city hall, nor a theater, nor a school; rather, it was a new hybrid typology, hence requiring the new term.

Starting with the workers' club prototype designed by Alexander Rodchenko for the International Exhibition of Modern Decorative and Industrial Arts in Paris in 1925, designers sought to graft the emerging forms of collective life through these new environments, treating them as showcases of the new lifestyle. The most prolific contribution to the new typology belongs to architect Konstantin Melnikov, who designed half a dozen workers' clubs in the late 1920s.

His iconic Rusakov Club, constructed in 1927–28, offered an inventive design solution to the relationship between the three primary programmatic components of the club: assembly, performance, and education. The club inverted the traditional relationship between the inside and outside by directly pushing the entry sequence outside and celebrating public procession. This idea was further manifested through the spatial and organizational structure of the entrance, foyer and auditorium zones. The auditorium component here becomes visually active, shaping the exterior as if turning the building inside out. Melnikov conceived the club as a system of auditoriums of different sizes separated by moveable partitions. According to his plan, when needed, these auditoriums could be combined into a composite performance and meeting space. Here, programmatic transformation manifests itself through spatial re-combination in two major ways: the auditorium subdivision and the expandable foyer.

### Formalists and Functionalists

Finding a perfect solution for the architecture of a social condenser became a subject of intense polemic in the design studios at the higher art and technical studios, known as Vkhutemas, a multidisciplinary design school active in Moscow in the 1920s. This intense process of experimentation resulted in buildings that vary greatly in terms of their compositional and organizational configurations. Perhaps more than other building typology, the workers' club reflected the difference in approaches between the two major camps in Russian avant-garde architecture of the 1920s—Constructivists and Rationalists. The main point of contention between these groups was the relationship between function and form.

For Constructivists, form was a derivative of function. The visible was less significant than (and, in fact, subordinate to) the invisible forces, like circulation patterns and technological processes. In other words, form was bound by the pragmatic approach articulated by their Western-European contemporaries, most notably Walter Gropius—the first director of the Bauhaus—and his successor

Hannes Meyer, who thought of building as pure organization, in every aspect: social, technical, economic and physical.

And, of course, Le Corbusier, who looked at architecture through the “criteria of economy” and famously treated buildings as “machines-for-living,” equivalent to mass-production objects. (Though, later in life, right around the time he visited Einstein’s home in Princeton in 1946,<sup>3</sup> he embraced what I would call a more mediated approach, focusing on the human body instead of machines.)

The modern buildings on campus, up until this point, can be attributed to this functionalist influence and, in fact, were designed by the disciples of Gropius.

Robert Geddes, who designed the dining hall, was a student of Gropius at Harvard Graduate School of Design. Breuer followed Gropius from the Bauhaus to Harvard and was hired to design the Institute Members’ housing in 1955.

By contrast, for the Rationalist architects form was not exhausted by the notions of use, structure, or technology, as it was for their colleagues. Instead, architecture was grounded in the timeless and universal properties, ostensibly present in spatial form and manifested in its perception. These formal properties included (according to them) geometry, size, position in space, mass, texture, relations and proportions, rhythm, and various types of composition.

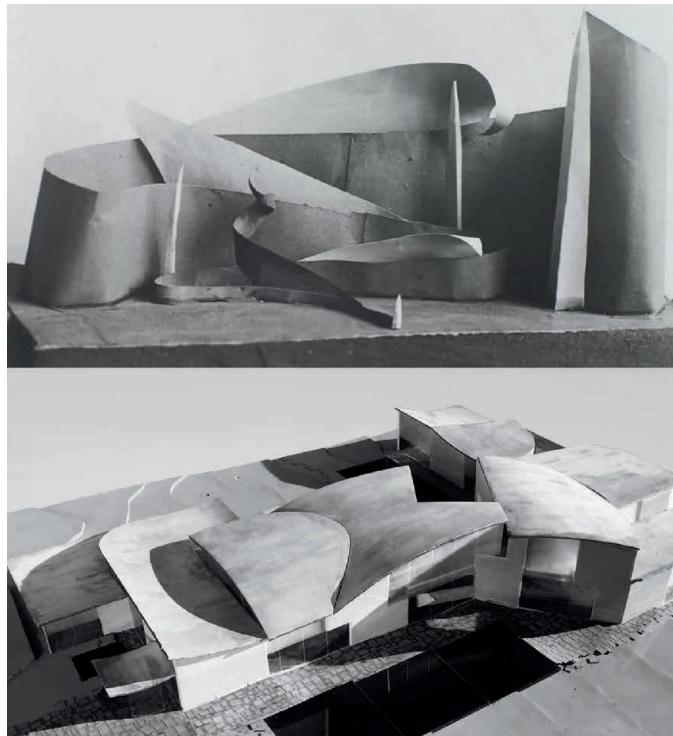
This approach echoed, I would argue, the work of expressionist architects, such as Erich Mendelsohn, manifested in his famous Einstein Tower, the astrophysical observatory completed in Potsdam in 1921. Mendelsohn made numerous sketches with an attempt to create a structure that would reflect Einstein’s groundbreaking theories, letting it emerge from what he called the mystique around Einstein’s universe.

Instead of precisely defining the activities inside it, the Rubenstein Commons creates a space between

—not just between walls, but between life and architecture. Like a hadron collider, the building smashes atoms (or, to paraphrase David Rubenstein, collides great brains together), in order to expand the horizon of our knowledge and collective human consciousness. It is not simply about giving form to life but rather allowing life to unfold in its most unpredictable form. As one of the greatest architects of our time, the late Paulo Mendes da Rocha, told Hashim Sarkis,<sup>4</sup> “architecture is the art of delineating life’s unpredictability.”<sup>5</sup>

Indeed, the language of architecture is not verbal. Rather, it is visual and spatial. Unlike other languages—mathematics, to name one—the language of architecture is accessible to all. Perhaps it is comparable to music in that sense; it is universal. Architecture speaks to us through its volumes and spaces, through structure and tectonics, texture and materials, through scale and proportions, through literal and phenomenal transparency. So much is communicated and understood through bodily experience and perception—without words and, as with any text, in between the lines. ■

*Anna Bokov is a former Member (2020–21) in the School of Historical Studies. Anna’s recent book Avant-Garde as Method: Vkhutemas and the Pedagogy of Space, 1920–1930 (Park Books, 2020) is dedicated to the Russian counterpart of the Bauhaus. She is currently working on the exhibition on Vkhutemas at the Cooper Union. She is also working on two projects: one focuses on the post-Vkhutemas decade and the attack on formalism in architecture; the other explores the embodied agency of the typology of the workers’ clubs and palaces of culture in the 1920s and 30s, unpacking the notion of the social condenser.*



Exercise on the Articulation of Deep Space, Space Course at Vkhutemas, Moscow, 1920s (top); proposed Rubenstein Commons from above (bottom)

3 “Albert Einstein, Frank Lloyd Wright, Le Corbusier, and the Future of the American City” by Milton Cameron, *Institute Letter*, Spring 2014

4 Hashim Sarkis is Dean of the School of Architecture and Planning at MIT and founding principal of Hashim Sarkis Studios.

5 Sarkis, Hashim. “Precisely Unpredictable: On the Architecture of Paulo Mendes da Rocha (1928–2021).” Facebook. May 25, 2021.



The Rusakov Workers’ Club, designed by Konstantin Melnikov (left); the S.M. Zuyev Workers’ Club, designed by Il’ya Golosov, built 1927–29 (middle); display of student exercises on the Interaction of Geometric Volumes (“chessboard” studies), Volume Course at Vkhutemas, Moscow, 1920s (right)

# Adventures of a Mathematician

Stanislaw Ulam, Françoise Ulam, and a new film by Thor Klein

BY GEORGE DYSON

The Institute for Advanced Study distributed \$21,742.50 in stipends for mathematics and \$10,000 for theoretical physics during the academic year 1935–36. Three hundred dollars, sufficient to secure entry to the United States, was awarded to the Polish mathematician Stanislaw Ulam (1909–84), who had written to John von Neumann about a problem in measure theory in 1934. Von Neumann followed up by arranging to meet at the train station in Warsaw while returning from a conference of topologists in Moscow in 1935. The Institute’s formal invitation followed, with Ulam sailing for New York aboard the *Aquitania* in December 1935. He and von Neumann remained intellectually inseparable until von Neumann’s death.

Françoise Ulam (née Fanchon Aron, 1918–2011) was born in a cellar during the bombardment of Paris at the end of World War I. Her family, who were “left-wing intelligentsia on one side and upper-crust Bohemianism on the other,” moved to Morocco in 1927, leaving her for two years on Place Saint-Michel in Paris with a childless aunt and uncle who were ardent communists, managers of a publishing house, and hosts of a celebrated literary salon. She learned English from a copy of *Alice in Wonderland* given to her by a British exchange student her hosts had taken in. In her own memoir, *From Paris to Los Alamos*, she plays the part of Alice, encountering many of the leading figures in twentieth-century mathematics and physics along the way.

Françoise applied to the Institute for International Education as an exchange student to the USA, and, in August of 1938, sailed for New York, making her way from there to Mills College in California by Greyhound bus. When her year at Mills was up, her mother warned her not to return to France, so she obtained a graduate scholarship to Mount Holyoke college in Massachusetts. There, at a party in Cambridge in the fall of 1939, she met Stan, who had secured a three-year fellowship under George David Birkhoff at Harvard, bringing his younger brother Adam (then seventeen) with him when he left Poland for the last time in August of 1939. They were on board the *Batory*, sailing for New York, when word came over the ship’s radio of the

Molotov-Ribbentrop Pact. “This is the end of Poland,” Stan announced.

Stan and Françoise would both lose most of their families to the holocaust they had escaped. Stan and Adam, now too impoverished to afford restaurants, had been too wealthy in Poland to have learned to cook for themselves, so Françoise began cooking for the two brothers and joining them for meals. “These were the darkest days of the war,”

STIPENDS AS ACTUALLY DISTRIBUTED  
1935-6 February 7, 1936

1935-6 appropriation for MATHEMATICS	\$80,000.00
Brought Forward from 1934-5 (re Gódel and Carlists)	2,750.00
	\$82,750.00
<b>Stipends</b>	
Dr. Reinhold Baer	\$1,500.00
Dr. Achille Bassi, Turin (see Phys.)	100.00
Dr. Paul Bergsma	1,500.00
Prof. Leonard Carlists, Duke	1,500.00
Prof. Edward Gsch, Brno	2,000.00
Prof. E.W. Whitteman, Univ. of Iowa	2,525.00
Dr. George Cosans	1,500.00
Prof. Arnold Dresden, Swarthmore	1,800.00
Prof. Philip Franklin, Mass. Tech.	3,000.00
Dr. Kurt Gödel	1,000.00
Prof. L.M. Graves, Univ. of Chicago	2,562.50
Dr. Hansel Hoffmann (see also Phys.)	750.00
Dr. William L. Bandler	1,500.00
Dr. Stanislaw M. Ulam	800.00
Dr. Leo R. Wilcox	1,800.00
	\$31,742.50
Balance of Gódel appropriation re- verted to Treasury	1,000.00
	\$32,742.50
Balance unallocated	7.50

IAS School of Mathematics stipends as actually distributed 1935–36, February 7, 1936

she remembers. “For a five-cent cup of coffee Stan sat for hours in the Georgian cafeteria with Polish and other foreign mathematicians who had found their way to Cambridge, discussing the anxious war news or talking mathematics. They became my friends too and I would join them after work.”

Harvard was flooded with refugees and, in 1941, the renewal of Stan’s fellowship was turned down. He was rescued by the offer of an instructorship at the University of Wisconsin for \$2,300 a year. Françoise followed him to Madison, bringing a degree from Holyoke and a five-dollar dress which she wore to their marriage before a justice of the peace. “Do you want the long or the short ceremony?” asked the judge, adding that the fee was two dollars for the short and five dollars for the long. “We’ll take the short,” answered Stan.

“Neither of us knew beans about domesticity,” said Françoise. Among friendly, no-nonsense American Midwesterners, they settled down as far as was possible amidst the reports filtering out from the communities in Europe that were being destroyed. Stan took flying lessons in hopes of joining the U.S. Air Force but, due to poor eyesight, his service was declined. On hearing

the news in the spring of 1941 that “20 torpedo boats [would] go to England,” he wrote to von Neumann: “I could not help thinking that 50 bicycles would also be valuable.” Von Neumann replied that there was “interesting” war work going on but that “he could not tell [Stan] where.” Finally, in late 1943, these hints resulted in a cryptic invitation from Hans Bethe, which the Ulams accepted without knowing what they had agreed to, or where.

Thus, Stan and Françoise, with a baby on the way, found themselves at Los Alamos, where, as Stan put it, “the air felt like champagne.” The isolated community on the remote New Mexico mesa had become an intellectual utopia, a temporary parallel to the community of scholars that Abraham Flexner had assembled at the IAS. “In the entire history of science there had never been anything even remotely approaching such a concentration,” Stan commented, noting, “At thirty-four I was already one of the older people.” The barriers between disciplines and backgrounds evaporated. For the first time since leaving Lwów and Paris, Stan and Françoise felt at home. This feeling was widely shared. “Los Alamos became a great baby farm,” says Françoise, “which annoyed General Groves.”

With on-site child care, health care, and school, it was easy—and expected—for the women at Los Alamos, many of whom were themselves scientists, to work. Françoise first joined the Documents Division, applying her training and family background in journalism to helping Emily Morrison and David Hawkins compile the definitive official history of Los Alamos (*Manhattan District History: Project Y, the Los Alamos Project*, released in two declassified volumes, totaling 612 pages, in 1961). She then joined the Theoretical Division as a data analyst, where she was happy to be working in proximity to Stan, but uncomfortable to be working on bombs.

Stan had a special gift (perhaps derived from his Polish sense of humor) of quietly following a mathematical or scientific concept for a while and then suddenly giving it an unexpected flip, the way a joke is revealed at the very end. Four of the twentieth-century’s great innovations—the Monte Carlo method for statistical analysis of otherwise intractable

processes, the “Teller-Ulam Invention” of radiation implosion that enabled the hydrogen bomb, the idea of nuclear pulse propulsion of space vehicles that enabled Project Orion, and the idea of universal cellular automata—originated, seemingly effortlessly, with Stan. He invented Monte Carlo while playing endless games of solitaire after being told to stop thinking while recovering from viral encephalitis; he envisioned Project Orion, wondering why we don’t use bombs to deliver rockets instead of using rockets to deliver bombs; his ideas about cellular automata crystallized after a conversation with von Neumann on a park bench in Central Park, which had been convened to pass along the top-secret news that his thermonuclear invention had just yielded 10.2 megatons in its first test, the underlying breakthrough having been achieved by accident while trying to prove that Edward Teller’s approach was a dead end. “I found him at home at noon staring intensely out of a window with a very strange expression on his face,” remembers Françoise. “I can never forget his faraway look as peering unseeing in the garden, he said in a thin voice, I can still hear it, ‘I found a way to make it work.’”

After his brush with death from encephalitis, Stan was given an indefinite appointment at Los Alamos, equivalent to the status of permanent member at IAS. Since he didn’t fit any of the existing groups, he was made a group leader instead. “Stan relished that label of Group-Leader,” says Françoise, “for he led a group of one, namely himself.” He was free to work on whatever he felt like

working on—and he did. Many of the technical developments of the second half of the twentieth century, from high-performance computing to theoretical biology, originated in the spirit of free enquiry which continued at Los Alamos after the war. There was an unspoken agreement in place: the government would not tell the scientists how to pursue science, and the scientists would not tell the government how to use (or not use) the weapons they had helped design. Oppenheimer was punished not for being a security risk or for past associations with communists (commonplace among better physicists), but for breaking this unwritten code.

Stan later shifted course into biology, bringing fresh insights everywhere he looked. In 1953, the scientific  
(Continued on page 9)



Stanislaw and Françoise Ulam, 1940s



John von Neumann, Richard Feynman, and Stanislaw Ulam, at Bandler National Monument near Los Alamos, 1949



world was transfixed by the discovery of the structure of DNA. It was now evident how genetic information was being replicated, but how the translation between nucleic acids and proteins was encoded remained to be fully explained. Ulam's Russian-born colleague George Gamow sent a telegram on July 20, 1953:

DEAR STAN, HAVE PROBLEM FOR YOU USING 20 DIFFERENT LETTERS WRITE A LONG CONTINUOUS WORD CONTAINING FEW THOUSAND LETTERS. HOW LONG THAT WORD SHOULD BE FOR FAIR PROBABILITY OF FINDING IN IT ALL POSSIBLE TEN LETTER WORDS? PLEASE WIRE.

Stan immediately answered:

PLEASE WIRE WHETHER ONE IS ALLOWED TO SKIP LETTERS IN THE LONG WORD TO FORM TEN LETTER WORDS. IF SO, ANSWER RATHER SHORT. IF ONLY CONTIGUOUS LETTERS ALLOWED ANSWER MUCH BIGGER THAN TEN TO THE TWENTIETH POWER AND CARSON WILL SEND THIS WORD COLLECT. LOVE, STAN.

When he was eleven years old, growing up near Ramstein, the U.S. military base in Germany, the future film director Thor Klein read Ed Regis's *Who Got Einstein's Office*, a popular account of life at the IAS. This, in addition to a generally unrequited love of mathematics and mathematicians, led Klein to Ulam's autobiography, *Adventures of a Mathematician*. Klein's recently-released feature film, produced by his Swiss partner Lena Vurma of Dragonfly Films, is focused on the friendship between Ulam and von Neumann in America during and shortly after World War II.

Klein sees this as a near-mythic story of two displaced Eastern European Jews, left to survive on their mathematical wits, who wander into the high desert of the American Southwest. They are hoping to save their down-to-earth American (and Native American) countrymen and countrywomen who have given them a home, but are never quite sure about what will happen to their own souls. This

story has been told many times from the Oppenheimer side (and is about to be staged for the big screen at epic scale) but the Ulam-von Neumann side is much less well known.

Thanks to the Alfred P. Sloan foundation—whose Program for the Public Understanding of Science has been hugely cost-effective at injecting small doses of science and mathematics into books and films at an early stage—Klein

was granted some critical early development funding, and with help from the Tribeca Film Institute, the Polish Film Institute, the Deutscher Filmförderfonds, and a host of other supporters, he and Vurma were able to bring their vision to the screen.

With two almost inevitable caveats—*Adventures of a Mathematician* contains almost no mathematics, and the chronology and cast of characters is somewhat mixed up—Klein, along with the help of superb performances from Philippe Tlokinski as Stan, Esther Garrel as Françoise, Mateusz Wieclawek as Adam, and Fabian Kociecki as von Neumann, has brought the story to life. Claire Ulam, who supplied, from her childhood, the epigraph for the *Los Alamos Science* memorial volume for her father—"All my father does is think, think, think!"—visited the set during filming at Los Alamos. She died in December 2020 but was able to attend the world premiere of the film in Palm Springs. She gave Tlokinski a hug afterwards, saying "Thank you, Dad!"

We agree. ■

George Dyson was a Director's Visitor for the 2002–03 academic year. Stanislaw Ulam features in four of his five books.



Esther Garrel as Françoise and Philippe Tlokinski as Stan

PHOTO COURTESY OF SAMUEL GOLDWYN FILMS

*Adventures of a Mathematician* by Stanislaw Ulam, in collaboration with Françoise, was first published by Scribner's in 1976 and remains in print.

*Adventures of a Mathematician*, directed by Thor Klein and produced by Dragonfly Films, is distributed in the USA by Samuel Goldwyn Films.

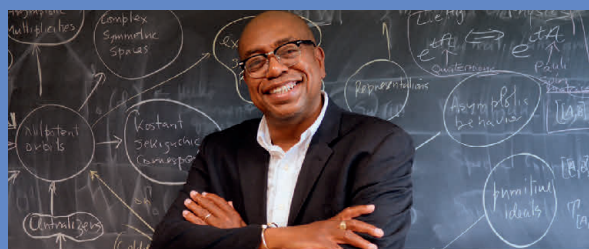
The most comprehensive survey of Ulam's life and work is *Stanislaw Ulam, 1909–1984*, published as a special issue (No. 15) of *Los Alamos Science* by the Los Alamos Scientific Laboratory in 1987. The entire issue is freely available as a series of PDFs for download at: <https://la-science.lanl.gov/lascience15.shtml>

## References

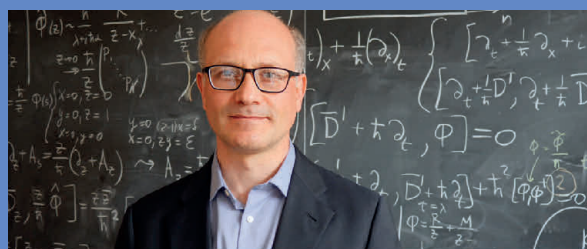
*Sets, Numbers, and Universes, Selected Works of S. M. Ulam*, was published by MIT Press in 1974.

*Analogies between Analogies: the Mathematical reports of S. M. Ulam and his Los Alamos collaborators*, was published by the University of California Press in 1990.

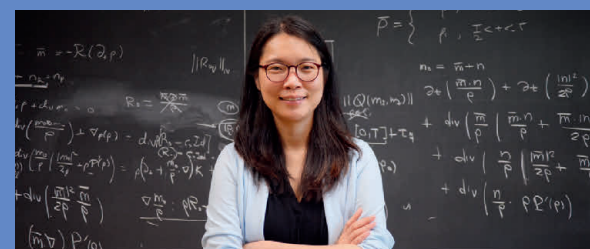
Françoise Ulam's memoir *From Paris to Los Alamos*, written in English in 1994, unfortunately remains unpublished in English although published in French translation as *De Paris à Los Alamos: Une odyssée franco-américaine* by L'Harmattan in 1998.



TERRENCE BLACKMAN



SERGEY CHERKIS



JINYOUNG PARK



"Paths to Math" is a video series that surfaces the universality of mathematics and celebrates the inclusive community of practitioners at IAS. Each three-minute episode shares the inspiring origin story of an exceptional scholar, including pivotal moments in their academic pursuits that ignited a passion for math. Keep up with the series here: [www.ias.edu/paths-to-math](http://www.ias.edu/paths-to-math).

Thus far, three scholars from the School of Mathematics have been featured. Terrence Blackman, Visitor (2020–21) in the School, uses the tools of spectral geometry to hear the shapes of drums. Initially, inspired to pursue a writing career, Blackman came to appreciate the

aesthetic and cultural significance of mathematics. Beyond his own path-breaking research, Blackman is also dedicated to empowering others through mathematics education.

Members Sergey Cherkis (2020–21), who began as a physicist, and Jinyoung Park (2020–21), a first-generation college graduate, share the unique tales that led to their research careers in mathematics.

Three more "Paths to Math" videos are set to be released in early 2022. ■

"Paths to Math" is produced by OFC ([ofc.tv](http://ofc.tv)).

Zachariah Cherian Mampilly, a Member in the School of Social Science, studies violent and non-violent movements for political transformation, focusing on Africa and South Asia. Previously his work has focused on governance by armed groups and the rise of popular protest movements in Africa and beyond.

He is currently the Marx Endowed Chair of International Affairs at the Marx School of Public and International Affairs at Baruch College as well as an affiliated faculty member in the Department of Political Science at the Graduate Center, CUNY. He is the Co-Founder of the Program on African Social Research.

*This Q&A has been edited for length and clarity.*

**How do you describe your work to friends and family?**

I study violent and non-violent movements, both revolutionary and reformist, with a focus on Africa and South Asia.

**What question(s) within your field do you most want to answer and why?**

How does the shifting nature of the global political economy impact local struggles over basic rights, inequality, and climate change? Are there alternatives to global capitalism emerging from the countries of the Global South or within marginalized communities in the Global North and what kinds of futures are they imagining?

**Who or what has had an outsized influence on you in your academic career?**

I grew up between pre-liberalization India and the American Midwest as a minority in both countries. Having been able to see and experience such diverse environments at a formative age always made me feel both out of place and at home everywhere and continues to influence how I approach my work today.

**What is one of your most memorable moments as an academic?**

I had the opportunity to participate in the Popular University for the Education of Citizens organized by the Afrikki Network of Social Movements in Dakar, Senegal in 2018. As an academic, it is always memorable when you get the chance to engage directly with movements that you study. It was an important reminder that while writing can feel like an abstract exercise, for the communities we write about, it is very real.



Zachariah Cherian Mampilly

## Q&A with Zachariah Cherian Mampilly

Member, School of Social Science

**Why IAS?**

My work is historically informed but deeply concerned with the present. As such, I've always been drawn to scholarship produced outside of my disciplinary home of political science. I was drawn to IAS so I can immerse myself in an environment where I can engage with scholars from different disciplines and methodological orientations as I work on my book project.

**How might the reopening of campus (and society at large) influence you and your work?**

The pandemic pushed me away from my preferred method of immersive fieldwork. Without the ability to spend time among the communities I write about, I've spent my time thinking about larger, more structural forces and how they shape local politics. I'm hoping to draw more of these connections between the local and global in my future work now that I may be able to travel again.

**How can we make academia more inclusive?**

The social sciences remain dominated by scholarship emanating from the Global North. Too many of us based in such places assume that this reflects the strength of our work rather than a structural reality that privileges the insights of the already privileged. A more inclusive academy must recognize that every society is always engaged in a constant interrogation of its own culture and politics that deserves attention and respect rather than hoisting our frameworks and analysis on others. Until we in the Global North

recognize this basic truth, we will continue to replicate the colonial and capitalist logics that continue to exclude knowledge production emanating from sites beyond our zones of comfort.

**Where is your favorite place to think?**

I love walking around the Bronx, where I live. The streets are teeming with people from all over the world as well as offering lots of green space when I need to get away from the beautiful noise.

**What other activities or pastimes do you enjoy?**

Live music, nature, and renovating the 110-year-old house I've lived in for the past six years.

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BROWN (Continued from page 1)

2021–22 academic term with James D. Wolfensohn Professor Didier Fassin and in collaboration with Harold F. Linder Professor Alondra Nelson.

“Professor Wendy Brown is recognized as one of the most original political theorists in the world,” stated Fassin. “A scholar of extraordinary breadth, she has also made signal contributions to the fields of legal theory, feminist theory, social theory, and political economy. Her joining our Faculty extends the tradition of scientific rigor and creativity at the School of Social Science.”

Brown's scholarship draws upon the history of political theory, nineteenth and twentieth century Continental theory, critical theory, and theories of contemporary capitalism. She is best known for intertwining the insights of Marx, Nietzsche, Weber, Freud, Frankfurt School theorists, and contemporary Continental philosophers such as Foucault to critically interrogate formations of power, political identity, citizenship, and political subjectivity in contemporary liberal democracies. In recent years, her scholarship has focused on neoliberalism and the affective and political formations to which it gives rise. Her current research focuses on how care for political freedom can be reconciled with repairing legacies of racial and sexual subordination and addressing the climate crisis.

“I have long admired the Institute's commitment to forthrightly interpretive and interdisciplinary social science, a commitment as rare as it is important,” stated Brown. “I am delighted to be joining splendid colleagues to develop this commitment in rich new directions.”

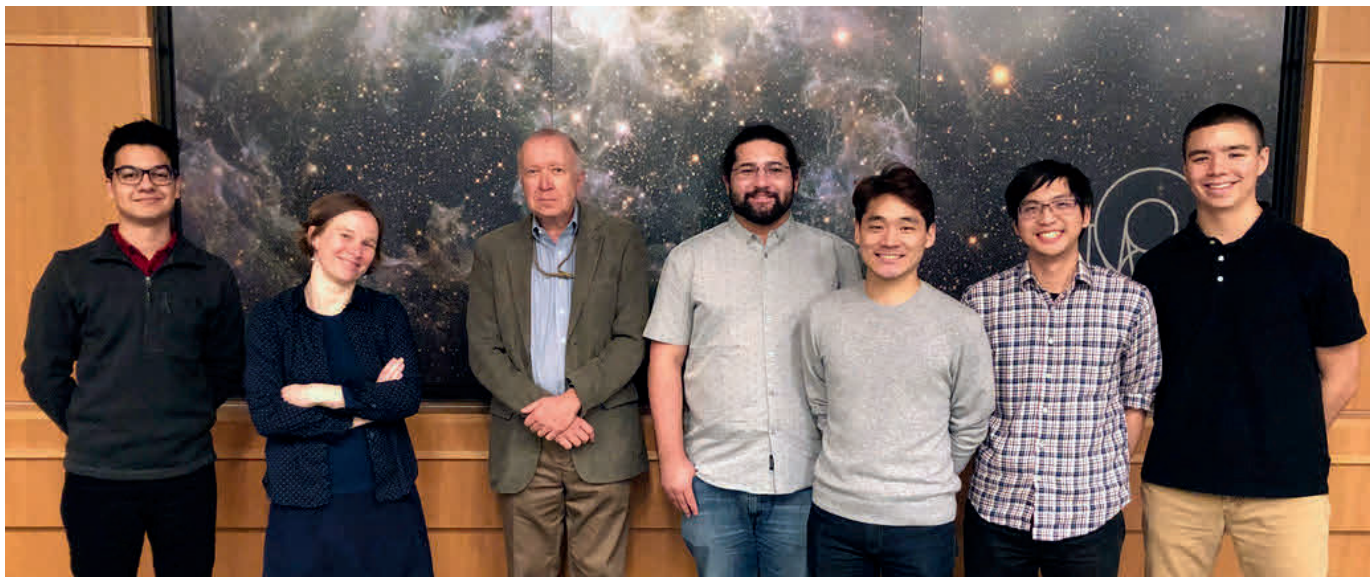
Brown has authored eight books—translated into more than twenty languages—co-authored or edited four more, and penned numerous essays and articles for scholarly publications. Brown's writing reflects a diverse range of subject matter and incisive analysis with enduring relevance.

In her first book, *Manhood and Politics: A Feminist Reading in Political Theory* (Rowman and Littlefield, 1988), Brown added new layers to the exploration of gender theory, considering the terms “manhood” and “masculinity” and the question: “Is politics gendered?” This groundbreaking work was one of

the first to separate gender from sexual difference, and it expanded upon the classical feminist perspective of women's political exclusion to the implications of formulations of politics in the image of masculinity. The work has been influential among sociologists, gender and cultural studies scholars, and political scientists.

Her recent books *Undoing the Demos: Neoliberalism's Stealth Revolution* (Zone Books, 2015), winner of the 2017 David and Elaine Spitz Prize for best book in liberal or democratic theory, and *In the Ruins of Neoliberalism: The Rise of Anti-Democratic Politics in the West* (Columbia University Press, 2019) provide a comprehensive political theory of neoliberalism, a form of governing that has prioritized markets and delegitimated the social state and the idea of society on which it is premised. Both books study the implications of neoliberal policies for the ways in which they undermine democratic states, cultures, and citizens. In the first book, she examines how neoliberalism transforms the state and the citizen, reducing both to economic entities; in the second, she reveals the neoliberal roots of recent authoritarian formations within liberal democracies. These works have been the subject of numerous interviews, podcasts, and journalistic accounts of the crisis of democracy.

Brown received her Ph.D. in Political Philosophy from Princeton University in 1983. Prior to joining IAS, she served on the faculties of the University of California, Berkeley (1999–2021), UC Santa Cruz (1989–99), and Williams College (1983–89). In addition to winning excellence-in-teaching awards at Berkeley and Santa Cruz, she has held a number of distinguished fellowships and visiting professorships, most recently at Columbia, Cornell, Birkbeck, Lucerne, and the London School of Economics. In 2017–18 she was a Simon Guggenheim Fellow and a UC Presidents Humanities Research Fellow. Brown has delivered more than two dozen endowed lectures, including most recently the Tanner Lectures at Yale University (2019), the Gauss Seminars in Criticism at Princeton University (2018), and the Rene Wellek Lectures in Critical Theory at UC Irvine (2018). ■



Nadia Zakamska (second from left) and Scott Tremaine (third from left) with members of Prof. Zakamska's group, including current IAS Member Hsiang-Chih Hwang (second from right), during Prof. Tremaine's colloquium visit to Johns Hopkins University and Space Telescope Science Institute in December 2019

ability to detect infrared radiation will be revolutionary for studying distant quasars which were active at the epoch when galaxies were forming most rapidly.

In the last few years I have become increasingly interested in close stellar binaries—objects where two stars orbit around a common center of mass, sometimes on extremely short-period orbits—hours or minutes. Binaries of stellar remnants—white dwarfs, neutron stars and black holes—are responsible for bursts of gravitational waves seen by the Laser Interferometer Gravitational-wave Observatory, for Type Ia supernova explosions and for other important astrophysical phenomena. There are many gaps in the current understanding of the formation and evolution of such binaries, and I think a lot of progress can be made in this field now thanks to ongoing and upcoming variability surveys—automated sky surveys detecting variable and transient astronomical sources—and unprecedented spectroscopic surveys of millions of Galactic stars. If there is one question I have to single out as a major unresolved problem in the field that I would like to tackle, it's the origin of Type Ia supernovae. These transients are ubiquitous and critically important in astronomy—they were used as cosmological standard candles in the discovery of dark energy—yet the nature of their progenitors has remained a stubbornly unsolved question for decades.

Another theme underlying my scientific interests is astrophysical extremes. In astrophysics we get to study the extremely rarified gas on the largest scales of the Universe as a whole, as well as the densest matter in white dwarfs and neutron stars, all over many orders of magnitude in temperature and physical scales. I am fascinated by the most extreme, rare objects—the most luminous quasars, the most powerful galactic winds, the shortest period binaries—which often represent extreme conditions which teach us something new about the physics of the universe.

*How do you describe your work to friends and family?*

"I am drowning in emails and I have a telescope proposal deadline tomorrow."

*Who or what has had an outsized influence on you in your academic career?*

First the 'what'—that was undoubtedly the decision to move from Russia to pursue my Ph.D. in Princeton in 2001. I received an excellent education at the Moscow Institute of Physics and Technology; I did undergraduate research at Lebedev Physical Institute, which was a warm and welcoming place, and I am still in touch with some of my professors. These places are full of passionate and talented people who provide first-class science education despite (what I think is) enormous bureaucratic and financial adversity. But knowing what I know now, I don't think that I would have been able to pursue research if I'd stayed in Russia. I'd always known that I wanted to have children. In 2001, I was a young mother of a newborn daughter. Looking back at the economic and political chaos in Russia in the last 30 years and knowing how difficult the daily life of parents of young children there is, I know that I would have prioritized securing every opportunity for my family and I wouldn't have had enough brain space to continue serious research. To paraphrase Russian poet Mayakovsky, the boat of curiosity would have crashed against the everyday. Both science and family are integral to who I am now. It has been by no means easy to raise a family of three children in the United States while pursuing an active research career, but it was ultimately possible without sacrificing either one in favor of the other.

Now to the 'who'. I have had the privilege of having several brilliant and supportive mentors and colleagues, but at the top of the 'outsized influence'

category—both as a scientist and as a mentor—would be Scott Tremaine, who recently retired from a professorship at the IAS and who was the Chair of Princeton Astrophysics when I arrived there as a graduate student. At the time when many fields evolve toward ever-increasing specialization, with his own breadth and depth of knowledge of physics and astrophysics, Scott served as an important role model to several generations of Princeton students and postdocs and IAS members. I continually aspire to maintain fresh knowledge across many areas of astrophysics thanks to his example. Scott provided invaluable career advice and support at every stage. I am sure his hallmark questions—"Why is this interesting?" and "It's too cute, why hasn't somebody done this before?"—will be remembered with a chuckle and taught to new generations of researchers across the country for decades to come.

*What is one of your most memorable moments as an academic?*

Several times during my academic life, I had 'eureka' moments, when I discovered something interesting in the data or figured out something about the underlying physics with crystal clarity for the first time, and I remember how satisfying these moments were. Amusingly, 'eureka' is a very private moment, because it takes weeks or months from that point to get the publication out to the scientists, or the press release out to the public, so for a few minutes you just sit there as the only person in the world who knows about it, then you might send an email to a collaborator or two, and the best collaborators are those who can immediately appreciate the significance of the finding and respond "this is awesome." When I started graduate school, I thought I was going to become a theorist, but the "high of discovery" that I experienced when working with astronomical data became too much of a temptation—I think I inherited that from my thesis advisor Michael Strauss, a former IAS member and now Astrophysics Chair at Princeton, another scientist with an outsized influence on my path.

I remember feeling elated on several occasions when I got prizes or other forms of recognition, or at some presentations that I've delivered that resonated with the audience. One particularly memorable one was a public talk here at the IAS in 2013 which seemed to be of strong interest.

A couple of years ago I was visiting a university in Europe, and an undergraduate student asked me what was the accomplishment I was most proud of. Until then, in a mad rush to get everything done at some non-embarrassing standard—my own research, student supervision, teaching, endless presentations and proposals—while raising small kids, I'd never really had time to reflect on what, if anything, there was to be proud of and on what, if anything, had been accomplished. In trying to answer this question, I realized that I was indeed particularly enthusiastic about some of my papers, but it seemed an inadequate response. So, I responded that the most important accomplishment was to have been able to have an intellectually satisfying job and a family I wanted. This has definitely been a team effort with my husband, and much of the credit for this outcome lies with him.

*What other activities or pastimes do you enjoy?*

I am working on my second novel as I am trying to find an agent for my first. So, if anybody has ideas for an agent interested in a crime story in a campus setting (I know, a shocking topic for somebody with my background...), please let me know!

I enjoy traveling and learning about the history and culture of the places I visit, being in nature (although not the mosquitos) and reading (almost exclusively modern literary and upmarket fiction). To this day I feel privileged that I have the luxury of 'pastimes'. Neither the financial capability to travel nor having enough time to pursue interests outside of work were foregone conclusions in my younger years. ■

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