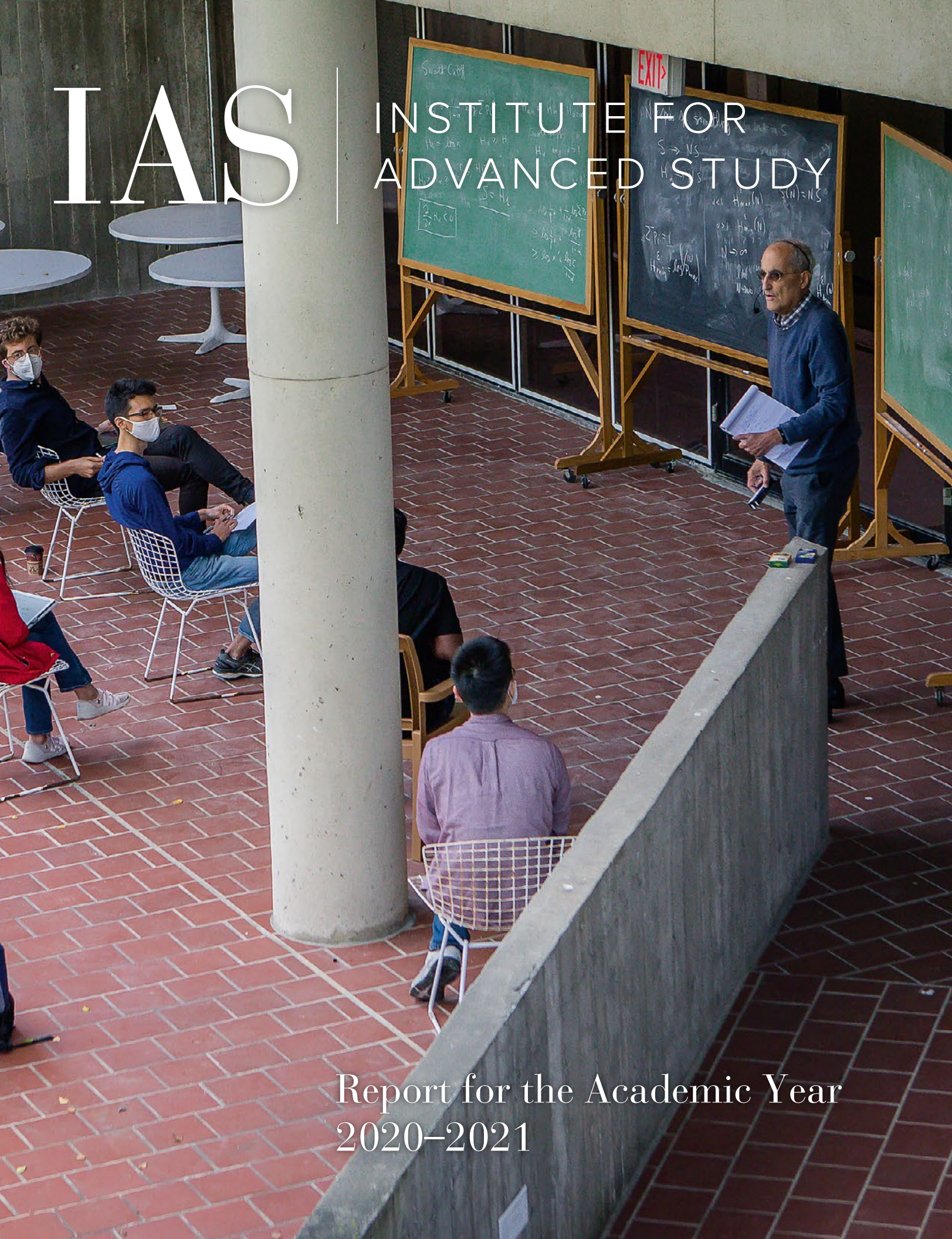

IAS | INSTITUTE FOR ADVANCED STUDY

Report for the Academic Year 2020–2021

Cover: Charles Simonyi Professor Edward Witten gives a socially-distanced lecture outside of West Building.

Opposite: Institute Pond

COVER PHOTO: ANDREA KANE

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Reports
OF THE CHAIR AND OF THE DIRECTOR

AS THE INSTITUTE'S CENTENNIAL APPROACHES, we are optimally positioned to foster a new era of self-sustaining, independent inquiry. The endowment reached a pivotal milestone in 2021, exceeding $1 billion for the first time.


ANDREA KANE

Over the last ten years, the Institute has made several strategic investments in its future—from new academic and residential facilities, campus renovations, and renewable energy systems to collaborative technologies and the expansion of School programs and enrollment. This growth-oriented approach reaffirms IAS as a global leader in theoretical research and has propelled the Institute into a new chapter of its history.

The Institute continues to enable the foremost scholars from around the world to pursue their curiosity in new and exciting ways. On January 13, 2021, IAS announced the establishment of the "Carl P. Feinberg Cross-Disciplinary Program in Innovation." Led by Nima Arkani-Hamed, Professor in the School of Natural Sciences, the program forges new and innovative collaborations across fields to accelerate understanding of the natural world.

Considered to be the heart of humanities at the Institute, the Historical Studies–Social Science Library is set to undergo restorations to preserve the iconic structure. This effort is thanks to the generous support of IAS Trustee Roger W. Ferguson, Jr. and a $750,000 challenge grant from the National Endowment for the Humanities.

The Institute welcomed four new members to the Board of Trustees: Bernard E. Harcourt, Fred Hu, Mike Speiser, and Pauline Yu. This enterprising group, hailing from the worlds of social theory, economics, internet technology, and comparative literature, provides a diverse set of perspectives to steward the IAS as it continues to grow and evolve.

We paid our respects to past champions of IAS who passed away: Vartan Gregorian, Trustee Emeritus and past president of the New York Public Library, and Martin Chooljian, Trustee Emeritus and longtime Friend of the Institute.

It is with immense gratitude that we recognize recently retired Board member E. Robert Fernholz. Bob demonstrated an overarching commitment to the School of Mathematics and strengthened community ties as Friends Liaison.

Despite volatile conditions, Institute scholars continue to lead in the quest for knowledge with grace and determination.

Charles Simonyi
Chair of the Board

THE 2020–21 ACADEMIC YEAR FEATURED a full slate of hybrid activities, outdoor seminars, and virtual collaborations. The resumption of physical gatherings, albeit limited in capacity, was a happy reminder of the importance of human connection in fostering intellectual exchange.


GABI PORTER

During "Virtual Welcome Day" on September 21, 2020, the Institute announced a new class of 241 leading scholars and scientists engaged in a combination of in-residence and remote work. While the campus community itself was limited to scholars and essential staff, the continued incorporation of video conferencing tools, virtual events, and a monthly electronic community bulletin drove participation to new heights.

On January 15, 2021, Alondra Nelson, Harold F. Linder Professor in the School of Social Science was appointed by then President-elect Joe Biden to the position of Deputy Director for Science and Society in the Office of Science and Technology Policy, which aims "to approach our science and technology policy in ways that are accountable, inclusive, and trustworthy."

A memorable virtual celebration was held on March 17, 2021, for Avi Wigderson, Herbert H. Maass Professor in the School of Mathematics, who was named a recipient of the 2021 Abel Prize with László Lovász—a former IAS Visiting Professor—of Eötvös Loránd University "for their foundational contributions to theoretical computer science and discrete mathematics.…"

Scholarship continued unabated with the publication of several landmark research papers garnering broad domestic and international news coverage, including a new test of Einstein's theory of general relativity and Hubble observations of dark matter deficient galaxies. Institute scholars were featured prominently for in-depth analysis of the pandemic and vaccine rollout. Francesca Trivellato, Andrew W. Mellon Professor in the School of Historical Studies, was awarded the 2020 Jacques Barzun Prize in Cultural History for *The Promise and Peril of Credit*.

We mourned the loss of Professor Emeritus Peter Paret, acclaimed military historian, and Professor Emeritus Giles Constable, a giant of medieval religious and intellectual history. Both leave a legacy of field-shaping work and deep scholarly insight.

We were heartened to witness the creativity and productivity of scholars under exceptional circumstances. We remain deeply thankful to our staff for their hard work and unwavering support of our cherished community and mission.

Robbert Dijkgraaf
Director and Leon Levy Professor

The Institute for Advanced Study

It was founding Director Abraham Flexner's belief that if the Institute "eschews the chase for the useful, the minds of its scholars will be liberated, they will be free to take advantage of surprises, and someday an unexpected discovery, apparently leading nowhere, will be found to be an indispensable link in a long and complex chain that may open new worlds in theory and practice."

The Institute for Advanced Study is an international center for theoretical research and intellectual inquiry that creates time and space for solitary work as well as dialogue among some 250 visiting researchers each year from more than 100 institutions around the world and at various stages in their careers. From postdocs with new perspectives and tools, to established experts who create and advance fields of inquiry, the Institute's focused yet freely inquisitive atmosphere enables advancement in unforeseeable ways, leading to societal innovation and new understanding. Research spans four Schools—Historical Studies, Mathematics, Natural Sciences, and Social Science—and is focused on long-term and fundamental outcomes with no concern for immediate application. IAS is a scholar's paradise—a campus of unparalleled energy and curiosity, free of external pressures and academic restraints where exceptional minds have limitless opportunity to explore what is not yet known. Thirty-five Nobel Laureates, forty-two of the sixty Fields Medalists, and twenty-one of the twenty-four Abel Prize Laureates, as well as many winners of the Wolf and MacArthur prizes, have been affiliated with the Institute. Albert Einstein, Kurt Gödel, Hetty Goldman, George F. Kennan, Erwin Panofsky, John von Neumann, and Hermann Weyl were among the first in a long line of distinguished Institute scientists and scholars to produce a deeper understanding of the physical world and of humanity. At the Institute, everything is designed to encourage scholars to take their research to the next level. Members carry out their work in a setting where human scale has been carefully maintained to encourage the sharing of ideas, serendipitous interaction, and friendship. During the 2020–21 academic year, the Institute adopted special measures in support of public health, ensuring that scholars both local and remote were safely able to push the boundaries of knowledge forward. Faculty and Members experience precious freedom at the Institute, an independence enabled by the generosity of the Institute's founders and subsequent benefactors, which leads to pioneering theories and the development of new knowledge. In the words of mathematical physicist Robbert Dijkgraaf, current IAS Director and Leon Levy Professor, "What do we know? What do we yet need to understand? How should we try to comprehend it? Fundamental research at the Institute furthers our grasp of a world of diverse facts, structures, ideas, and cultures. We share the conviction of our founders that such unrestricted deep thinking will change this world, but where and how is always a surprise."

School of Historical Studies

The School of Historical Studies, established in 1949 with the merging of the School of Economics and Politics and the School of Humanistic Studies, actively promotes interdisciplinary research and cross-fertilization of ideas, thereby encouraging the creation of new historical enterprises.

FACULTY

Suzanne Conklin Akbari

Yve-Alain Bois

Angelos Chaniotis

Nicola Di Cosmo
Luce Foundation Professor in East Asian Studies

Jonathan Haslam
George F. Kennan Professor

Myles W. Jackson

Sabine Schmidtke

Francesca Trivellato
Andrew W. Mellon Professor

PROFESSORS EMERITI

Glen W. Bowersock

Caroline Walker Bynum

Giles Constable
deceased January 17, 2021

Patrick J. Geary

Jonathan Israel

Peter Paret
deceased September 11, 2020

Heinrich von Staden

The School of Historical Studies bears no resemblance to a traditional academic history department, but rather supports all learning for which historical methods are appropriate. Its Faculty and Members embrace a historical approach to research throughout the humanistic disciplines, from socioeconomic developments, political theory, and modern international relations to the history of art, science, philosophy, music, and literature. In geographical terms, the School concentrates primarily on the history of Western, Near Eastern, and Far Eastern civilizations, with emphasis on Greek and Roman civilization, the history of Europe (medieval, early modern, and modern), the Islamic world, and East Asia. Support has been extended to the history of other regions, including Central Asia, India, and Africa. The Faculty and Members of the School do not adhere to any one point of view but practice a range of methods of inquiry and scholarly styles, both traditional and innovative. Uniquely positioned to sponsor work that crosses conventional departmental and professional boundaries, the School actively encourages interdisciplinary research and the intermingling of diverse ideas, nurturing the development of new and exciting endeavors in historical research.

Professor **Suzanne Conklin Akbari**'s work centers on the global Middle Ages, especially the relationship between the global and the local. She is interested in how our research emerges from the particular land that we live and work on, the role of IAS in fostering collaborations concerning the place of the humanities in today's world, and possible future directions of disciplinary realignment.

Akbari is a founding member of NAISIP, the Native American and Indigenous Studies Initiative at Princeton: https://indigenous.princeton.edu/about. Her publications on the intersection of Medieval Studies and Indigenous Studies include "Medieval Indigeneity," in *A Cultural History of Race in the Medieval Age, 800–1350* (forthcoming, 2022) and "The Gift of Shame" (*postmedieval* 11.2 [2020]: 318–25), as well as a public lecture at Berlin's ICI Kulturlabor, "What Ground Do We Read On? Reading Canonical Authors in Unsettling Times" (May 10, 2021): https://www.ici-berlin

DAN KOMODA

The West Building, home to both Historical Studies and Social Science, was designed by Robert Geddes in 1971.

.org/events/suzanne-conklin-akbari/. Together with IAS Member Cord Whitaker (2019–20) and Sara Lipton, Akbari delivered the Conway Lectures at the University of Notre Dame on the theme of "Race in the Middle Ages"; Akbari's talk was titled "Racializing Religion: The Case of the Ethiopian Magus and the Jews of Cologne" (November 5–6, 2020).

Akbari is co-PI of "The Book and the Silk Roads," a Mellon-funded research project based at the University of Toronto which seeks to map connections between parts of the premodern world by describing the technology of the book. Along with collaborators, Akbari presented an overview of the project's data management aspects at IAS's Digital Scholarship Conversations, "The Book and the Silk Roads: Corralling Data in the Digital Workspace" (December 4, 2020): https://www.ias.edu/video/book-and-silk-roads-corralling-data-digital-workspace. Together with IAS Research Associate Melissa Moreton, Akbari organized an international workshop on "Textiles in Manuscripts: Cross-cultural Trade, Craft Production, and Influence in the Art of the Premodern Book," hosted at IAS virtually on June 2–3, 2021: https://booksilkroadstextiles.artsci.utoronto.ca/. This interdisciplinary workshop brought together a wide range of book historians, textile scholars, conservators, art historians, and codicologists to examine the use of textiles in manuscript books. Akbari is also co-curator of an upcoming exhibition at Toronto's Aga Khan Museum, "Hidden Stories: Books Along the Silk Roads," which will run from October 9, 2021 to February 27, 2022, with an accompanying digital exhibit and teaching resources.

The Medieval Studies seminar for 2020–21, held remotely via Zoom, focused on the topic of "Language and Power in the Global Turn." In addition to IAS Members in Medieval Studies for 2020–21—Jonathan Hsy, Samantha Kelly, and Nahir Otaño Gracia, Nicholas Watson, and Jan Ziolkowski—attendees included invited participants from various parts of North America as well as from the Princeton area. Finally, IAS Faculty Suzanne Akbari and Sabine Schmidtke partnered with Samantha Kelly, Member (2020–21) and Aaron Butts, Member (2019–20) to host a series of four webinars on Ethiopian Studies, including two focused on the intersection of Medieval Studies and Ethiopian Studies: "The Turn to the Medieval in Ethiopian Studies—The Turn to Ethiopia in Medieval Studies I and II." (For more information and recorded videos, see https://www.ias.edu/hs/ias-ethiopian-studies-series.)

For most of the academic year, Professor **Yve-Alain Bois** finished and edited the manuscript for the second volume of his *catalogue raisonné* of Ellsworth Kelly's paintings, reliefs, and sculpture, covering the years 1954–58. This hefty tome, with close to seven-hundred illustrations, came out in September 2021. The only diversions to this endeavor were writing an essay on the French artist Martin Barré for the catalogue of his retrospective exhibition at the Centre Pompidou in Paris, and a preface to the French translation of British art critic David Sylvester's essays on art.

At IAS, Bois continues to lead the art history seminar, which was very energetic despite (or perhaps because of) the pandemic. It is clear that Members felt bereft of one of the most endearing features of a stay at the Institute—impromptu discussions and lunches with scholars working on other topics or fields than one's own—and were eager to debate. While we had been able to hold several seminar sessions outdoors at the beginning of the fall term, this had to stop when the weather got nasty and the spring term sessions were conducted via Zoom. (This allowed for guests from outside our bubble to participate on several occasions.) As usual, Members presented their current works, in search of feedback on the most recent chapter of the book they were writing, for instance—but several sessions were dedicated to discussing a recently published book or essay dealing with topical issues pertaining to the discipline of art history at large. Erwin Panofsky's *Habilitationsschrift*, *Michelangelo's Design Principles,* which had just been published by Princeton University Press, was the topic of our first (very lively) debate, followed by *Object Biographies,* edited by Member John Hopkins for the Menil Collection (Houston), and a series of recent essays on race in art history and yet another on forgery.

Lastly, past Members, Marisa Bass (2015–16) and Margaret Graves (2015–16) (who each had just received a major prize for the book they had written while at the IAS a few years ago) presented their new research.

The main focus of **Angelos Chaniotis**'s work remains the study of inscriptions and the information they provide for Greek social, cultural, and religious history. He co-edited *Supplementum Epigraphicum Graecum* LXVI (Leiden, 2021) and continued working on his book *Epigraphic Research at Aphrodisias, 1995–2015*. The collective volume *Unveiling Emotions III. Arousal, Display, and Perception of Emotions in the Greek World*, which he edited, was published in early 2021 by Steiner Verlag. Chaniotis resumed his research on ancient Crete, co-directing together with Associate Professor Antonis Kotsonas (ISAW/NYU) the systematic excavation of the city of Lyktos. Because of the pandemic, the excavation started in late June 2021. Additionally, the digitization of squeezes of Greek inscriptions at the IAS made significant progress, with generous grants by the Fowler Merle-Smith Family Trust and the National Endowment for the Humanities.

The Ancient Studies Seminar (October 2020 to May 2021) took place online and was opened to former Members, who enthusiastically participated both with lectures and contributions to the discussions. Subjects—related to the political culture of ancient Greece, the legal history of Rome, Greek drama, the cultural history of the Roman Empire, and epigraphy—were treated by Members and former Members. The workshop "Epigraphic Friday," which Chaniotis has organized since 2013, took place online and lasted for two days (March 5–6, 2021), in order to facilitate attendance by scholars in different time zones, from California to Israel. The lectures by fifteen scholars from six countries were attended by more than sixty scholars and graduate students from the U.S., Europe,

ANDREA KANE

Scholars at the Institute spent a great deal of time outside, separated by 1.043 Einsteins.

and Israel. Chaniotis gave sixteen lectures in Belgium, Germany, Greece, Norway, Spain, the United Kingdom, and the U.S., all of them online. He also taught the online course "Theatrical Behavior in Hellenistic Public Life" at the Northeast Normal University, Changchun (China). His lectures focused on his research on theatricality in public life, the history of emotions, and nightlife in antiquity.

Chaniotis continued his work as a member of the Council of Higher Education in Greece, a board of five members which is responsible for the strategic planning and the evaluation of Greek universities. He also co-produced a documentary on life in a nursing home for the elderly in Athens during a lockdown from March to May 2020. This documentary, *Through the Glass*, directed by Christos Barbas, was Greece's official representation in the 23rd Thessaloniki Documentary Festival in June 2021 and won the Fischer Audience Award.

During the academic year 2020–21, **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, was involved in various collaborative projects, mostly related to environmental change in the history of frontier regions across Eurasia, with special emphasis on short-term climate impacts.

Collaborative work with climate scientists resulted in the publication of "Climate and Environmental Context of The Mongol Invasion of Syria and Defeat at 'Ayn Jālūt (1258–1260 C.E.)" in *Erdkunde* 75.2, co-authored with climate scientists U. Büntgen and S. Wagner, who were responsible for the climate reconstruction and modeling. On the popular side, he published "L'hypothèse climatique" in *L'Histoire* n. 483 (May 2021). The application for an interdisciplinary project called "Volcanoes, Climate and History" was funded by the Zentrum für Interdisziplinäre Forschung at the University of Bielefeld. Also concerning research on climatic change in Asian history, he collaborated with Luca Olivieri in presenting the pilot project called "Late Antique Swat Ecology and Resilience: Climate and Habitat in Interfacial Periods" (University of Venice).

The book *Rebel Economies: Warlords, Insurgents, Humanitarians*, co-edited with Didier Fassin and Clémence Pinaud, was published in May 2021 (Lexington Books), which includes chapters by anthropologists, political scientists and historians on the topic of non-state war economies. He authored the chapter "The War Economy of Nomadic Empires."

On the theme of war and violence, he contributed the chapter "Violence in Inner Asian History" to *The Cambridge World History of Violence: Vol II 500–1500 C.E.* He has also been asked to join the editorial board of a new journal called *History and Violence* promoted by the editors of *The Cambridge World History of Violence*.

Among his other activities, speaking engagements (all remote) included the following venues: Oasis Association and Magazine (Italy), NYU-Shanghai (China), Mongolia and Inner Asian Study Unit (Cambridge, U.K.), Indiana University (Sinor Lecture), and the keynote address at the Conference on "Climate Change, Water and Livelihood in High Asia" (Columbia University). He was an external dissertation examiner in Norway and served on academic committees in Germany, Italy, and China. He continues to act as member of the scientific advisory board of the Walter Benjamin Kolleg (Bern University).

On the educational side, he taught a graduate seminar as a guest lecturer of the History Department at Columbia University on the topic "Climate variability and steppe empires," and supervised a dissertation at Princeton.

Within IAS, his activities included serving on the Ad Hoc Committee and Title IX Committee. Finally, he convened the East Asian seminar series, which hosted fifteen seminars, eight by current Members and seven by invited speakers.

For the historian, original research means excavation in the archives. Due to the obvious difficulties arising from the pandemic, it proved impossible for George F. Kennan Professor **Jonathan Haslam** to conduct in-person archival research. Even obtaining copies of declassified documents remotely from the national archives in Britain proved difficult because of an interminable backlog. Hence his keen anticipation of being able to make headway with research on the Greek civil war (1944–49) and the international dimension of foreign interference proved foolhardy. As the former Soviet prime minister Viktor Chernomyrdin used to say, "We hoped for the best, but things turned out as they usually do."

Haslam's time was therefore largely spent completing a much smaller study of the Cuban revolution and the literary left of Latin America, which benefited from research in the Princeton University

Archives. Due to professional and political tribalism among some Latin Americanists, Haslam anticipates a fierce headwind of opposition with his study of Cuba, which he faced decades ago publishing on the Nixon administration and the fall of Salvador Allende.

On the positive side of the ledger, *The Spectre of War: International Communism and the Origins of World War II* (Princeton University Press, 2020) has been met with almost unanimous acclaim in review and will appear under paper cover in the autumn of 2022. The Press has done a tremendous job of marketing the book under adverse circumstances. Half a dozen podcasts on the book can be found online, the best of which may be a discussion at the Centre for Geopolitics, available on YouTube: https://www.youtube.com/watch?v=kO70ONIaqZU.

Should pandemic restrictions return in the measure they reached in 2020–21, Haslam intends to construct a long text on the evolution of the European/international states system from the French invasion of Italy in 1494 through to the revolution in Iran in 1978–79, getting away from the mechanics of the balance of power and focusing on the ideological dimension of international relations—all of which can thankfully be done out of the Cambridge University Library.

And, as is only appropriate at the point of retirement, Haslam would like to thank all those at IAS, in particular the librarians for history and social science, but also those who remain efficiently but discreetly behind the scenes, who made his stay so profitable.

Professor **Myles W. Jackson** has nearly completed the first draft of his book manuscript on the history of the trautonium. His work offers a material and cultural history of science and technology that uses the electronic musical instrument to probe the porous boundaries between physics, radio engineering, physiology, and musical aesthetics in Germany from the 1920s to the 1970s. After polishing up and submitting the manuscript, he will return to his project on the history of science over the past three centuries aimed at the educated public.

He delivered remotely the Ruperto Carola *Ringvorlesung* lecture of the University of Heidelberg this past November. It was entitled "Eigentum: Genetische Information und biologische Molekule" ("Property: Genetic Information and Biological Molecules"). Over the summer he offered two Zoom lectures on the trautonium to the Ludwig Maximilian University of Munich and the Deutsches Museum of Munich. This coming year he is lecturing via Zoom on the intellectual property of biological molecules to Cedars-Sinai Medical Center of Los Angeles, on the trautonium to Hamilton College and Caltech, and (Covid-19 permitting) will spend one week as a visiting professor at the Jagiellonian University in Krakow, Poland.

Jackson's work was featured among sixty other leading scholars in the exhibition "The Fascination of Science" by the renowned German photographer, Herlinde Koelbl, which is currently touring throughout Germany. In addition to serving on the IAS Library Committee, Finance Committee, and Director's Search Committee, he is a member of the Board of Directors of the American Friends of the Alexander von Humboldt Foundation and the Prizes and Awards Committee of the History of Science Society. He is co-organizing an interdisciplinary seminar at IAS with Professors Akshay Venkatesh and Helmut Hofer from the School of Mathematics on AI and machine learning.

While the pandemic last year reduced the number of Members in the history of science, this year he is fortunate to have six, four of which will stay the entire year, two of which will join us for the autumn term. Their projects are as diverse as they are fascinating: the history of modern objects; the history of early twentieth-century German dance and physiology; Chinese medical theories and practices during the Song Dynasty; history of science and medicine in Latin American and Native communities; art, technology, and science in the Urdu language during the twentieth century; and early modern European, Latin American, and indigenous traditions of natural knowledge production.

In 2020–21, Professor **Sabine Schmidtke** focused on the Zaydi Shiʿi tradition of Yemen and Northern Iran, Twelver-Shiʿi legal and doctrinal thought, the history of Islamic studies including epistolary exchanges between scholars, and the "Science of Judaism" at the turn of the century.

DAN KOMODA

As indoor activities resumed, traditional lectures and events returned, now with Covid-19 safety protocols.

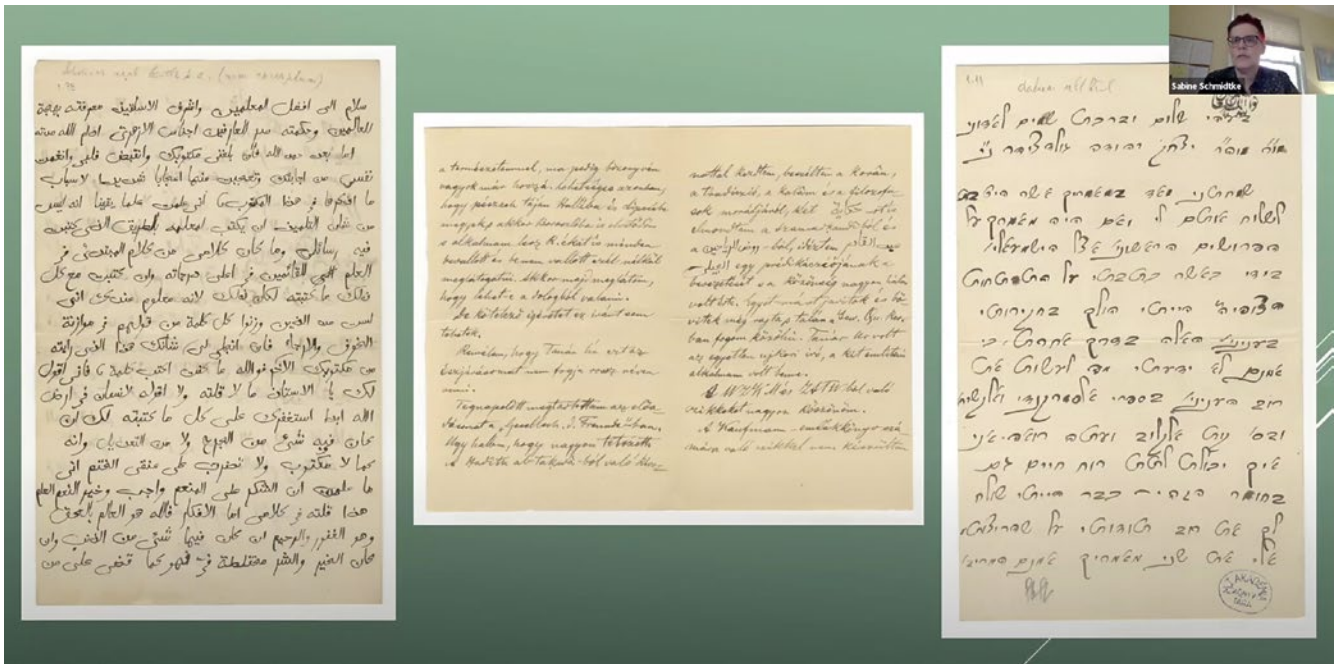
The partnership with Hill Museum & Manuscript Library (HMML) at St. John's University, Collegeville, Minnesota to build up a repository hosting digital surrogates of manuscripts pertaining to the Zaydi literary tradition continued to flourish. The National Endowment for the Humanities granted an extension to the project until 2022 to make up for the delay caused during 2020 as a result of Covid-19 to process the image materials. Moreover, in the framework of the NEH project, the history of the collections of Zaydi/Yemeni manuscripts in Europe is being studied through the papers and records from the recently discovered *Nachlass* of the Italian scholar Eugenio Griffini (d. 1925) that is kept in the Biblioteca comunale centrale, Palazzo Sormani, in Milan and has by now been digitized. These, as well as relevant complementary materials from the *Nachlass* of Eduard Glaser (d. 1908) in Austria and the Czech Republic, are being analyzed in cooperation with colleagues in Italy and Spain (Valentina Sagaria Rossi, Jan Thiele)—Griffini and Glaser were the most important collectors of Arabic manuscripts of Yemeni provenance during the final decades of the nineteenth century and the beginning of the twentieth century. Additionally, the edited volume, "Yemeni manuscript cultures in peril" (co-edited with Hassan Ansari), is currently in press (Gorgias Press).

Moreover, Schmidtke studied the intellectual tradition and history of Zaydism in Iran, during the ninth through the late twelfth century, as well as between the thirteenth until the sixteenth century C.E., when Yemen had replaced Northern Iran as the intellectual center of Zaydism. This research was supported by the Persian Heritage Foundation. From the ninth through the late twelfth century, the leading intellectual centers of Zaydism were located in Northern Iran, namely in Ṭabaristān, Daylamān and Gīlān in the Caspian region, as well as in Rayy during and after the Buwayhid age and in Bayhaq in Khurāsān. Gradually, the Zaydi communities in Iran experienced a decline and most of their literary legacy was no longer transmitted. Had it not been for the transfer of Zaydi religious literature from Iran to Yemen following the political unification of the Caspian and Yemeni Zaydis that began by the end of the eleventh century, most of the Iranian Zaydi literary heritage would have been lost. Following the death in 1217 of the Yemenite Imam al-Manṣūr bi-llāh, relations between the Iranian and Yemeni Zaydi communities became more tenuous and the transfer of literary sources from Iran to Yemen, which had by now replaced Northern Iran as the intellectual center of Zaydism, had mostly ceased. That the tradition of Zaydi learning continued in Iran at least until the sixteenth century is confirmed by scattered documents attesting the scholarly tradition of Zaydism of the fifteenth and sixteenth centuries, as well as by a number of manuscripts transcribed in the Caspian Zaydi community between the thirteenth and the sixteenth centuries. One of the principal concerns in the framework of this project was to unearth additional written documents that testify to the Zaydi presence in Iran, especially during the second period, since the thirteenth century. The most important find in that respect was a hitherto unknown Zaydi heresiography from Northern Iran, *Asās al-maqālāt fī qamʿ al-jahālāt*, by one Abū Muḍar Shurayḥ. The author can only tentatively be identified, but must have lived in the thirteenth century. The work is preserved in Ms. Tehran, Majlis 10727, a multitext codex, which was copied around 1332 in Iranian Zaydi circles. The heresiography allows entirely new insights into the legal and intellectual history of Zaydis of northern Iran. During the academic year 2020–21, a critical edition and study of the text was prepared, which has now been published in *Shii Studies Review* 5 (2021), pp. 49–140 (Hassan Ansari, Rouhallah Foroughi, and Sabine Schmidtke). Additionally, another important work by the eleventh-century Iranian Zaydi Imām al-Muwaffaq bi-llāh on the legal notion of the consensus of the family of the Prophet Muḥammad (*Masʾala fī anna ijmāʿ ahl al-bayt ḥujja*) was prepared and is forthcoming (Hassan Ansari, ʿAmmār Jumʿa, and Sabine Schmidtke).

Analyzing the crossroads of Islamic Studies and the "Science of Judaism" at the turn of the century, Schmidtke continued to work on a monograph on Martin Schreiner (1863–1926), a former student of Ignaz Goldziher, who played a pioneering role in the scholarly exploration of the Muʿtazila (to be published by Mohr Siebeck). In parallel, an edition of his correspondence (in Arabic, Hebrew, Hungarian, and German) is being prepared (with Dora Zsom). In June 2021, the library of the Jewish Theological Seminary in New York reopened, so that additional essential archival materials could be accessed. (The library had been closed since March 2020 due to Covid-19.)

Within the area of the history of Near Eastern and Islamic studies, Schmidtke completed a study on Friedrich Kern (1874–1921), which is primarily based on epistolary exchanges with other scholars, including Ignaz Goldziher, Martin Hartmann, and Carl Heinrich Becker. She further worked on a monograph devoted to Rudolf Strothmann (1877–1960), the founder of Shiʿi studies in Europe. Besides Strothmann's letters that can be traced in the archives of other contemporary scholars, Schmidtke discovered a partial *Nachlass* of Strothmann that is kept by one of his descendants. The *Nachlass* contains hundreds of letters Strothmann exchanged with colleagues and members of his family between 1915 and 1945, which are immensely valuable. Additionally, the *Nachlass* includes Strothmann's diary recording his trip to the Middle East in 1929/30—during which he spent close to two months in Yemen. The diary surpasses in quality and detail all other extant reports by European travelers to Yemen during the time, and, together with Strothmann's granddaughter (Gaby Strothmann), Schmidtke began preparing an edition of the diary which is close to completion.

In the field of Twelver Shiʿi thought, she completed, with Hassan Ansari, Parts One and Two of Volume One of a three-volume study, "Imami Thought in Transition: An Archeological Inquiry into Texts and their Transmissions," currently in press with UCO Press, Cordoba. (Part



Professor SABINE SCHMIDTKE gave her virtual presentation "Scholarly Correspondences: A Window into the DNA of Scholarship" in March 2021.

Two is ready to be printed, while Part One is being proof-read and indices are being produced.) In the field of Shi'i Studies, Schmidtke also completed (with H. Ansari) the fifth volume of the peer-reviewed journal, *Shii Studies Review*, published by Brill, Leiden (www.brill.com/ssr).

Over the course of the year, Schmidtke organized a number of online events. These included presentations of collaborative research projects and panels hosted over the course of the year, some of which were convened in collaboration with Digital Scholarship Conversations @ IAS. Additionally, Schmidtke convened, together with IAS Faculty Suzanne Akbari and two IAS Members, Samantha L. Kelly and Aaron Butts, the IAS Ethiopian Studies Series, which consisted of four panel discussions: The Beta Israel and Ethiopian Christian Views of Jews and Judaism; The Turn to the Medieval in Ethiopian Studies—The Turn to Ethiopia in Medieval Studies I and II; Beyond Ethiopia: The Islamic Intellectual History of the Horn of Africa. In collaboration with Gorgias Press and IAS Faculty Angelos Chaniotis, Schmidtke further convened a series of online talks, "The Author's Voice," featuring new publications in the field of NES.

Schmidtke also spent much of her time at the Institute with a large and diverse group of Members studying subjects related to the Near and Middle East, though not necessarily to Islam. The group was highly international, with Members from the U.K., Germany, Sweden, and the U.S. Over the course of the year, the Members regularly met in a lively bi-weekly online seminar which was also frequented by Princeton University graduate students and faculty, former Members of the IAS, as well as occasional visitors.

Schmidtke further began to donate significant portions of her personal library to the Historical Studies and Social Science Library at the Institute for Advanced Study, in an effort to strengthen the library's profile in Near Eastern and Islamic Studies [https://albert.ias.edu/handle/20.500.12111/7903].

As someone who relies on archives and rare book libraries for her research, Andrew W. Mellon Professor **Francesca Trivellato** had to adjust her plans in 2020–21, and feels lucky to have been able to do so. While she could only advance some of the empirical research she is conducting at the intersection of the economic, legal, and cultural history of pre-industrial Europe, she continued to write on the scholarly traditions that inform her academic fields and pursued various editorial projects.

Her most recent book, *The Promise and Peril of Credit* (Princeton University Press, 2019), was awarded the 2020 Jacques Barzun Prize in Cultural History and was issued in paperback. Meanwhile, she revised the book's Italian translation, now forthcoming.

Trivellato curated the latest issue of *Capitalism: A Journal of History and Economics* titled "On the Margins" (vol. 2.2, Summer 2021), which includes contributions on China, Brazil, the United States, the pedagogy of quantitative methods, and more. Together with Jonathan Karp (SUNY-Binghamton), she submitted a volume on *Jews in Early Modern Europe* in the series "Classic Essays in Jewish History" to Routledge. For an edited collection on the legacy of Salo W. Baron, the first holder of a chair in Jewish history at a secular university in the United States, she wrote on his approach to economic history. Together with Claire Lemercier (Sciences Po), she completed a paper that uses quantitative methods to advance the comparative study of vast series of eighteenth-century notarial records available in France and Italy.

In light of the sustained and widespread

interest in the relationship between Italian microhistory and recent trends in global history, she devoted a forthcoming article and some online talks and interviews to this topic. Her 2009 work on micro and global history, *Familiarity of Strangers*, appeared in Portuguese from Edições 70 as *Familiaridade entre estranhos: A diáspora sefardita, Livorno e o comércio transcultural na Idade Moderna*, in addition to previous Italian, French, and Japanese translations, and she was invited to discuss the book via Zoom with several audiences in Brazil. Two of her essays, "Is There a Future for Italian Microhistory in the Age of Global History?" (2011) and "Microstoria/Microhistoire/Micro-history" (2015), are now also available in Portuguese in *Espaços, escalas e práticas sociais na micro-história italiana*, ed. Deivy Ferreira Carneiro and Maíra Vendrame (Fondazione Getúilo Vargas, 2021).

Finally, she published "A Missed Encounter: Burckhardt and the Economic Historians of Renaissance Florence," in *Burckhardt. Renaissance: Erkundungen und Relektüren eines Klassikers* (Göttingen: Wallstein, 2021); and "Lettres de change: confiance et malaise du crédit commercial dans l'Europe moderne," *Sensibilités: Histoire, critique et sciences sociales*, 9 (2021).

Trivellato continues to work closely with graduate students at various institutions, and had the pleasure of participating (remotely) in ten dissertation defenses at Yale, Princeton, Vanderbilt, UCLA, the European University Institute, as well as the Universities of Brasilia, Exeter, and Pisa.

Her seminar at IAS, by now nicknamed "Early Modern Europe Plus," was held entirely on Zoom but provided for many lively sessions, listed at the end of this report.

The prolonged sequestration during the months of pandemic, without access to office books and files, made it difficult for Professor Emeritus **Glenn Bowersock** to continue various projects. Nevertheless, working from home until September 2020, together with computer access and unfailing support from Institute staff, made it possible to continue largely as planned. He was able to resume his work gradually once the Institute was open again. Interaction with Members was sporadic at best, because not many were on campus, but Professor Bowersock kept regularly in touch with Members who had been obliged to return to their homelands. This provided a "virtual" IAS environment, including fruitful exchanges with Anne-Valérie Pont in France and Zbigniew Fiema in Finland. Professor Bowersock's friend and colleague Angelos Chaniotis conducted a fruitful series of online international seminars that he was glad to join.

Recently-accessible Russian archives have made it possible for historians, including Professor Bowersock, to explore the decades in which the eminent ancient historian Michael Rostovtzeff built up a glittering career in Russia before going into exile in 1918. Until now he has been known chiefly for the work he conducted in the United States. Professor Bowersock prepared, for the New York Review of Books, an article on a puzzling problem posed by six ancient leather strips that contain texts related to the biblical Deuteronomy—texts which could either have anticipated the biblical book or have been dependent upon it.

Eventually intending to provide a public statement for the publication of a new book by IAS Research Associate George Kiraz, Professor Bowersock had the pleasure and privilege of reading before publication his extraordinary autobiography, spanning a varied career that began in Bethlehem and continues today in Piscataway and Princeton. In the meantime, as IAS life gradually settled into its new normality, Professor Bowersock returned to work on various projects concerning pre-Islamic Arabia. But as of now, it is hard to know when he will be able to go to the region again, in view of the current instability in Yemen and his own advancing age.

Professor Emerita **Caroline Walker Bynum**'s book *Dissimilar Similitudes: Devotional Objects in Late Medieval Europe* appeared from Zone Books in October 2020. A presentation of it, arranged by Dorothea von Möltke of Labyrinth Books in Princeton and led by Professor Brooke Holmes of the Princeton University Classics department, took place on Zoom and despite certain technical difficulties was attended by over four-hundred people and generated lively discussion. A collection of interrelated essays, *Dissimilar Similitudes* contributes to recent theoretical debates in historical studies, anthropology, art history, and religious studies about what is involved in comparing events and objects across cultures and about what some have called the "new materialism." In 2020–21, Bynum continued to work on devotional objects in the late medieval/early modern period with special attention to natural materials such as stone and earth as conveying presence and power. She published a book review on objects in the ancient Mediterranean and contributed to a symposium on anthropological approaches to objects as well as continuing to work on a different topic in material history: the monuments of the American South where she grew up and ways to erase the racist "Lost Cause" ideology they represent. In the fall of 2020, she led a virtual workshop for the ERC-funded "Beyond the Elite" project in Jerusalem directed by Professor Elisheva Baumgarten, who has twice been a Member in the School of Historical Studies. In the spring of 2021, she lectured via Zoom at Ben Gurion University of the Negev in Israel, at the Seminar on Abrahamic Religions at Oxford University, and at The New School in New York City. She continued to mentor graduate students whom she taught several years ago as an adjunct professor at Columbia University and to tutor grammar school students through the Homework Help Program at St. Michael's Church in Manhattan.

The pandemic has kept Professor Emeritus **Patrick Geary** physically isolated in Portland, Oregon, and far from his beloved office in Fuld Hall. Nevertheless, he was able to continue weekly meetings via Zoom with his collaborators in the European Research Foundation funded Synergy Grant project HistoGenes that is studying population structure and mobility in Central Europe by combining genomic, archaeological, and historical resources. The project has now collected and sequenced over one thousand individuals who lived in the

Carpathian basin between the fifth and tenth centuries and the team is in the process of preparing its first preliminary publications. Already, they are uncovering strong evidence of population movements between Central and even East Asia and Central Europe in the sixth and seventh centuries, demonstrating how deeply entangled the populations of Eurasia already were in that period. Likewise, via Zoom, he was able to present lectures on genetics and history to audiences at Oxford University, MIT, the University of Naples, the Hebrew University of Jerusalem, and at his undergraduate alma mater, Spring Hill College. In February, in order to draw public attention to the important work of the Society of Bollandists, the Brussels-based organization that since the seventeenth century has been the leading scholarly institution that undertakes critical studies in all areas of hagiography (the study of saints), he delivered a lecture for the Lumen Christi Institute, "Pledges of the Saints: The Cult of Relics in the Catholic Tradition." Once more, he chaired MA thesis defenses at the Central European University, which, having been expelled from Budapest by the increasingly totalitarian government of Hungary, has relocated to Vienna, Austria. He published a short book on the dangers as well as the possibilities of genetic history, a topic increasingly debated, particularly in Germany, under the title *Herausforderungen und Gefahren der Integration von Genomdaten in die Erforschung der frühmittelalterlichen Geschichte* (Wallstein: Göttingen, 2021) as well as several articles on genetics and genetic history. He also serves on various advisory and editorial boards, including the ERC project, VINCULUM, which studies how the legal instrument of entail-structured families transmitted power and created corporate identities in southern Europe, between the fourteenth and seventeenth centuries.

During 2020–21, Professor Emeritus **Jonathan Israel** has continued with his broad study of aspects of the Western Enlightenment and completed three essays, one on Montesquieu, and another on the Baron d'Holbach, due to appear in collective volumes during 2022, and a third comparing Hobbes and Spinoza's very different conceptions of "democracy" that recently appeared in *Hobbes Studies*. His book *Revolutionary Jews from Spinoza to Marx. The Fight for a Secular World of Universal and Equal Rights* appeared with Washington University Press in June 2021. By Zoom and in one case in person, he delivered public lectures during this period in Amsterdam, Haarlem, Oxford, and Culemborgh and appeared in an international Zoom panel discussion on early Enlightenment "libertinism" conducted from Oxford. Meanwhile, he has continued his research on the IAS special Spinoza collection and continued working on his biography of Spinoza which is due for completion in 2022.

2020–21 MEMBERS AND VISITORS

f First Term ✦ *s* Second Term ✦ *m* Long-term Member ✦ *v* Visitor ✦ *vp* Visiting Professor ✦ *ra* Research Associate

Hassan Farhang Ansari
Islamic Law and Theology ✦ Institute for Advanced Study ✦ *vp*
Funding provided by the Persian Heritage Foundation and the Ruth Stanton Foundation

Ayse Baltacioglu-Brammer
Early Modern Middle East ✦ New York University ✦ *f*
Andrew W. Mellon Foundation Fellowship for Assistant Professors

Björn Burkhardt Peter Bentlage
Arabic Literature in the Early Modern Period ✦ Orientalisches Institut, Martin-Luther-Universität Halle-Wittenberg ✦ *f*
Infosys Member

Anna Bokov
History of Architecture ✦ The Cooper Union for the Advancement of Science and Art
Funding provided by the Patrons' Endowment Fund

Olga Bush
Islamic Art and Architecture ✦ Vassar College ✦ *f*
Funding provided by the Ruth Stanton Foundation Fund

Aaron Michael Butts
Near Eastern Studies ✦ The Catholic University of America ✦ *v*

Simona Cerutti
Early Modern History ✦ École des Hautes Études en Sciences Sociales, Paris ✦ *s*
Edwin C. and Elizabeth A. Whitehead Fellow

Rishad Choudhury
South Asian History ✦ Oberlin College ✦ *f*
Funding provided by the Herodotus Fund

Dee Clayman
Classical Studies

Richard Bernard Cockett
Modern Intellectual History ✦ The Economist
Elizabeth and J. Richardson Dilworth Fellow

Khaled Fahmy
Middle Eastern Studies ✦ University of Cambridge
Patricia Crone Member

David Hancock
History of the First British Empire, Business and Economic History of the Early Modern Atlantic World ✦ University of Michigan ✦ *s*
Martin L. and Sarah F. Leibowitz Member

Morten Steen Hansen
Early Modern Art History ✦ Accademia di Danimarca–Det Danske Institut i Rom
Agnes Gund and Daniel Shapiro Member

Carissa M. Harris
English, Medieval Literature ✦ Temple University
AMIAS Member

Áine Heneghan
Music Theory, Music History ✦ University of Michigan ✦ *s*
Funding provided by the Herodotus Fund

Karen Henson
Musicology, Opera Studies ✦ Queens College and The Graduate Center, The City University of New York
Edward T. Cone Member in Music Studies; additional funding provided by Carnegie Corporation of New York

Aaron Hershkowitz
Ancient History, Epigraphy ✦ Institute for Advanced Study ✦ *ra*

John North Hopkins
Art History, Archaeology ✦ New York University
Friends of the Institute for Advanced Study Member

Jonathan Hsy
Cultural History of Disability, Critical Theory ✦ The George Washington University
George William Cottrell, Jr. Member

Eleanor Hubbard
Early Modern Britain ✦ Princeton University
Elizabeth and J. Richardson Dilworth Fellow

Christopher P. Jones
Classical Philology and History ✦ Harvard University ✦ *ra*

Yannis Kalliontzis
Ancient History, Greek Epigraphy ✦ Inscriptiones Graecae, Berlin-Brandenburgische Akademie der Wissenschaften ✦ *s*
Funding provided by the Hetty Goldman Fund

Dimitri James Kastritsis
History ✦ University of St Andrews
Funding provided by the Fund for Historical Studies and the British Academy Mid-Career Fellowship

Samantha Lee Kelly
Early Modern Mediterranean History ✦ Rutgers, The State University of New Jersey
Willis F. Doney Member

George A. Kiraz
Ottoman History of Religious Minorities, Syriac Studies ✦ Beth Mardutho: The Syriac Institute ✦ *ra*

Gabor Kosa
History of Religions ✦ Eötvös Loránd University (ELTE)
Roger E. Covey Member in East Asian Studies

Xiaoqiao Ling
Literature and History of Reading ✦ Arizona State University ✦ *s*
Funding provided by the Herodotus Fund

Pamela Olivia Long
Late Medieval/Early Modern Europe, History of Science, Technology and Culture
Willis F. Doney Member

Jonathan Loopstra
Syriac Studies, Late Antiquity, Biblical Masorah ✦ University of Northwestern–St. Paul ✦ *s*
Funding provided by the Patricia Crone Fund

Valeria Alejandra Escauriaza Lopez Fadul
Early Modern Spain, Colonial Latin America, History of Science ✦ Wesleyan University
Andrew W. Mellon Foundation Fellowship for Assistant Professors

Georgia Mallouchou
History and Epigraphy ✦ Archaeological Society at Athens
Stavros Niarchos Foundation Member

Louise McReynolds
Imperial Russian History ✦ The University of North Carolina at Chapel Hill
Funding provided by the Andrew W. Mellon Foundation Fund

Pernilla Myrne
Arabic Studies ✦ University of Gothenburg
Funding provided by the Fund for Historical Studies

Norihiro Naganawa
Russian and Eurasian History ✦ Hokkaido University ✦ *s*
William D. Loughlin Member

Esen Ogus
Classical Archaeology ✦ Austin Peay State University ✦ *ra*

Arnaud Orain
History of Economics, Economic History ✦ Université Paris 8 Vincennes-Saint-Denis
Funding provided by the Florence Gould Foundation Fund

Julia Christiane Orell
Art History of China ✦ The University of British Columbia ✦ *s*
Funding provided by the Herodotus Fund

Nahir Ivette Otaño Gracia
Medieval Studies ✦ University of New Mexico
Andrew W. Mellon Foundation Fellowship for Assistant Professors

Michael Peachin
Roman Imperial History, Roman Law ✦ New York University
Funding provided by the Gladys Krieble Delmas Foundation

Amanda Phillips
University of Virginia ✦ *v*

Isabelle Poutrin
Early Modern History ✦ Université de Reims Champagne-Ardenne ✦ *s*
Funding provided by the Fund for Historical Studies

Jessica Ratcliff
History of Science and Technology ✦ Cornell University
Founders' Circle Member; funding provided by Georg Albers-Schönberg in memory of Ernst Albers-Schönberg

Jonathan Sheehan
History ✦ University of California, Berkeley
Hans Kohn Member

Francesco Torchiani
Intellectual History, Jewish Studies ✦ Università degli Studi di Pavia ✦ *f*
Felix Gilbert Member

Stephen V. Tracy
Greek History and Epigraphy ✦ The American School of Classical Studies in Athens ✦ *ra*

Karina Urbach
Modern International Relations and Jewish Family History ✦ University of London ✦ *v*

Marijn van Putten
Philology, Text Criticism, Historical Linguistics ✦ Leiden University ✦ *s*
Funding provided by the Herodotus Fund

Constantine Vaporis
Japanese History (Early Modern Period) ✦ University of Maryland, Baltimore County
Starr Foundation East Asian Studies Member

Nathan Vedal
Chinese Cultural History ✦ Washington University in St. Louis
Andrew W. Mellon Foundation Fellowship for Assistant Professors; additional funding provided by the ACLS Fellowship

Alexandra Villing
Archaeology ✦ British Museum ✦ *f*
Funding provided by the Hetty Goldman Fund

Nicholas James Watson
Medieval Studies ✦ Harvard University
Funding provided by the Andrew W. Mellon Foundation Fund

Shellen Xiao Wu
Asian History, Global History ✦ University of Tennessee, Knoxville
Starr Foundation East Asian Studies Member

Meng Zhang
Early Modern China, Economic and Environmental History, Global Capitalism ✦ Loyola Marymount University ✦ *s*
Andrew W. Mellon Foundation Fellowship for Assistant Professors

Jan Michael Ziolkowski
Medieval and Medievalism Studies ✦ Dumbarton Oaks and Harvard University ✦ *f*
Funding provided by the Fund for Historical Studies

School of Mathematics

The School of Mathematics, established in 1933, was the first School at the Institute for Advanced Study. Several central themes in mathematics of the twentieth and twenty-first centuries owe their major impetus to discoveries that have taken place in the School, which today is an international center for research on mathematics and theoretical computer science.

FACULTY

Camillo De Lellis
IBM von Neumann Professor

Helmut Hofer
Hermann Weyl Professor

Jacob Lurie

Peter Sarnak

Akshay Venkatesh
Robert and Luisa Fernholz Professor

Avi Wigderson
Herbert H. Maass Professor

PROFESSORS EMERITI

Enrico Bombieri

Pierre Deligne

Phillip A. Griffiths

Robert P. Langlands

Robert D. MacPherson

Thomas Spencer

DURING THE 2020–21 ACADEMIC year, the School had a special program on Geometric and Modular Representation Theory. Geordie Williamson of the University of Sydney was the Distinguished Visiting Professor, with senior participants George Lusztig, Simon Riche, and Raphael Rouquier.

Williamson worked on the Hecke category, deducing from it the Kazhdan-Lusztig conjectures, and its similarity to the principal block of reductive algebraic groups: namely that wall-crossing functors give an action of the (affine) Hecke category. He, along with Simon Riche, showed that this conjecture implies several rather deep statements in representation theory (mod p analogues of the Kazhdan-Lusztig conjectures). Recently, this has been proved in two different ways: the first (by Roman Bezrukavnikov and Riche) via mod p localization and the second (by Josh Ciappara) via Smith theory.

Representation theory began with the work of Frobenius in the late nineteenth century and soon grew to play an important role in the development of modern mathematics. The second half of the last century saw the introduction of powerful new geometric techniques. Some of the deepest results in representation theory are obtained with geometric means, via the passage to algebraic geometry and the use of D-modules, perverse sheaves and weights. More recently, techniques of higher representation theory have provided new techniques and impetus from algebra and higher category theory.

The focus of this special year was modular representations (i.e., representations in positive characteristic). Here experience suggests that simple questions (e.g., understanding simple representations) can be extremely difficult. The subject has been dominated for the last thirty years by conjectures stating that the story should be "the same" as over the complex numbers, where "classical" tools of geometric representation theory provide the answer. However recent results suggest that the story is more complicated, and one is in need of new conjectures. It seems likely that both algebraic and geometric tools will be necessary to make progress. One might hope that a better understanding of pure characteristic p phenomena (e.g., Frobenius twist, Steenrod operations, relatively simple structure of motives …) will become essential to further understanding.

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Scholars in the School of Mathematics got used to working outside, regardless of the weather.

Another focus of this special year was achieving a better understanding of derived equivalence. This notion has grown into a unifying principle throughout representation theory: from attempts to categorify counting conjectures in finite group theory, through the representation theory of real Lie groups, to the local geometric Langlands program. A better understanding of these equivalences and their consequences seems guaranteed to lead to further progress.

The activities in geometric analysis and partial differential equations at the IAS, led by **Camillo De Lellis**, IBM von Neumann Professor, have been focused mostly on three topics. Elia Bruè, Giorgio and Elena Petronio Fellow, has spent considerable time on researching how the notion of "curvature" of a space can be optimally introduced with a minimal amount of structural assumptions on the underlying geometric object. He has published a groundbreaking paper with his collaborators Aaron Naber and Daniele Semola where they propose a new general definition of "boundary" for spaces with bounds on the so-called synthetic Ricci curvature, thereby answering a series of conjectures by Guido De Philippis and Nicola Gigli, two prominent mathematicians working in the area. At the beginning of the nineteenth century, the Belgian physicist Joseph Plateau investigated soap films and he pointed out that their shapes minimize the area among all the ones that span the same contour. Since then, the relevant geometric objects, called by mathematicians minimal surfaces, have been a central area of research in pure mathematics. During his stay at the IAS, Robert Young, von Neumann Fellow, finished a long-running project on minimal surfaces in a special ambient space, called the Heisenberg group, which has been subject to extensive investigations from several mathematicians in the past decades. He has introduced a new notion of harmonic intrinsic graph, characterized a large class of minimal surfaces, and developed new variational tools to analyze them. His work led him to discover quite concrete new examples, of which visual three-dimensional models can be found at https://cims.nyu.edu/~ryoung/ruledBernstein.

De Lellis, together with his Ph.D. students and some external collaborators, spent the year investigating the geometric properties of two distinct classes of minimal surfaces in the classical Euclidean spaces, focusing in particular on which kind of singularities they can possibly form. In one recently completed work, De Lellis and his collaborators gave the first complete structural theorem on the singular set of area-minimizing hypersurfaces modulo an even number p, generalizing a well-known result by Jean Taylor in the 1970s, which addressed the special case of $p = 3$. In an ongoing project with a Ph.D. student and a Brazilian researcher they provide the first answer to a problem raised by White in the 1980s, namely how multiple minimal surfaces can attach at a common contour: a key finding is that they have to attach "transversally," namely the presence of a single touching point forces the surfaces to entirely collapse on a single one.

A third area of investigation has been the basic equations of continuum mechanics describing the motions of gases and fluids. In 2018, Michail Vishik published two long works solving a long-standing open question in the motion of two-dimensional ideal fluids; more precisely, he showed that a suitably singular forcing term can lead to the existence of different evolutions for the fluid starting from the same initial conditions. The question had been open since a celebrated work of V.I. Yudovich in the 1960s, who showed that, unless the forcing term has infinite vorticity at some location in space, the motion of the fluid is uniquely determined. Even though Vishik's papers are available on the web, they have not yet been peer-reviewed. Bruè, De Lellis, Hyunju Kwon, and four external collaborators (Dallas Albritton, Maria Colombo, Vikram Giri, and Maximilian Janisch) have led a six-month-long seminar to understand Vishik's proof. In the process, they have found alternative routes to some substantial portion of his arguments and they are preparing a book on the subject. At the same time Kwon has investigated, together with Giri, another classical system of equations, which govern the evolution of ideal gases, and discovered the new surprising phenomena that irregular solutions can dissipate energy (or increase entropy) even in the absence of classical shock waves.

Helmut Hofer, Hermann Weyl Professor, led the research in symplectic geometry at IAS. It covers a wide range of topics and involved von Neumann Fellow Daniel Cristofaro-Gardiner and Members Laurent Cote, Sara Tukachinsky, Zhengyi Zhou, and Alexsey Zinger. The activities are enhanced by the numerous interactions of group members with other Members of the School of Mathematics. Of course, Covid-19 made such interactions, which usually occur naturally at IAS, more difficult. One of the highlights were two breakthroughs by Cristofaro-Gardiner jointly with Vincent Humiliere and former Member Sobhan Seyfaddini. They settled some long-standing questions, which go back to Kapovich/Polterovich and former Member Albert Fathi, respectively. One of the solutions describes the large-scale features of the Hofer Geometry of the Hamiltonian diffeomorphism group of the two-sphere and the other the algebraic structure of the group of area-preserving homeomorphisms of the two-sphere. These results follow their 2019–2020 solution of the simplicity conjecture, another conjecture by Albert Fathi from the 1970s described in the Highlights of the NSF Mathematical Science Institutes: https://mathinstitutes.org/highlights/mathematicians-solve-one-of-the-mysteries-of-two-dimensional-shapes.

The research interests of some of the group members covered Gromov-Witten theory in different flavors. In this context, Sara Tukachinsky continued her work with former Member Jake Solomon and will start the coming academic year with a tenure track position at Tel Aviv University. Zinger continued his joint work with Penka Georgieva.

Zhou used methods from Symplectic Field Theory to study, among other things, important questions about symplectic fillings. He also has been involved in the polyfold project, which

was developed by Hofer with former Members Kris Wysocki (1956–2016) and Eduard Zehnder. Finally, the research monograph *Polyfold and Fredholm Theory* by Hofer, Wysocki, and Zehnder, describing a novel theory to deal with smooth moduli spaces as they for example occur in symplectic geometry, has been published. It forms the basis for further developments, namely the application of the theory to important problems in the symplectic context. Part of these activities is the ongoing joint work with Jake Solomon on an inductive perturbation theory for polyfold Fredholm problems and the work with former Member Joel Fish and recent von Neumann Fellow Umberto Hryniewicz to apply these theories in concrete contexts.

Hofer and Fish used their Feral Curve Theory as a tool to approach questions about the typical behavior of Hamiltonian systems. An example is the wide-open question about the smooth closing lemma, namely the question if periodic orbits on a generic compact Hamiltonian energy surface are dense. It is known to former Member Michael R. Herman that the answer in general is no. As speculated in recent work by Fish and Hofer and supported by recent results by Kei Irie, the answer should be related to the richness of pseudoholomorphic curve theory, which sometimes can be captured by the Gromov-Witten invariants. Instrumental for Irie's work has been the 2015 proof of the volume conjecture by Cristofaro-Gardiner, former Member Michael Hutchings, and Vinicius Ramos.

Hofer gave the Zoom talk "The Floer Jungle: 35 years of Floer Theory" to a large audience involving the IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Zoominar and the consortium Math+ (comprised of the three Berlin universities and the University of Potsdam). The one-hour talk, https://www.youtube.com/watch?v=kSNyU71MpgQ, which is based on a book project about the German Mathematician Andreas Floer with the author, journalist, and senior editor of the MIT Technical Review Siobhan Roberts (also a frequent Director's Visitor) ended with an interesting almost hour-long Q&A session involving Abel Prize winners Misha Gromov and Karen Uhlenbeck, also Distinguished Visiting Professor at IAS, and former Member Dusa McDuff, who leads the Institute's Women and Mathematics program (WAM).

ANDREA KANE

ALEXANDER LUBOTZKY at lunch with colleagues. His interests are in group theory, including Lie groups, arithmetic groups, and finite groups, to name a few.

Jointly with former Member Silvia Ghinassi, now at the University of Washington in Seattle, the Zoom version of the Mathematical Conversations continued with weekly talks. It drew an international audience but capped the number of participants to about fifty in order to have meaningful discussions.

Prismatic cohomology is a fundamental new tool in the study of p-adic geometry, which was introduced recently by Bhargav Bhatt and Peter Scholze. In its original "relative" incarnation, the theory of prismatic cohomology depends on the choice of an auxiliary mathematical object called a prism. Over the past year, Professor **Jacob Lurie** (in collaboration with Bhatt) has studied an "absolute" counterpart of this theory, where the choice of prism is not fixed. One of their discoveries is that the totality of prisms can be understood in a geometric way: they are parametrized by a mathematical object called the CartierWitt stack (which has been introduced independently by Vladimir Drinfeld). The Cartier-Witt stack has an intricate but surprisingly tractable structure and has many interesting connections with arithmetic geometry.

Another ongoing project of Lurie's is the development of the online monograph Kerodon (https://kerodon.net/). Loosely modeled on the Stacks Project of Johan de Jong, the goal of Kerodon is to provide a self-contained, foundational account of categorical homotopy theory and some of its applications. Its target audience includes both researchers in the field (in need of a resource which can be easily searched and cited) and students seeking to learn about the subject (for which there are very few textbook accounts).

Visiting Professor Alexander Lubotzky ran a weekly hybrid (in person and on Zoom) seminar on group theory which was well attended by Members as well as by group theorists from around the world. Given the success of the seminar, it continued running for a second season with Professor **Peter Sarnak** joining as co-organizer—the topic focusing on related number theory as well. The interplay between group theory and number theory has a rich tradition in the School of Mathematics (Weyl, Siegel, Selberg, Borel, Harish-Chandra) and it remains a central theme today. The advanced developments in the theory of automorphic forms and especially around the Langlands Program involve linear groups (matrices) and their actions. Some years ago, Jean Bourgain and Sarnak together with their collaborators and students initiated a study of nonlinear actions in the analysis of

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Scholars and friends from all over the world celebrated AVI WIGDERSON'S Abel Prize in a hybrid ceremony.

Diophantine equations which are expected to have a rich set of integer solutions. Recently there have been a number very interesting advances along these lines and the resulting theory offers a glimpse into some of the most mysterious classical such equations: for example, which integers are sums of three integer cubes.

In the past year, Robert and Luisa Fernholz Professor **Akshay Venkatesh** has continued, with his collaborators David Ben-Zvi and Yiannis Sakellaridis, his investigations of the duality of automorphic periods. Together with Member Tony Feng, he is seeking to understand the numerical consequences of this duality, particularly in exotic causes where singular spaces are involved. Along with Jacob Lurie, Venkatesh organized a learning seminar on "monstrous moonshine," the remarkable relationship between the Fourier expansion of the modular j-invariant and certain finite simple groups; the path to this involved learning some conformal field theory. A silver lining on the many difficulties of a pandemic year was the newfound ease of having experts from around the world educate them about these topics.

As usual, work in the CSDM (computer science and discrete mathematics) group, headed by Herbert H. Maass Professor **Avi Wigderson**, was quite diverse in its scope. In a breakthrough paper in the area of probability and statistics, von Neumann fellow Paul Valiant, with his student Jasper Lee, resolved perhaps the most basic questions of statistics, namely *mean estimation*, optimally(!) for every possible sampled distribution of bounded variance. Here, optimal refers to the number of samples needed given the desired accuracy and confidence parameters. The algorithm and its analysis are very sophisticated and reveal several interesting phenomena. One surprising consequence is that the Gaussian distribution, viewed as the easiest (in terms of sample size) for this question, turns out to be the hardest.

Continuing work in algorithmic Invariant Theory, Member Visu Makam and Wigderson and collaborators Peter Buergisser, M. Levent Doğan, and Michael Walter, studied the complexity of *orbit problems*. Orbit problems concern the question of telling apart different orbits of a dynamical system defined by the action of some group on some space (e.g., in Hamiltonian dynamics, the question of whether two celestial bodies will ever collide). Generalizing work on the special case of null cone problems, this paper develops polynomial time algorithms for the general orbit problems for Abelian (torus) group actions. It highlights the value of using rational, as opposed to polynomial, invariants in computation.

In Optimization, the far-ranging work of Member Vijay Bhattiprolu, with Euiwoong Lee, and Assaf Naor, they study the approximability of quadratic maximization under convex constraints. This is a rich and expressive family of optimization problems; it includes a diverse range of interesting combinatorial and continuous optimization problems including max-cut, Grothendieck's inequality, the non-commutative Grothendieck inequality, certifying hypercontractivity, small set expansion, vertex expansion, and the spread constant of a metric. Their paper devises an overarching method for obtaining constant factor approximation algorithms that unifies most of the known prior cases in the literature for which this was achieved, as well as many more new cases which seemed to lie beyond the reach of existing techniques.

In Coding Theory, a remarkable example of the power of probabilistic constructions was given by Member Lisa Sauermann in joint work with Asaf Ferber and Matthew Kwan. They completely answer a basic question about list-decodability properties of Reed–Solomon codes (and many others). Their main result is establishing the existence of a Reed–Solomon code with the best possible rate among all codes with a list-decoding radius close to one. (Namely, there are very few codewords in any Hamming ball of this radius.) This result is obtained from a general theorem, giving good list-decodability properties of *random puncturings* of any given code with a sufficiently large distance.

2020–21 MEMBERS AND VISITORS

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School of Natural Sciences

The School of Natural Sciences, established in 1966, supports research in broad areas of astrophysics, systems biology, and theoretical physics. Areas of current interest include investigating the origin and composition of the universe; conducting research at the interface of molecular biology and the physical sciences; and elementary particle physics, string theory, quantum theory, and quantum gravity.

FACULTY

Nima Arkani-Hamed

Stanislas Leibler

Juan Maldacena
Carl P. Feinberg Professor

Nathan Seiberg

James Stone

Michail Tsodyks
C.V. Starr Professor

Edward Witten
Charles Simonyi Professor

Matias Zaldarriaga
Richard Black Professor

PROFESSORS EMERITI

Stephen L. Adler

Peter Goddard

Peter Goldreich

Arnold J. Levine

Scott Tremaine

EACH YEAR, THE SCHOOL OF Natural Sciences appoints about fifty Members, the majority of them postdoctoral fellows, who are typically at the Institute for three years, some for up to five years. Collaboration is encouraged among Members who work in the School's many scientific areas—from molecular biology to mathematical physics. From its earliest days, the Institute has been a leading center for fundamental physics, contributing substantially to many of its central themes, which now interrelate with astrophysics and biology. Areas of current interest in theoretical physics include elementary particle physics, string theory, quantum theory, and quantum gravity, and their relationship to geometry, theoretical and observational astrophysics, and cosmology. Research in the School's astrophysics group encompasses astronomical systems from nearby planets to distant galaxies, from black holes to the dark matter and dark energy that dominate the evolution of the universe. There is a growing cross fertilization between astrophysics and elementary particle physics, and the work of many Members and Faculty crosses the boundary between these two disciplines. Members in the astrophysics research group employ an array of tools from theoretical physics, large-scale computer simulations, and ground- and space-based observational studies to investigate the origin and composition of the universe, and to use the universe as a laboratory to study fundamental physics. At the Simons Center for Systems Biology, the tools of modern physics and mathematics are being applied to biological investigation on varying scales, from molecular to organismic, and in some cases focusing on understanding disease processes. The School's collaborative and pioneering approach to the sciences, which extends to the Institute's School of Mathematics, Princeton University, and the larger scientific community, continues to transform research in these fields and to open opportunities for powerful and important discoveries.

Astrophysics

Most of the visible matter in the universe is a plasma, that is a dilute gas of ions, electrons, and neutral particles. The dynamics of astrophysical plasmas is complex, but important for understanding a wide range of processes, from the formation of stars and galaxies in the early universe, to how planets in our own and other solar systems came to be. Computational methods have emerged as powerful tools for studying such problems, and Professor **James Stone** has continued his work with these methods during the past year in collaboration with members of the astrophysics group.

With Jeffrey Fung (along with Princeton graduate student A. Bailey), Stone has explored how Jupiter mass planets acquire

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Scholars in the School of Natural Sciences safely continued their collaborative research outdoors.

mass from the circumstellar disk in which they form, to understand how quickly they grow. For the first time, these calculations included numerical methods to enable realistic calculations of how the planet cools by the emission of infrared radiation. Stone, along with Libby Tolman, Lev Arzamasskiy, and Siyao Xu, has been studying fundamental processes such as turbulence and magnetic reconnection in weakly ionized plasmas relevant to the conditions in the interstellar medium of both galaxies and protoplanetary disks. With Lena Murchikova, Stone has been studying the dynamics of gas near the galactic center created by colliding stellar winds, and in particular how this gas gets captured and accreted into the central black hole in our galaxy. Finally, Stone and Elias Most have been exploring a new implementation of numerical methods for general relativistic magnetohydrodynamics that can exploit the computational power of graphical processing units (GPUs). It is hoped that this new implementation will be able to harness the substantial computing resources of the cloud for astrophysical research.

During the past year Richard Black Professor **Matias Zaldarriaga** continued his involvement in Gravitational Wave research. Together with Member Horng Sheng Chia, and former Members Barack Zackay, Liang Day, and Tejaswi Venumadhav, as well as with Princeton University graduate students Javier Roulet and Seth Olsen, Zaldarriaga applied novel analysis techniques to the public data from the LIGO/Virgo observatory. A study of the distribution of spins of the merging black holes revealed a preference for the spins being aligned with the orbital angular momentum, shedding new light on the formation channel of the LIGO/Virgo sources. A reanalysis of GW151226, the so-called Boxing Day event, showed that the data for this event could be explained by the merger of a pair of black holes with very different masses. This new solution also shows clear signs of orbital precession, creating a new challenge for understanding the formation history of this system.

Zaldarriaga continues to be interested in topics related to Cosmology. Together with Marko Simonovic, Mikhail Ivanov, Marcel Schmittfull, and Oliver Philcox, Zaldarriaga presented a new method for reducing the dimensionality of Large Scale Structure data sets used to infer cosmological parameters. The technique significantly reduces the computational cost of the analysis while at the same time leads to more robust constraints. The team also developed a new analytical forward model to predict the redshift-space galaxy over density field.

The composition of the dark matter that comprises most of the matter in the universe is one of the major unsolved problems in physics. One promising candidate is axion-like particles having masses so small that quantum-mechanical effects are important even on the scale of galaxies—the de Broglie wavelength of these particles is comparable to the size of small galaxies. In this case interference patterns between the waves lead inevitably to relaxation of the phase-space distribution of the dark matter and perhaps to the formation of a dense core (a "soliton") at the center of the galaxy. Professor Emeritus **Scott Tremaine** has collaborated with former Members Ben Bar-Or and Jean-Baptiste Fouvry to determine the rate and properties of this relaxation process. They have derived an equation that describes the evolution of the phase-space distribution starting either from the empirical Uehling-Uhlenbeck equation or more fundamentally from the Schrödinger equation, investigated both analytic and numerical solutions of this equation, and determined the linear stability of simple models of spatially homogeneous dark-matter halos. A remaining unsolved problem is to determine the properties of the soliton formed by this process.

The long-term stability of planetary systems over billions of orbits is one of the oldest problems in theoretical physics. Numerical simulations show that systems of three or more planets can develop weak instabilities that lead to collisions or ejection of a planet after ten billion orbits or more, but the mechanisms of these instabilities remain poorly understood. Tremaine collaborated with Dan Tamayo and Joshua Winn (Princeton University) and Norman Murray (University of Toronto) to explore the dynamics that determine long-term instabilities in planetary systems. They found that for a wide range of parameters the instability arises from the overlap of two-body resonances whose widths expand and contract due to slow variations in the eccentricities of the planetary orbits. Understanding this mechanism may enable us to predict the stability of planetary systems without expensive N-body integrations (typically several weeks of CPU time per system).

Systems Biology

Using theoretical approaches originating in physics, Professor **Stanislas Leibler** and Members working at the Simons Center for Systems Biology are looking for general mechanisms that could operate across different lengths and time scales and different organizational levels of biological systems.

In 2020–21, Leibler continued his studies of nonequilibrium aspects of biological phenomena. In particular, he carried on his collaborative work on nonlinear elastic theory of proteins and on a general control theory for dynamic memories in biological systems. In addition, Leibler has been developing a new line of research connected with complex (agro)ecosystems. Together with Members Nicolas Lenner and Riccardo Rao, he has been learning and thinking about soil microbial ecosystems critical for sustainable plant growth.

Michail "Misha" Tsodyks, C.V. Starr Professor, continued his studies of human memory. The mathematical model that he developed previously with Michelangelo Naim resulted in the universal relation between the number of items that are contained in memory and the average number of them that can be recalled. The universality of this relation was further confirmed by observing that lists of verbs are more difficult to recall than lists of nouns, but both satisfy the above relation. The reason for the difference is then explained by the fact that verbs have higher probability to be erased from memory during list presentation compared to nouns. In other words, while memory recall is governed by the

universal process, memory acquisition and maintenance are not. This conclusion corresponds to the nature of the forgetting process hypothesized by Tsodyks and his colleagues Antoine Georgiou and Misha Katkov, according to which memory items are erased during retrograde interference from subsequently acquired items, according to the multidimensional metric of their importance. The number of dimensions is a model parameter that is now shown to depend on the type of material being memorized: in particular it is different for verbs and nouns, and also for visual images such as sketches of simple objects.

Over the past several years, Professor Emeritus **Arnold J. Levine** and his collaborators have been exploring how spontaneous cancers arise in different tissues of the body and how the immune system responds to the appearance of these cancers. Spontaneous cancers develop in tissue specific stem cells by mutations that occur in selected genes, in a defined order, that selects for increased fitness of a cell, resulting in a self-limited expansion of cell numbers and a benign tumor. Although mutations can occur randomly, the selection process is ordered (Levine, *Nature Cancer Reviews*, 2020). After the accumulation of several mutations, a malignant tumor arises that is invasive. During this process the cellular immune system recognizes the differences between a normal cell and a cell containing mutations and responds by producing lymphocytes, called CD-8 T cells, that can keep the tumor under control. However, the tumor can evolve methods of escaping immune control. In collaboration with two previous Members at IAS, Ben Greenbaum and Marta Luksza, a quantitative evolutionary fitness model has been developed that measures these variables and helps to predict the outcomes of tumor treatments by activating the immune system.

By analyzing the signal transduction pathways where the genetic mutations drive the fitness of cancer cells, they have derived a geometric network analysis that predicted the responses of women with ovarian cancers to checkpoint immunotherapy (with A. Tannenbaum, *Nature Genomic Medicine*, 2021).

Victor Mikhaylov, a research associate in the Simons Center, has been studying the molecular interactions of T cell receptors with their antigens produced by the cancer cells. The HLA class 1 and 2 receptors that present these cancer specific antigens to T cells result in cell death or cell division. He has employed AlphaFold, an artificial intelligence program developed with Google's Deep-mind computer, to model the protein folding and structure of the receptor protein interacting with its antigen. This program of neural networks will, we hope, lead to better predictions of antigen-receptor interactions and possibly vaccines for cancer treatment. One of the applications of this approach will be to test the fitness models and experimental results with the Tp53 tumor suppressor protein. Previous work has determined the p53 antigen-T cell receptor interactions that are productive and kill cells. We wish next to understand the molecular basis of these protein complexes.

Theoretical Physics

Professor **Nima Arkani-Hamed**'s major focus over the course of 2021, continuing a line of research begun in earnest at the outset of the pandemic, has been uncovering new mathematical structures connected to the universal properties of the most basic physical processes that take place in the real world we see when we look out our windows: the interaction and scattering of elementary particles.

The first example of this new class of ideas was the story of the "amplituhedron" in 2013, which was restricted to the description of the scattering of gluons. But new hints of this type of structure emerged in 2017, connecting the simplest "tree" amplitudes, for the simplest interactions of scalar particles, with a famous class of geometric objects known as "associahedron polytopes." In 2019, these ideas were extended to incorporate the first leading quantum corrections to these scattering processes, involving the notions of similar polytopes associated with "cluster algebras." Ever since, it has been clear that these ideas had to extend in complete generality—but a large number of physical and mathematical obstacles had to be overcome to see this come about. In collaboration with a group of mathematicians and physicists,

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Carl P. Feinberg Professor JUAN MALDACENA in outdoor discussions with other physicists.

this vision is finally in the midst of being fully realized. A new class of polytopes dubbed "surfacehedra," naturally associated with any two-dimensional surface, play the role of the "amplituhedron" for this large class of particle scattering amplitudes. Furthermore, these polytopes admit a remarkable "curvy" realization in terms of "binary" geometries, with the physical interpretation of generalizing from particle to string scattering amplitudes. This shows a deep, essentially combinatorial link between particles and strings, and gives fascinating representations for these scattering processes as answers to new sorts of questions not invoking evolution in spacetime or Hilbert space in a fundamental way, but seeing these properties emerge from a more primitive mathematical rubric.

In another vein pushing to connect this approach to basic physics even closer to directly describing the real world, Arkani-Hamed and IAS collaborators attacked an old question: that of understanding the structure of short-distance singularities and the "renormalization group," from this new perspective, eschewing direct reference to any pictures of local spacetime processes. Instead, both the leading short- as well as long-distance divergences associated with any particular process can be understood from the facet structure of so-called "Symanzik Polytopes." Using the ideas of "tropical geometry," in conjunction with an especially simple description of these Symanzik polytopes, provides a powerful way of both understanding and easily computing these physical singularities from a new point of view.

Separately, on April 7, an experiment at Fermilab confirmed a measurement of the anomalous magnetic moment "(g-2)" of the muon performed at Brookhaven in the early 2000s, now more sizably disagreeing with the at-the-time best available theoretical prediction of the Standard Model. While the jury is still out on whether this anomaly really represents new physics, it is by a fair margin the most convincing candidate for new physics we have seen in fifteen years, and so worth taking very seriously. Together with an IAS Member, Arkani-Hamed dropped all his other activities for a month to focus on this question, and studied perhaps the simplest possible model for explaining the anomaly, which had been examined a number of times before in the literature. But this model turned out to hide a wonderful surprise, providing a calculable example violating the (in)famous Wilsonian notion of naturalness, that in other contexts has bedeviled four decades of effort in trying to understand the answer to a simple question—why is the universe big?—when violent short-distance quantum fluctuations would seem to destroy the possibility of any long-range order. Ordinarily, only new symmetries can be used to tame quantum fluctuations, in accordance with the totalitarian principle in quantum mechanics, "that which is not forbidden is compulsory," but we have seen no new symmetries to control the size of the vacuum energy (the mystery "why is the universe big?") or the mass scale of the Higgs particle ("why is gravity weak so the universe can have big things in it?"). This simple model for the muon (g-2) violates these rules, albeit in a different setting. Despite the absence of any symmetries prohibiting its generation, the naively leading contributions to (g-2) vanish exactly, in a way that appears miraculous to a low-energy observer, much like the tininess of the cosmological constant and the Higgs mass currently appears miraculous to us. But in this model, the "miracle" finds a very simple explanation, though only when the full structure of the theory including all ultramassive states is revealed, with these massive states perfectly canceling the naive contributions to (g-2) expected by long-distance observers. This observation also has an important phenomenological consequence, forcing the required masses of new fermions to be lower than naively expected, with a sizeable portion of parameter space already covered by direct searches at the LHC, and the entire parameter space accessible to future runs of the LHC/precision measurements at possible future "Higgs factories."

Juan Maldacena, Carl P. Feinberg Professor, has spent his time analyzing peculiar aspects of magnetically charged black holes. Such black hole solutions are consistent with the Standard Model of particle physics, but they are probably very difficult to produce. The large magnetic field in the near horizon regions leads to a restoration of the electroweak symmetry when the black hole mass is less than about the mass of the earth. The black hole develops an electroweak "corona" some distance outside the horizon which marks the transition region between the ordinary electroweak vacuum and the restored one. This restoration of the electroweak symmetry implies that these black holes would have very peculiar and interesting properties, if they were to exist.

Together with Princeton student Matan Grinberg, Maldacena studied how subtle features about the mass dependence of expectation values of massive fields encode the proper time to the Schwarzschild black hole singularity. This is the maximum time that an observer could live after he or she crosses the horizon before being killed at the singularity. This time is an observable about the black hole interior while the expectation values of the fields can be measured outside the black hole horizon.

With Princeton student Yiming Chen, Maldacena has studied aspects of small black holes in string theory. Previously it had been speculated that small black holes would turn into highly excited oscillating strings. By making use of a large dimension approximation the problem becomes more tractable and leads to a more detailed understanding for what happens with small black holes. In particular, they have shown that there is a maximum temperature for these black holes which is higher than the highest temperature for string theory in flat space.

Professor **Nathan Seiberg** continued his explorations of quantum field theory. In the context of condensed matter physics, it has been widely believed that the long-distance, low-energy behavior of every microscopic (local) system is captured by a quantum field theory. However, certain recently discovered, exotic systems seem to violate this lore. This fact motivated Seiberg and his collaborators to explore whether the

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Charles Simonyi Professor EDWARD WITTEN gave a socially-distanced lecture outside of West Building.

standard framework of quantum field theory can be extended, such that it can accommodate these systems.

Continuing his earlier work with a long-term Member Shu-Heng Shao and two students, Pranay Gorantla and Ho Tat Lam, many more known and new lattice systems were studied and were incorporated into their continuum framework. This discussion led them to many new results about these systems.

The key unifying aspect of all these systems seems to be a special symmetry, known as subsystem symmetry. Unlike ordinary symmetries, which act on the entire system, this kind of symmetry acts independently on various subspaces. An interesting consequence of this subsystem symmetry was found in a paper with Shao and Member Tom Rudelius. They considered various previously studied exotic lattice systems and the continuum models with twisted boundary conditions. The effect of the twist turned out to be rather dramatic. The low-energy theory exhibits a new symmetry, which depends on the twisting parameters. As a result, the ground state degeneracy varies with these parameters. This change in the number of ground states is not continuous and it depends sensitively on the microscopic details of the model. This is a new manifestation of the nontrivial mixing between short- and long-distance physics, which makes these systems so peculiar.

The surprising features of these systems motivated Gorantla, Lam, Seiberg, and Shao to find new lattice systems that are closer to the continuum models. The new lattice models are easier to analyze and they enjoy all the global symmetries (except continuous translation) of the continuum models. As a result, many interesting and subtle properties of the continuum theory, like anomalies and dualities, can be derived already on the lattice. This places the continuum discussion on firmer ground and confirms the earlier results.

In the last year, Charles Simonyi Professor **Edward Witten** re-examined the relation between gauge theory and the geometric Langlands correspondence, with the goal of understanding, in a physical language, some new observations by mathematicians. This resulted in two papers Witten wrote with former IAS Member Davide Gaiotto. In one paper, they re-examined the subject of "quantization via branes," and in the other paper, they applied these methods to geometric Langlands.

The new formulation of geometric Langlands involves concrete statements about operators and Hilbert spaces, while the traditional approach involves a more abstract discussion of categories and functors. From a quantum field theory point of view, one arranges the same ingredients in a different fashion to get the different statements.

With IAS colleague Juan Maldacena and graduate student Yiming Chen, Witten re-examined the Hagedorn transition in string theory between a black hole and, roughly speaking, a ball of string. Among other things, they developed a linear sigma-model that can be used to study this transition. It looks quite plausible that a smooth transition is possible between a black hole and a ball of string in the case of heterotic string theory but not in the case of Type II superstring theory.

2020–21 MEMBERS AND VISITORS

f First Term ✦ *s* Second Term ✦ *m* Long-term Member ✦ *v* Visitor ✦ *dvp* Distinguished Visiting Professor ✦ *jvp* Junior Visiting Professor ✦ *ra* Research Associate

Ahmed Almheiri
Quantum Field Theory ✦ Institute for Advanced Study ✦ *m*

Lev Arzamasskiy
Astrophysics ✦ Institute for Advanced Study
Ralph E. and Doris M. Hansmann Member; additional funding provided by Schmidt Futures

Gáspár Bakos
Astrophysics ✦ Princeton University

Pinaki Banerjee
Theoretical Physics ✦ Institute for Advanced Study ✦ *s*

Fiona Burnell
Condensed Matter Physics ✦ University of Minnesota Twin Cities ✦ *jvp*
Funding provided by Carnegie Corporation of New York

Giovanni Cabass
Cosmology ✦ Institute for Advanced Study
AMIAS Member

Lisa Carbone
Mathematical Physics ✦ Rutgers, the State University of New Jersey ✦ *f*

Sukanya Chakrabarti
Astrophysics ✦ Rochester Institute of Technology
IBM Einstein Fellow

Christopher Logan Chariker
Computational Neuroscience ✦ Institute for Advanced Study
Funding provided by the Simons Foundation

Horng Sheng Chia
Gravitational Waves, Black Holes, Particle Physics, Astrophysics ✦ Institute for Advanced Study

Susan E. Clark
Astrophysics ✦ Institute for Advanced Study
Friends of the Institute for Advanced Study Member

Shany Danieli
Astrophysics ✦ Institute for Advanced Study
NASA Hubble Fellow

Jo Dunkley
Cosmology ✦ Princeton University

Nick Early
Theoretical Physics and Combinatorial Geometry ✦ Institute for Advanced Study ✦ *s*

Lorenz Eberhardt
String Theory ✦ Institute for Advanced Study ✦ *m*

Brenda Frye
Observational Cosmology ✦ University of Arizona
Funding provided by The Ambrose Monell Foundation and the Bershadsky Fund

Jeffrey Fung
Astrophysics ✦ Clemson University
Funding provided by Schmidt Futures

Daniel Grin
Cosmology ✦ Haverford College
IBM Einstein Fellow

Felix Haehl
Theoretical Physics ✦ Institute for Advanced Study
Funding provided by the U.S. Department of Energy, the Paul Dirac Fund, and the Sivian Fund

Keisuke Harigaya
Particle Physics ✦ Institute for Advanced Study
Friends of the Institute for Advanced Study Member

Matthew Heydeman
Theoretical Physics ✦ Institute for Advanced Study and Princeton University
Funding provided by the U.S. Department of Energy

Nafiz Ishtiaque
Quantum Field Theory ✦ Institute for Advanced Study
Roger Dashen Member; additional funding provided by the National Science Foundation and the Sivian Fund

Daniel Steven Kapec
Theoretical Physics ✦ Institute for Advanced Study
Funding provided by the U.S. Department of Energy and the Adler Family Fund

Mikhail Katkov
Neuroscience ✦ Weizmann Institute of Science ✦ *v/s*

Alexander A. Kaurov
Astrophysics, Cosmology ✦ Institute for Advanced Study
William D. Loughlin Member

Joonho Kim
Theoretical Physics ✦ Institute for Advanced Study
Funding provided by the National Science Foundation and the Sivian Fund

Helmer Herman Koppelman
Galactic Dynamics, Galactic Archaeology ✦ Institute for Advanced Study
Martin A. and Helen Chooljian Member

Petr Kravchuk
Particle Physics ✦ Institute for Advanced Study
Funding provided by the U.S. Department of Energy and the Adler Family Fund

Nicolas Lenner
Biophysics, Ecology, Evolution ✦ Institute for Advanced Study

Adam Levine
Quantum Gravity, Quantum Information Theory ✦ Institute for Advanced Study
Founders' Circle Member; funding provided by Carl P. Feinberg, the National Science Foundation, and the Sivian Fund

Elliott H. Lieb
Mathematical Physics ✦ Princeton University ✦ *v*

Dalimil Mazac
Quantum Field Theory ✦ Institute for Advanced Study
Founders' Circle Member; funding provided by Edward and Kiyomi Baird and the U.S. Department of Energy

Lia Medeiros
Astrophysics ✦ Institute for Advanced Study

Victor Mikhaylov
Biology ✦ Institute for Advanced Study ✦ *ra*

Sebastian Mizera
Theoretical Physics ✦ Institute for Advanced Study
Frank and Peggy Taplin Member; additional funding provided by the U.S. Department of Energy

Elias Most
Theoretical Astrophysics ✦ Institute for Advanced Study and Princeton University

Baurzhan Mukhametzhanov
Theoretical Physics ✦ Institute for Advanced Study
Funding provided by the National Science Foundation and the Sivian Fund

Elena Murchikova
Astrophysics ✦ Institute for Advanced Study
Corning Glass Works Foundation Fellowship

Yaron Oz
Quantum Field Theory, Gravity, Strings ✦ Tel Aviv University
IBM Einstein Fellow; additional funding provided by the John and Maureen Hendricks Charitable Foundation

Sridip Pal
Quantum Field Theory ✦ Institute for Advanced Study
Funding provided by the U.S. Department of Energy

Natalie M. Paquette
Theoretical Physics, Mathematical Physics ✦ Institute for Advanced Study
Funding provided by the National Science Foundation and the Sivian Fund

Geoff Penington
Theoretical Physics ✦ University of California, Berkeley ✦ *jvp/s*
J. Robert Oppenheimer Visiting Professor

Robert Penna
Theoretical Physics ✦ Institute for Advanced Study
Funding provided by the U.S. Department of Energy and the Sivian Fund

Roman Rafikov
Astrophysics ✦ University of Cambridge
John N. Bahcall Fellow

Carolyn Raithel
Astrophysics ✦ Institute for Advanced Study and Princeton University
John N. Bahcall Fellow

Riccardo Rao
Systems Biology ✦ Institute for Advanced Study
Martin A. and Helen Chooljian Member in Biology

Shlomo Razamat
Theoretical Physics ✦ Technion–Israel Institute of Technology ✦ *jvp*
IBM Einstein Fellow; additional funding provided by The Ambrose Monell Foundation

Vladimir Rosenhaus
Theoretical Physics ✦ Institute for Advanced Study
Funding provided by the National Science Foundation and the Sivian Fund

Phil Saad
Theoretical Physics ✦ Institute for Advanced Study
Marvin L. Goldberger Member; additional funding provided by the W. M. Keck Foundation Fund

Marcel Manfred Schmittfull
Cosmology ✦ Institute for Advanced Study
Funding provided by the National Science Foundation

Shu-Heng Shao
Theoretical Physics ✦ Institute for Advanced Study ✦ *m*
Funding provided by the Simons Foundation

Alexandre Streicher
High Energy Theory ✦ Institute for Advanced Study and Perimeter Institute for Theoretical Physics

Rashid Sunyaev
Astrophysics ✦ Max-Planck-Institute für Astrophysik ✦ *dvp*
Maureen and John Hendricks Distinguished Visiting Professor

Yuan-Sen Ting
Astrophysics ✦ Institute for Advanced Study
NASA Hubble Fellow

Elizabeth Ann Tolman
Plasma Physics ✦ Institute for Advanced Study
Bezos Member

Benjamin Wallisch
Cosmology ✦ Institute for Advanced Study and University of California, San Diego

David Weinberg
Astrophysics ✦ The Ohio State University
Funding provided by the W. M. Keck Foundation Fund and the John and Maureen Hendricks Charitable Foundation

Siyao Xu
Magnetohydrodynamic Turbulence, Turbulent Dynamo ✦ Institute for Advanced Study
NASA Hubble Fellow

Lai-Sang Young
Dynamical Systems ✦ New York University ✦ *v/f, dvp/s*

Ying Zhao
Theoretical Physics ✦ Institute for Advanced Study
Funding provided by the Simons Foundation

School of Social Science

Founded in 1973, the School of Social Science is devoted to a multidisciplinary and international approach to the analysis of societies, social change, and social problems. Every year, a theme is chosen to provide coherence to the collective work undertaken, although other areas of research are also welcome. For 2020–21, the theme was "Science and the State." In total, twenty-six Members, six Visitors, and two Visiting Professors participated in the activities of the School.

FACULTY

Didier Fassin
James D. Wolfensohn Professor

Alondra Nelson
Harold F. Linder Professor

PROFESSORS EMERITI

Joan Wallach Scott

Michael Walzer

MODERN SCIENCE and the modern state are co-emergent and inextricable. Indeed, the rise of the state form has been accomplished in part via the ways of knowing and extracting that scientific analysis makes possible—including classification, hierarchization, quantification, and reductionism. But while the production of science and the formation of the state respectively are well studied, much remains to be understood about the relationships between the two—how states support, use, and regulate sciences, and how the support the structure, function, and legitimacy of states.

This line of inquiry raises corollary issues: What historical processes have driven the intertwined development of states and sciences, and how have these varied across national contexts? While the state remains an important facilitator of science and technology in certain societies, what has its role become in others, where innovation is increasingly seen as the purview of the private sector? As we today face issues from human gene-editing to climate change, that supersede provincial boundaries—even as governance and forms of violence and social control enabled by science continue to be operationalized by nation-states—what forms of transnational oversight may be required? How does the corporate world respond to increasing demands from both the state and citizens for social responsibility and ethical practice with regard to science and technology? How might state engagement with the natural and social sciences, such as the use of "nudge units" and "evidence-based" claims in legislation and governance, necessitate new understandings of the relationship between states and sciences?

These questions foregrounded the School of Social Science's 2020–21 theme seminar, "Science and the State." The seminar was co-convened by Alondra Nelson, Harold F. Linder Professor in the School, and Charis Thompson, Visiting Professor in the School and Professor of Sociology at the London School of Economics, in collaboration with Didier Fassin, James D. Wolfensohn Professor, and was supported by a grant from the Alfred P. Sloan Foundation. Meeting mostly virtually, owing to the ongoing pandemic and the travel barriers faced by some Members, the seminar was nevertheless vibrant and generative.

For the past three years, **Didier Fassin**, James D. Wolfensohn Professor, has been conducting research with Visiting Scholar Anne-Claire Defossez on migration at the French-Italian border in the Alps, confronting the perspectives of exiles, non-governmental organizations who rescue them in the mountain, and police who try to prevent them from entering the country. This local scene with its tragedies, its display of solidarity, and its enforcement of ever-stricter laws epitomizes a broader crisis of hospitality being studied as part of a Nomis grant. Both researchers were invited at the Villa Medici in Rome for a one-month

ANDREA KANE

The West Building is home to both the School of Historical Studies and the School of Social Science.

For 2020-21, the School's weekly Social Science Seminar was held in a hybrid format, with a limited number of in-person participants onsite in the Dilworth Room and others on Zoom.

writing residence to work on this project.

Having been elected at the Collège de France to the Annual Chair in Public Health, Fassin had to give eight original lectures developing an anthropological analysis of public health in the unexpected context of the latter's major crises: the Covid-19 pandemic. A volume comprised of a revised version of the lectures was published at Le Seuil in the fall. A final conference titled "Invisible Lives, Unspeakable Deaths" was held.

In parallel, Fassin delivered the Mosse Lecture on conspiracy theories at the Humboldt University in Berlin, the keynote lecture on moral societies at the Conference of the Association of French Speaking Sociologists in Tunis, the award lecture at the ceremony for the Prize of the Best Young Economist in Paris, and a special lecture on crisis at the American University of Beirut following the port explosion, among others. He was also invited to the Night of Philosophy to speak in Rome and Coimbra as well as to the Avignon Theater Festival for the concluding lecture of a workshop on the social and political challenges to come.

Various publications were released, including *Rebel Economies: Warlords, Insurgents and Humanitarians,* a collaborative work with the School of Historical Studies, co-edited with Nicola Di Cosmo and Clémence Pinaud, at Lexington Books, and *Words and Worlds: A Lexicon for Dark Times*, edited alongside former Trustee Veena Das, at Duke University Press. The counter-investigation of the killing of a man from the Roma community by a French elite police unit, which produced an interpretation of the events entirely distinct from that of the justice system, was published as *Death of a Traveller* at Polity Press: it was presented as an attempt to explore the possibilities of social sciences beyond its usual limits.

Once again, this year, the Summer Program in Social Science for early-career scholars of the Global South could not take place normally. It was replaced by a one-week video conference in which the work of each fellow was discussed.

On January 15, 2021, President-elect Joe Biden announced his appointment of **Alondra Nelson**, Harold F. Linder Professor, to the White House Office of Science and Technology Policy (OSTP). Earlier this year, she assumed a new role as Deputy Director for Science and Society. In this newly established role, she brings social science to bear on science and technology policy. At OSTP, Nelson's portfolio of work includes the implications of new and emerging technologies, the STEM education and ecosystem, and the material, social, and normative infrastructures for science and technology research and development. In this appointment, Nelson also draws on her distinctive expertise at the intersections of science, technology and social inequality, leading work on defining and mobilizing equitable science and technology policy in federal and multinational sectors.

Nelson was elected by her peers as president-elect of the international Society for Social Studies of Science, but stepped down from this leadership position to assume her role in the Biden Administration. In *Science,* Nelson and coauthors published an article advancing an agenda—including opportunities and obstacles—for the nascent field of computational social science. Nelson delivered numerous invited virtual lectures including at the University of North Carolina at Chapel Hill, Stanford University, the American Council of Learned Societies, the American Philosophical Society, the Smithsonian National Museum of African American History and Culture, and the National Human Genome Research Institute of the U.S. National Institutes of Health.

Nelson's honors included election as a Fellow of the National Academy of Medicine and an honorary degree, Doctor of Humane Letters, *honoris causa*, from the City College of The City University of New York, where she also delivered the commencement speech. She received the 2020 Morison Prize in Science, Technology, and Society; conferred by MIT, the award recognizes outstanding individuals who combine humanistic values with effectiveness in practical affairs, particularly in science and technology. Nelson's book, *The Social Life of DNA,* was recognized with honorable mention for the Diana Forsyth Book Prize of the American Anthropological Association.

Professor Emerita **Joan Scott**

participated in her share of Zoom seminars and conferences. She thinks someone (not she) should do a study of scholarly communication in the Age of Zoom. In addition to virtual School of Social Science seminars and workshops, she regularly attended a Zoom seminar at the CUNY Graduate Center, the theme of which was "debt." Her virtual travels were many: she gave the keynote lecture at a conference in Ankara, Turkey on academic freedom. (The text, "What kind of freedom is academic freedom?" is forthcoming in the online journal *Critical Times* in March 2022.) She participated in a dissertation defense in Rome; a graduate student workshop on gender and sexuality in Bern, Switzerland; and a history conference at York University in Canada. She gave talks in London, England; Washington, DC; and Princeton, NJ on her most recent book, *On the Judgment of History* (2020)—all without leaving her home. She gave a presentation to Princeton University's Davis Center for Historical Studies on her work-in-progress on the early nineteenth-century sex revolutionary Charles Fourier and continues to work on that project. The amazing support of the staff at the IAS Historical Studies/Social Science Library made her research possible at a time when there was no way to actually go to a library. Scott continues to serve on the Committee on Academic Freedom and Tenure of the American Association of University Professors at a time when critical independent scholarship is under siege by forces on the right that, in the name of freedom of speech, would restrict our ability to do the kind of research, teaching, and writing that protects democracy and the truths of our histories.

Professor Emeritus **Michael Walzer** continued to attend conferences and give lectures on Zoom, without leaving Princeton. His major achievement for the year was to finish a book manuscript called *The Adjective Liberal*, which should be published in 2022. He also wrote articles on toleration, the separation of religion and politics, policing, and asymmetric warfare for print and online magazines.

2020–21 MEMBERS AND VISITORS

f First Term ✦ *s* Second Term ✦ *v* Visitor ✦ *vp* Visiting Professor

Lawrie Balfour
Political Science (Political Theory), African American Studies, American Studies ✦ University of Virginia
Friends of the Institute for Advanced Study Member

Banu Bargu
Political and Social Theory ✦ University of California, Santa Cruz

Joshua Barkan
Geography, Legal Studies ✦ University of Georgia

Erica A. Cartmill
Anthropology and Psychology ✦ University of California, Los Angeles ✦ *v*

Nusrat Chowdhury
Anthropology ✦ Amherst College

Marc de Leeuw
Philosophy and Law ✦ University of New South Wales ✦ *v*

Anne-Claire Defossez
Sociology ✦ Institute for Advanced Study ✦ *v*

Thomas Fossen
Philosophy ✦ Leiden University

Jacob Gates Foster
Sociology ✦ University of California, Los Angeles
Infosys Member

Aisha Ghani
Anthropology ✦ University of Minnesota Twin Cities

Sarah Barringer Gordon
American Religious and Legal History ✦ University of Pennsylvania

Diana Graizbord
Sociology ✦ University of Georgia

Emmanuel Henry
Sociology, Political Science, Science and Technology Studies ✦ Université Paris-Dauphine, PSL University

Florence Jany-Catrice
Socioeconomics ✦ Université de Lille
Richard B. Fisher Member

Nikolas Kosmatopoulos
Anthropology ✦ American University of Beirut
Wolfensohn Family Member

Donald W. Light
Comparative Health Care ✦ Rowan University ✦ *v/f*

Magdalena Małecka
Philosophy ✦ University of Helsinki

Luis Mireles-Flores
Philosophy and Economics ✦ University of Helsinki ✦ *v/s*

Ryo Morimoto
Anthropology ✦ Princeton University
AMIAS Member

Anne Norton
Political Science ✦ University of Pennsylvania

Arnaud Orain
History of Economics, Economic History ✦ Université Paris 8 Vincennes-Saint-Denis
Funding provided by the Florence Gould Foundation Fund

David Ost
Political Science ✦ Hobart and William Smith Colleges

David Owen
Social and Political Philosophy ✦ University of Southampton ✦ *vp/f*

Timothy Pachirat
Political Science ✦ University of Massachusetts Amherst
Roger W. Ferguson, Jr. and Annette L. Nazareth Member

Leslie Paik
Sociology ✦ The City College of New York

Joy Rohde
History, Science and Technology Studies ✦ University of Michigan, Ann Arbor
Funding provided by Carnegie Corporation of New York

Christo Sims
Communication and Science Studies ✦ University of California, San Diego

Oscar Sosa López
Urban and Regional Studies ✦ The New School ✦ *v*

Robyn C. Spencer
U.S. History, Post–World War II Social Movements, Radical Politics ✦ Lehman College, The City University of New York
Frederick Burkhardt Fellowship funded by the American Council of Learned Societies

Charis Thompson
Science, Technology, Biomedicine, Inequality, Gender, Race, Social Theory ✦ London School of Economics ✦ *vp*

Fabien Truong
Sociology ✦ Université Paris 8 Vincennes-Saint-Denis
Funding provided by the Florence Gould Foundation Fund

Sonja van Wichelen
Sociology and Anthropology ✦ University of Sydney
Founders' Circle Member; funding provided by Deborah Lunder and Alan Ezekowitz

Sarah E. Vaughn
Anthropology ✦ University of California, Berkeley

Waqar H. Zaidi
World History ✦ Lahore University of Management Sciences

Special Programs and Outreach

The Institute for Advanced Study is committed to the idea that science and learning transcend all geographic boundaries and scholastic disciplines, and that scholars and scientists are members of one commonwealth of the mind. It engages with the greater Princeton community through public lectures, concerts, and events, and extends its influence beyond academia through innovative programs designed to inspire and educate.

* *During the 2020–21 academic year, some annual programs were postponed due to Covid-19.*

BEYOND THE WORK that takes place in the four Schools, the Institute's scope is broadened and enhanced by its special programs, which contribute much to the vitality of the Institute.

The Program in Interdisciplinary Studies, directed by Professor Piet Hut, explores ways of viewing the world that span a range of disciplines from computational astrophysics, geology, and paleontology to artificial intelligence, cognitive psychology, and philosophy.

The Artist-in-Residence Program was established in 1994 to create a musical presence within the Institute community, and to have in residence a person whose work could be experienced and appreciated by scholars from all disciplines. Artists-in-Residence have included Robert Taub, Jon Magnussen, Paul Moravec, Derek Bermel, and Sebastian Currier. Pulitzer Prize–winning composer David Lang has been in residence since 2016, curating the Edward T. Cone Concert Series and artist salons, along with pursuing his creative and intellectual work.

The Director's Visitors program enables the Director to invite scholars from a variety of fields, including areas not represented within the four Schools, to participate in the range of intellectual and social activities at the Institute.

The Institute's robust digital resources allow scholars opportunities for knowledge-sharing and discovery within a virtual setting. A Digital Scholarship@IAS initiative was formed in 2016 to accelerate the pace of research across disciplines and geographic locations by offering Faculty and Members new tools and technologies to gather and process large amounts of data, visualize the results, and make the data and results openly available.

The Women and Mathematics Program is an annual program with the mission to recruit and retain more women in mathematics. It was cofounded in 1993 by 2019 Abel Prize laureate Karen Uhlenbeck, IAS Distinguished Visiting Professor in the School of Mathematics, and former IAS Member Chuu-Lian Terng.

First held at IAS in 2002, Prospects in Theoretical Physics is a two-week residential summer program that provides lectures and informal sessions on the latest advances and open questions in theoretical physics for exceptionally promising graduate students and postdoctoral scholars. It encourages the participation of women, minorities, and students from smaller institutions that do not have extensive programs in theoretical physics or astrophysics.

The Institute also engages in outreach beyond its local community. Since 1994, the IAS/Park City Mathematics Institute annual summer session brings together educators, researchers, and students for a three-week residential program in Park City, Utah. Through lectures, seminars, activities, and events, the program is designed to focus on particular topics each year.

The Summer Program in Social Science, led by Didier Fassin, James D. Wolfensohn Professor in the School of Social Science, is an interdisciplinary initiative for early-career scholars from Africa, the Middle East, and Latin America, which aims to enrich and expand the realm of social sciences through the confrontation of different intellectual traditions and perspectives.

SPECIAL PROGRAMS

PROGRAM IN INTERDISCIPLINARY STUDIES

Left: PIET HUT attends a talk in Tokyo in virtual space. *Right:* PIET HUT meets with his collaborators in Second Life.

Professor **Piet Hut**, Head of the Institute's Program in Interdisciplinary Studies, continued his research in a broad range of topics, within the general theme of "the Nature of Reality, as seen through the lenses of Math, Matter, and Mind," including these subthemes: for Math, "Algorithms and Foundations"; for Matter, "Physics and Biology"; and for Mind, "Phenomenology and Contemplation."

Last year he started a project to produce a series of relatively short books, with a typical length in between that of a journal article and a textbook, aimed at an interdisciplinary audience. Each book will combine significant original research with an overview of the interdisciplinary context. He continued to gather a team of colleagues in mathematics, physics, biology and philosophy, to author or co-author some of the books that are planned.

With Harald Wiltsche, philosopher of science at Linköping University, Sweden, he is writing a book, titled *Rekindling Natural Philosophy: Toward a Fully Empirical Science and Technology.* While following in the footsteps of pragmatists like Charles Sanders Peirce and William James, and phenomenologists like Edmund Husserl and Eugen Fink, they developed a more mathematical and scientific methodology, taking up the challenge posed by Husserl to work toward a science of science, akin to James's notion of radical empiricism.

Hut is writing another book, *The Innovation Circle: Emergent Order in Cognition and in the World,* with Eric Smith, a physicist working on chemistry and biology at the Earth-Life Science Institute in Tokyo, a research center that Hut and colleagues founded eight years ago within the Tokyo Institute of Technology. The aim is to develop a typology of novelty, with the notion of phase transitions as a broad paradigm for innovation in nature, culture and technology.

With Mark van Atten, a philosopher at CNRS in Paris, Hut is working on a book that analyzes Brouwer's motivation for the development of Intuitionism, the philosophy of mathematics, based on his interpretation of time and conceptual thinking. Hut envisions establishing a book collection, not as a linear series, but more like Lego bricks that can be put together to be read in different configurations depending on the background and the interests of each reader.

As the head of the Program in Interdisciplinary Studies, Hut has led the After Hours Conversations series of regular "bar talks," in which speakers from each of the four Schools give ten-minute talks, followed by informal discussions, a popular program that he started twelve years ago with Professor Emerita Caroline Walker Bynum. The main difference with previous years was that our bar, and its drinks, were all virtual, and the events took place on Zoom.

2020–21 VISITORS

s Second Term

Stephen Burlingham
Art and Science

Will Cavendish
Science Communication

Eiko Ikegami
Historical Sociology ✦ The New School

Philip Ording
Mathematics ✦ Sarah Lawrence College ✦ *s*

Michael Th. Rassias
Mathematical Analysis, Analytic Number Theory ✦ Universität Zürich

Michael Solomon
Bioethics ✦ Institute for Advanced Study

Edward Tenner
History of Science and Technology ✦ Lemelson Center, Smithsonion Institution

Edwin L. Turner
Astrophysics ✦ Princeton University

Harald Wiltsche
Philosophy of Science ✦ Linköping University

ARTIST-IN-RESIDENCE PROGRAM

In academic year 2020–21, Pulitzer Prize-winning composer **David Lang** continued his second three-year term as IAS Artist-in-Residence. Lang presented the 2020–21 Edward T. Cone Concert Series, albeit in a new virtual format. Events were livestreamed and included cellist Maya Beiser, whose program covered Bach, Tavener, Golijov, and Reich; pianist Matthew Shipp, who performed semi-improvised jazz in the post-avant-garde tradition; and composer and performance pioneer Pamela Z, who presented *Other Rooms* from her studio in San Francisco, a choreographed experiment in electronic sound. The series concluded with a visit from the Jasper String Quartet which played a piece by young composer Shelley Washington and a work by an old and familiar composer: Beethoven's C# minor quartet, opus 131—one of the longest, most intensely personal, and most powerful quartets ever written, and one of Beethoven's last works. To learn more about the Artist-in-Residence program, visit www.ias.edu/air.

DAN KOMODA

Top: Lang is Professor of Music Composition at the Yale School of Music and Co-Founder and Co-Artistic Director of New York's legendary music festival Bang on a Can. He was awarded the 2008 Pulitzer Prize for Music for his choral work *the little match girl passion*.

Bottom: Pamela Z in her San Francisco studio after performing *Other Rooms*. The event was followed by a conversation with David Lang.

2020–21 DIRECTOR'S VISITORS

David N. Cannadine
History of Philanthropy

Anna Laqua
Institute Visitor

Lorenza Pescia De Lellis
Institute Visitor

DIGITAL SCHOLARSHIP@IAS

In 2020–21, IAS Faculty and Staff continued to support ongoing digital scholarship projects as well as planning for future projects and collaborations. This past academic year included these projects:

- **The Zaydi Manuscript Tradition.** In partnership with the Hill Museum and Manuscript Library, Professor Sabine Schmidtke's Zaydi Manuscript Tradition: A Digital Portal continued to grow. The project was expanded by looking deeper into the history of the respective collections of Yemeni manuscripts in Europe. For this purpose, preparatory steps have been taken to digitize and analyze the extant papers and correspondence in the Archivio Eugenio Griffini, in Milan, which sheds entirely new light on the history of the collection of some two thousand manuscripts, brought together by the Italian merchant Caprotti, which are nowadays kept in the Ambrosiana in Milan and the Bavarian State Library in Munich. See https://www.ias.edu/digital-scholarship/zaydi_manuscript_tradition

- **Krateros: Squeezes of Greek Inscriptions at the IAS.** The Krateros Project, led by Angelos Chaniotis, Professor in the School of Historical Studies, successfully completed the first year of its NEH grant, finishing the 2D digitization of the squeeze collection, greatly furthering metadata collection efforts, and launching a new section of its website to promote the collection and the digitization project. See https://www.ias.edu/krateros

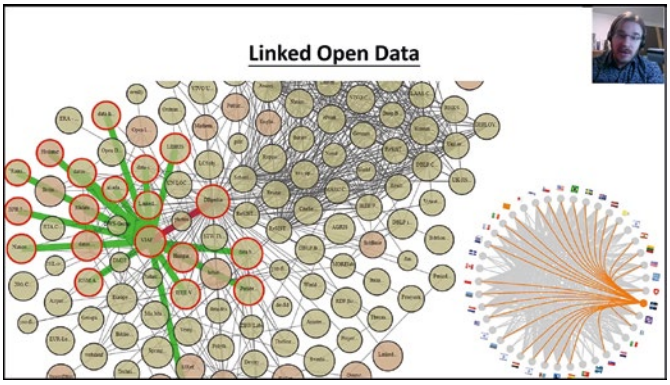
- **The Book and the Silk Roads: New approaches to the global history of the book.** Two major events in the final year of this phase of the project, both led by co-PI Suzanne Conklin Akbari, were held. One was a virtual workshop with pre-recorded videos, held on June 2–3, 2021, on "Textiles in Manuscripts" (https://booksilkroadstextiles.artsci.utoronto.ca/). The workshop brought together an international group of textile and manuscript historians, art historians, and book conservators to explore the intertwined histories of book production and craft practices in Eurasia and Africa, contributing to a comparative understanding of textile use across cultures from a broad global perspective. And two, an exhibition was presented at the Aga Khan Museum titled "Hidden Stories: Books Along the Silk Roads" (October 9, 2021–February 28, 2022), plus a concurrent digital exhibit hosted by the University of Toronto Libraries (https://hiddenstories.library.utoronto.ca/). See: https://booksilkroads.library.utoronto.ca/

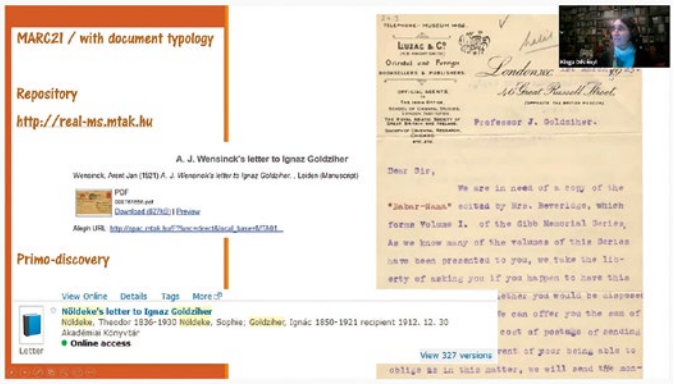
- **Practices of Commentary:** With a five-year SSHRC Insight Grant and supported, among others, by Professor Suzanne Conklin Akbari, the project seeks to develop a global perspective on practices of commentary, de-siloing regionally focused work in East Asia, South Asia, the Near and Middle East, and Europe, while simultaneously offering fine-grained and nuanced accounts of the function of commentary in cultures and communities of the premodern world. Akbari is co-editing a special issue of the Open Access journal *The Medieval Globe* presenting the research group's findings, to appear autumn 2022. See: https://globalcommentary.utoronto.ca/

About DS@IAS

The strategic direction for the Institute's support of digital scholarship continues to be provided by the Digital Scholarship Working Group, currently comprised of Jeff Berliner, Emma Moore, Marcia Tucker, María Mercedes Tuya, and Sabine Schmidtke, Professor in the School of Historical Studies. This past year, the group again curated the Digital Scholarship Conversations series, many of the events done in collaboration with the Near Eastern and Medieval Studies at IAS.

The DS@IAS team has also been responsible for the creation and management of Albert, the Institute's open-access institutional repository (https://albert.ias.edu), as well as the Institute's current policy regarding Open Access..

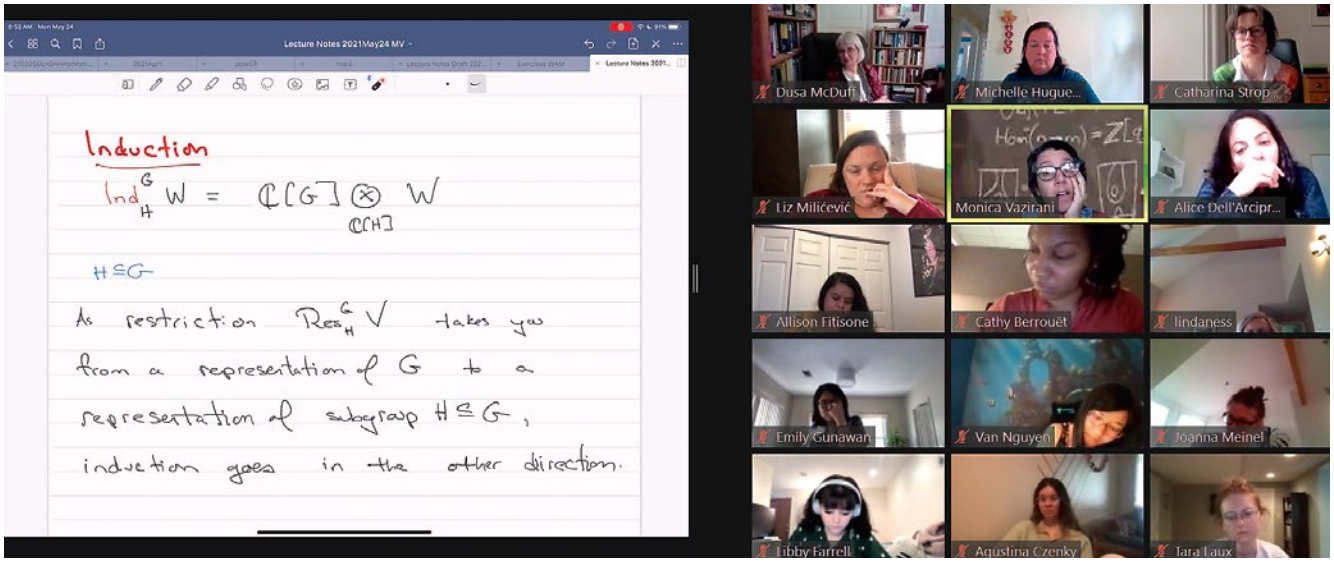




Left: "Bibliotheca Arabica—A Digital Home for the Arabic Manuscript Tradition" was a joint lecture held by Near Eastern Studies and Digital Scholarship Conversations. It focused on the context, production, transmission, and reception of the manuscripts that for centuries carried the works we study today. *Right:* "Hidden gem of a bygone era: A polythematic work from a Rasulid era," another joint lecture, provided a brief overview of the history of the Oriental Collection and demonstrated the use of digital humanities using an undated manuscript of polythematic work from the Rasulid era, the Unwan al-sharaf of Ibn al-Muqri' (d. 837/1433).

OUTREACH

PROGRAM FOR WOMEN AND MATHEMATICS



Participants in WAM were able to continue their activities using video conferencing tools and various online platforms.

The 27th Women and Mathematics Program, "Representation Theory: Categories & Combinatorics," was held online, May 22–28, 2021. The program was sponsored by IAS, the National Science Foundation, and Lisa Simonyi, and organized by Dusa McDuff (Barnard College), Sun-Yung Alice Chang (Princeton University), Michelle Huguenin (IAS), and Elizabeth Milicevic (Haverford College).

The 2021 program included 62 participants (20 undergraduates, 23 graduates, 14 postdocs, and 5 faculty), 12 committee members, and 33 volunteers from all over the world. Participants from the U.S., U.K., Australia, Chile, Spain, France, Germany, Norway, Canada, and China utilized online platforms such as Sococo, Gather.Town, and Zoom to engage in the following curricular activities:

- Terng Lecture Series, "Representation Theory and Combinatorics of the Symmetric Group and Related Structures," by Monica Vazirani (UC Davis) and teaching assistants, Jennifer Brown (UC Davis) and Anne Dranowski (IAS);
- Uhlenbeck Lecture Series, "Representation Theory and Categorification," by Catharina Stroppel (University of Bonn) and teaching assistants Joanna Meinel (University of Bonn) and Nicolle Sandoval Gonzalez (UCLA);
- Colloquium, "Geometric Categorifications of the Hecke Algebra," by Laura Rider (University of Georgia);
- Special Talk, "Beyond Algebra," by Chelsea Walton (Rice University);
- Various "Lunch-time Talks" focused on graduate school, career goals, and professional development;
- Daily Problem Sessions;
- Postdoc Seminars, in which 12 post-doctoral participants 1) presented their current research, and 2) received constructive feedback on their delivery and effectiveness from two designated participants (postdocs or faculty).

In conjunction with the Princeton Public Library, Margaret Readdy organized a virtual outreach program entitled, "Math E-Carnival with the Institute for Advanced Study." WAM participants Elise Catania, Shanna Dobson, Libby Farrell, Adeli Hutton, Mee Seong Im, Emily Norton, and Bhargavi Parthasarathy facilitated math activities for over 30 children and adolescents.

Thanks to a generous grant from Lisa Simonyi, the WAM Ambassador Program concluded its fourth year of funding a series of mini-grants designed to build support and outreach networks across the country. Funded activities for 2020–21 included Florida Atlantic University's 3rd Annual Florida Women in Mathematics Day (FWIMD), and their AWM Graduate Student Chapter mentoring initiative, "Dare To BEE"; TTIC's Women in Theoretical Machine Learning Symposium; Tulane University's Math For All in New Orleans Conference; and Virginia Tech's Talented Young Mathematicians E-Day (VT-TYME) and Blacksburg Math Circles. The AWM Chapter at Virginia Tech also received permission to donate a small amount of leftover funds to the Blacksburg Volunteer Rescue Squad for much needed Personal Protective Equipment (PPE).

IAS/PARK CITY MATHEMATICS INSTITUTE

"Where in the World is PCMI" had participants send in photos from around the world: Irena Swanson, USS and UFP Organizer, with the Neil Armstrong statue at Purdue University, West Lafayette, Indiana (left); Soumya Dey, The Institute of Mathematical Sciences, Pallavaram Guest House, Chennai, India (middle); Dina Buric, Victoria B.C., Canada (right).

The IAS/Park City Mathematics Institute (PCMI) is an annual summer program held in Park City, Utah. Its intensive program incorporates activities for groups across the mathematical community, from researchers and graduate students to K–12 teachers. The program aims to promote academic excellence within each of these groups, and to promote communication between them. Founded in 1991, PCMI has been an outreach program of the IAS since 1994. It is currently funded by major grants from the National Science Foundation, the Simons Foundation, and Math for America, as well as a number of generous gifts from individuals and private foundations. Rafe Mazzeo (Stanford University) serves as PCMI Director, alongside Program Manager Dena Vigil.

PCMI consists of six parallel subprograms, with the more advanced subprograms focusing on a specific research theme that changes annually. These include a program for researchers and a closely aligned program for graduate students. The graduate program centers on eight mini-courses given by leading experts in that year's research theme. These are attended by the eighty graduate student participants, as well as many of the researchers (up to sixty participate in the program) and the more advanced undergraduate students.

PCMI's forty-five undergraduate students participate in a program consisting of two parallel lecture courses on topics pertaining to the theme, as well as an "experimental math lab" that brings participants together to work on open-ended problems. There is also a fifteen-person undergraduate faculty program geared toward faculty—often from undergraduate-only institutions—who are drawn to PCMI as a way to reconnect with the research community and rekindle their research programs. The last undergraduate program is a ten-person workshop on issues related to equity and inclusion in the mathematics profession and classroom.

Lastly, PCMI features a large and widely known professional development opportunity for middle and high school teachers. Approximately half of the subprogram's sixty participants come from the New York–based Math for America program, while the rest come from school districts across the country. These teachers work on intricate problems and challenges to consolidate their mathematical knowledge and rediscover the challenges of learning rather than teaching mathematics; another part of their day is spent on reflecting on best pedagogical practices.

In 2021, PCMI took place virtually. The Graduate Summer School offered three one-week online sessions: Motivic Homotopy, Illustrating Mathematics, and Number Theory Informed by Computation. Its undergraduate counterpart took on the theme "Quadratic forms, Milnor K-theory, and arithmetic," with Dustin Clausen (University of Copenhagen) and Akhil Mathew (University of Chicago) leading the course on the general theory of quadratic forms—more specifically, the Hasse-Minkowski theorem, the quadratic reciprocity law and its formulation via Milnor K-theory, and the Siegel mass formula. The Undergraduate Faculty Program was reduced to a single one-week online program led by Kyle Ormsby (Reed College) titled Motivic degree and Milnor numbers. The Teacher Leadership Program held three one-week sessions: Fibonacci Recurrences, Geometry & Complex Numbers, and Hands-on Combinatorics. Finally, the 2021 PCMI Workshop on Rehumanizing Mathematics was organized online by Rochelle Gutierrez, funded with an award from the National Science Foundation. It focused on developing an understanding of identity and power issues in mathematics and considered how to expand our goals to rehumanize mathematical experiences.

THIERRY LULLE

Mural of the program "Acciones culturales en calle," Bogotá, 2016.

An International and Interdisciplinary Initiative for Early-Career Scholars from the Global South Funded by the Andrew W. Mellon Foundation

Designed to draw together twenty early-career scholars from countries in Africa, the Middle East and Latin America, the Summer Program in Social Science aims to enrich and expand the realm of the social sciences through the confrontation of different intellectual traditions and perspectives; to facilitate and enhance the dialogue between various scientific disciplines and communities; and to strengthen international networks across continents.

The 2021–23 Summer Program in Social Science began with a one-week online session in March 2021. The program normally takes place over a two-year cycle, however, because the current cycle had to be postponed due to the coronavirus pandemic, it will take place over three years. In-person workshops will begin with a two-week session in Princeton in the spring of 2022, followed by one week, mid-2023, at one of the two collaborating institutions in South Africa and Colombia, with continuous communication facilitated among the scholars throughout the two-year period.

The program, organized by the School of Social Science and led by Didier Fassin, James D. Wolfensohn Professor, is conducted in collaboration with the Wits Institute for Social and Economic Research at the University of the Witwatersrand, in Johannesburg, and the Escuela de Estudios de Género and Centro de Estudios at the Universidad Nacional de Colombia, in Bogotá. It is funded by the Andrew W. Mellon Foundation.

Fellows pursue and present their own research projects during the program. Special attention is paid to local contexts of production and global modalities of circulation of knowledge and the participants are invited to exchange their research experiences. The purpose is to constitute a genuinely international and interdisciplinary network of social scientists from the global South.

RECORD OF EVENTS

School of Historical Studies

ANCIENT STUDIES ACTIVITIES

October 6
Ancient Studies Seminar ✦ *From the social and cultural construction of emotion to the emotional construction of society and culture: Angry generals, hopeful cities, affectionate slaves, and more* ✦ **Angelos Chaniotis**, Professor, School of Historical Studies

October 20
Ancient Studies Seminar ✦ *The Athenian democratic revolution and the politics of memory* ✦ **Alex Gottesman**, Temple University

November 3
Ancient Studies Seminar ✦ *Realism of the humble and of the grand in Euripides'* Electra ✦ **Marco Fantuzzi**, University of Roehampton

November 10
Ancient Studies Seminar ✦ *Making law in the Early Empire* ✦ **Michael Peachin**, New York University; Member, School of Historical Studies

December 1
Ancient Studies Seminar ✦ *Dance as history in the Roman provinces* ✦ **Felipe Rojas**, Brown University

December 8
Ancient Studies Seminar ✦ *Painting and sculpture on the expedition of Alexander the Great* ✦ **Dee Clayman**, The City University of New York; Member, School of Historical Studies

February 2
Ancient Studies Seminar ✦ *Seven-gated Thebes, the Seven against Thebes, and Mesopotamian Myth and Ritual* ✦ **Vaios Liappis**, Open University of Cyprus

February 16
Ancient Studies Seminar ✦ *Prometheus Bound and emotional narratology: tyranny, violence, and fear at display* ✦ **Anton Bierl**, University of Basel

February 23
Ancient Studies Seminar ✦ *Constitutional innovation during the Second Punic War (218–201 B.C.E.): some unintended consequences* ✦ **Frederik Vervaet**, The University of Melbourne

March 5
Epigraphic Friday, Day 1 ✦ *IG II/III² 1498 and the amalgamation of the two boards of* ταμίαι *406 B.C.* ✦ **Sebastian Prignitz**, Austrian Academy of Sciences, Vienna ✦ *Inscription from the theater of Dionysos* ✦ **Paraskevi Martzavou**, Columbia University ✦ *Status and property in third-century Athens* ✦ **Ilias Arnaoutoglou**, Academy of Athens ✦ *The lease inscription of the Klytidai, Chios, SEG XXII 508* ✦ **Georgia Malouchou**, Archaeological Society at Athens; Member, School of Historical Studies ✦ *The reuse of Classical monuments and inscriptions in Roman Athens* ✦ **Muriel Moser-Gerber**, Goethe-University Frankfurt ✦ *Was Decius (249–251 A.D.) a persecutor of the Christians?* ✦ **Hartwin Brandt**, University of Bamberg ✦ *Further Light on the urban prefecture: new and rediscovered tesserae* ✦ **Michael Kulikowski**, Pennsylvania State University ✦ *Sabaean inscriptions from Northern Somalia* ✦ **Christian Robin**, French National Centre for Scientific Research ✦ *Epigrams from Kos and Prousias ad Hypium* ✦ **Angelos Chaniotis**, Professor, School of Historical Studies

March 6
Epigraphic Friday, Day 2 ✦ *An economic scandal and other affairs in Orchomenos at the end of the 3rd century B.C.* ✦ **Yannis Kallιontzis**, Inscriptiones Graecae, Berlin-Brandenburgische Akademie der Wissenschaften; Member, School of Historical Studies ✦ *A new inscription from Mt. Lykaion* ✦ **David Romano**, The University of Arizona ✦ *New inscriptions from Euromos* ✦ **Anne-Valérie Pont**, Paris-Sorbonne University ✦ *A puzzling epistolary exchange from Euromos* ✦ **Marc Domingo Gygax**, Princeton University ✦ *Water for the city again. An update on the edict of the proconsul of Asia to Laodikeia on the Lykos (114/115 CE)* ✦ **Francesco Guizzi**, Sapienza University of Rome ✦ *A re-edition of the so-called Pitane-Mytilene Dossier from Pergamon (I.Pergamon I 245)* ✦ **Julian Schneider**, University of Vienna

March 2
Ancient Studies Seminar ✦ *Πάνθειος, Deus Pantheus,* πάνθειον, *signum pantheum: a contribution to the religious vocabulary of the Imperial period* ✦ **Angelos Chaniotis**, Professor, School of Historical Studies

March 23
Ancient Studies Seminar ✦ *Society and economy in Roman Boeotia: an unpublished Inscription from Coronea* ✦ **Yannis Kallιontzis**, Inscriptiones Graecae, Berlin-Brandenburgische Akademie der Wissenschaften; Member, School of Historical Studies and **Nikos Papazarkadas**, University of California, Berkeley

April 13
Ancient Studies Seminar ✦ *What did the Romans want from their law?* ✦ **Michael Peachin**, New York University; Member, School of Historical Studies

ART HISTORY ACTIVITIES

October 14
Art History Seminar ✦ *Vkhutemas and the Pedagogy of Space* ✦ **Anna Bokov**, Cooper Union; Member, School of Historical Studies

October 21
Art History Seminar ✦ *Concerning the Spiritual, and the Concrete, in Kandinsky's Art* ✦ **Lisa Florman**, Ohio State University; Past Member, School of Historical Studies

October 28
Art History Seminar ✦ *On Treaties of Modern Architecture in Soviet Russia: Survival of Constructivist Principles under Stalin* ✦ **Anna Bokov**, Cooper Union; Member, School of Historical Studies

November 11
Art History Seminar ✦ *Gendering Artistic Culture in the Tuscan Grand Duchy* ✦ **Morten Hansen**, Accademia di Danimarca; Member, School of Historical Studies

November 18
Art History Seminar ✦ Group discussion of Panovsky's Habilitationschrift

December 9
Art History Seminar ✦ *Leonardo da Vinci's Observational Mechanics* ✦ **Pamela Long**, Independent Scholar; Member, School of Historical Studies

December 16
Art History Seminar ✦ *Unmaking Roman Architecture* ✦ **John Hopkins**, New York University; Member, School of Historical Studies

January 14
Art History Seminar ✦ *Arriving by Rail: Mudéjar Revival in the Public Architecture of early 20th Century Spain* ✦ **Olga Bush**, Vassar College; Member, School of Historical Studies

February 10
Art History Seminar ✦ *On Robert Klein and Scholarly Vitae* ✦ **Yve-Alain Bois**, Professor, School of Historical Studies

February 17
Art History Seminar ✦ *Presentation on the book* Object Biographies *(Menil Collection)* ✦ **John Hopkins**, New York University; Member, School of Historical Studies

February 24
Art History Seminar ✦ *Mobilizing the Cult Image: Andrea del Sarto's Vallombrosa Altarpiece* ✦ **Morten Hansen**, Accademia di Danimarca; Member, School of Historical Studies

March 10
Art History Seminar ✦ Group discussion led by **John Hopkins** on the issue of race in art history (and in classical studies in particular)

March 17
Art History Seminar ✦ *Counter-monuments in the Early Modern Netherlands* ✦ **Marisa Bass**, Yale University; Past Member, School of Historical Studies

March 24
Art History Seminar ✦ *Painting as process in the early medieval Islamic world* ✦ **Margaret Graves**, Indiana University; Past Member, School of Historical Studies)

March 31
Art History Seminar ✦ *Elements of Spatial Composition: Modernism and Socialist Realism at Vkhutemas and Academy of Architecture, 1927–1937* ✦ **Anna Bokov**, Cooper Union; Member, School of Historical Studies

April 5
Art History Seminar ✦ *On the issue of forgery (in Chinese art in particular)* ✦ **Julia Orell**, University of British Columbia; Member, School of Historical Studies

April 28
Art History Seminar ✦ *Zlotnikov's Doubt* ✦ **Jane Sharp**, Rutgers, The State University of New Jersey

EARLY MODERN EUROPE ACTIVITIES

October 13
Early Modern Europe Seminar ✦ *On Knowledge-Gathering, Language, and History Writing in the Spanish Empire* ✦ **Valeria López-Fadul**, Wesleyan University; Member, School of Historical Studies

October 27
Early Modern Europe Seminar ✦ *Englishmen at Sea: Labor and the Nation at the Dawn of Empire, 1570–1630 (Chapter: A Plundering People)* ✦ **Eleanor Hubbard**, Princeton University; Member, School of Historical Studies

November 10
Early Modern Europe Seminar ✦ *Tiber River Flooding in Rome: Responses to a Recurring Disaster, 1476–1598* ✦ **Pamela O. Long**, Member, School of Historical Studies

November 24
Early Modern Europe Seminar ✦ *Gods of Paste: Sacrifice and the Anthropology of Error* ✦ **Jonathan Sheehan**, University of California, Berkeley; Member, School of Historical Studies

December 1
Early Modern Europe Seminar ✦ *Hajj between Empires: Muslim Pilgrimage and Political Culture after the Mughals (Chapter 1: Pilgrim Passages)* ✦ **Rishad Choudhury**, Oberlin College; Member, School of Historical Studies

January 19
Early Modern Europe Seminar ✦ *Translating Ethiopian Sanctity: Two Pilgrims in Pisa, 1516* ✦ **Samantha Kelly**, Rutgers, The State University of New Jersey; Member, School of Historical Studies

February 2
Early Modern Europe Seminar ✦ *Reawakening the Ammonites: A Biography of an Extinct Lineage* ✦ **Jeremy R. Schneider**, Princeton University

February 16
Early Modern Europe Seminar ✦ *Ethnography of the Commons* ✦ **Angelo Torre**, Università del Piemonte Orientale

March 2
Early Modern Europe Seminar ✦ *The Etymologies of Phillip II* ✦ **Valeria López-Fadul**, Wesleyan University; Member, School of Historical Studies

March 16
Early Modern Europe Seminar ✦ *Corcos and Boncompagni: The Costs and Benefits of Religious Conversion in Sixteenth-Century Rome* ✦ **Isabelle Poutrin**, Université de Reims Champagne-Ardenne; Member, School of Historical Studies

March 30
Early Modern Europe Seminar ✦ *French Merchant Capitalism, State Reform, and Science of Commerce in the Age of Enlightenment* ✦ **Arnaud Orain**, Université Paris 8 Vincennes-Saint-Denis; Member, School of Historical Studies

April 13
Early Modern Europe Seminar ✦ *What Differences Make a Difference? Global History and Microanalysis Revisited* ✦ **Francesca Trivellato**, Professor, School of Historical Studies

April 27
Early Modern Europe Seminar ✦ *The Loving Attention Towards the Poor: Jurisdiction and Market Rules (the Savoyard State in the 18th Century)* ✦ **Simona Cerutti**, École des Hautes Études en Sciences Sociales, Paris; Member, School of Historical Studies

May 11
Early Modern Europe Seminar ✦ *Curiosity and Compulsion: The Reformations of an Elizabethan Seaman* ✦ **Eleanor Hubbard**, Princeton University; Member, School of Historical Studies

EAST ASIAN STUDIES ACTIVITIES

October 5
East Asian Seminar ✦ *Growing Empire in the Age of the Nation-State: From the American West to the Chinese Borderlands* ✦ **Shellen Wu**, University of Tennessee; Member, School of Historical Studies

October 19
East Asian Seminar ✦ *Indian Ascetics in a Chinese Manichaean Painting* ✦ **Gabor Kosa**, Eötvös Loránd University; Member, School of Historical Studies

November 2
East Asian Seminar ✦ *Animal Style and Its Visual Tropes: New Perspectives on Iron-Age Portable Ornament from the Eurasian Steppes* ✦ **Petya Andreeva**, Parsons School of Design, The New School

November 16
East Asian Seminar ✦ *Preserve to Erase: Architectural Heritage in Shanghai, 1949–2015* ✦ **Lena Maria Scheen**, NYU-Shanghai

November 30
East Asian Seminar ✦ *Instrument of Flesh: The Operatic Voice in Late Ming and Early Qing Musical Culture* ✦ **Judith Zeitlin**, University of Chicago

December 7
East Asian Seminar ✦ *Transitional Justice in Post-Mao China and Its Aftereffects: A Case from Shanghai* ✦ **Qin Shao**, The College of New Jersey

December 14
East Asian Seminar ✦ *The Liao Dynasty in Light of Recent Archaeological Finds* ✦ **François Louis**, Bard Graduate Center

January 25
East Asian Seminar ✦ *The Beginning of a Reading Tradition: Encyclopedic Learning in 1499 Hongzhi "Xixiang ji"* ✦ **Xiaoqiao Ling**, Arizona State University; Member, School of Historical Studies

February 8
East Asian Seminar ✦ *Cartographic Perspectives in Song Dynasty Painting* ✦ **Julia Orell**, University of British Columbia; Member, School of Historical Studies

February 22
East Asian Seminar ✦ *Samurai and the World of Painting, East and West—The Life Experiences of Odano Naotake (1750–80) and Kakizaki Hakyō (1764–1826)* ✦ **Constantine Vaporis**, University of Maryland-Baltimore County; Member, School of Historical Studies

March 1
East Asian Seminar ✦ *Japanese Peripheries and Cultural Centers—The Samurai Kakizaki Hakyō (1764–1826) and his Ainu Chieftain Paintings* ✦ **Constantine Vaporis**, University of Maryland-Baltimore County; Member, School of Historical Studies

March 15
East Asian Seminar ✦ *Philology of the Strange: Evidential Learning and Commentary on Liaozhai zhiyi in the Nineteenth Century* ✦ **Nathan Vedal**, Washington University in St. Louis; Member, School of Historical Studies

March 22
East Asian Seminar ✦ *Transmission and Transitions of Tang Literature* ✦ **Anna Shields**, Princeton University

March 29
East Asian Seminar ✦ *Knowing Exotica: Edible Birds' Nests in Early Modern China* ✦ **Meng Zhang**, Loyola Marymount University; Member, School of Historical Studies

April 5
East Asian Seminar ✦ *The Disquieting History of Foreign Enslavement in Medieval China* ✦ **Don Wyatt**, Middlebury College

MEDIEVAL STUDIES ACTIVITIES

October 1
Medieval Studies Seminar ✦ *The Global Turn in Medieval Studies* ✦ **Suzanne Conklin Akbari**, Professor, School of Historical Studies

October 15
Medieval Studies Seminar ✦ *Byzantine Studies in the Global Turn* ✦ **Andrea Achi**, Metropolitan Museum of Art

October 22
Medieval Studies Seminar ✦ *Iberian Mediterranean Studies* ✦ **Nahir Otaño Gracia**, Member, School of Historical Studies

November 12
Medieval Studies Seminar ✦ *The Historiography of Premodern Sign Languages* ✦ **Jonathan Hsy**, Member, School of Historical Studies

December 3
Medieval Studies Seminar ✦ *Indigenous Studies and Medieval Studies* (Andrews and Beechy, *Indigenous Futures and Medieval Pasts*) ✦ **Suzanne Conklin Akbari**, Professor, School of Historical Studies

December 4
Digital Scholarship Conversations ✦ *The Book and the Silk Roads: Corralling Data in the Digital Workspace* (https://www.ias.edu/video/book-and-silk-roads-corralling-data-digital-workspace) ✦ **Suzanne Conklin Akbari**, Professor, School of Historical Studies, with **Rachel Di Cresce**, **Jessica Lockhart**, and **James Sargan** (University of Toronto, "Old Books, New Science" lab)

December 10
Medieval Studies Seminar ✦ *Global History* ✦ **Celia Chazelle**, The College of New Jersey

January 19
Medieval Studies Seminar ✦ *Translating Ethiopian Sanctity: Two Pilgrims in Pisa, 1516* ✦ **Samantha Kelly**, Member, School of Historical Studies, jointly with Early Modern Studies

February 11
Medieval Studies Seminar ✦ *Balaam's Ass: Vernacular Theology Before the English Reformation* ✦ **Nicholas Watson**, Member, School of Historical Studies

February 25
Medieval Studies Seminar ✦ *The Other Faces of Arthur: Medieval Arthurian Texts from the Global North Atlantic* ✦ **Nahir Otaño Gracia**, Member, School of Historical Studies

March 18
Medieval Studies Seminar ✦ *In Place of the Self: Ascetic Cultures in Medieval England* ✦ **Amy Appleford**, Visitor, School of Historical Studies

April 1
Medieval Studies Seminar ✦ *Objects, Matter, and Assemblage: Orientalism and Awe in Clari's Constantinople* ✦ **Joseph Derosier**, Beloit College

April 22
Medieval Studies Seminar ✦ *Marked Change: Disability and Life Writing, Past and Present* ✦ **Jonathan Hsy**, Member, School of Historical Studies

April 29
Medieval Studies Seminar ✦ *The Poetics of Rage: Women's Anger, Misogyny, and Political Power in Premodern Britain* ✦ **Carissa Harris**, Member, School of Historical Studies

May 6
Medieval Studies Seminar ✦ *What Ground Do We Read On? Reading Canonical Authors in Unsettling Times* ✦ **Suzanne Conklin Akbari**, Professor, School of Historical Studies

June 2–3
International workshop on *Textiles in Manuscripts: Cross-cultural Trade, Craft Production, and Influence in the Art of the Premodern Book* (https://booksilkroadstextiles.artsci.utoronto.ca/) ✦ **Suzanne Conklin Akbari**, Professor, School of Historical Studies, with **Melissa Moreton**, Research Associate, School of Historical Studies

NEAR/MIDDLE EASTERN AND ISLAMIC STUDIES ACTIVITIES

October 21
Near Eastern Studies Lecture ✦ *Maghribi Theology in Manuscript: Reason, Belief, and the Common Folk* ✦ **Caitlyn Olson**, Harvard University and **Jan Thiele**, Consejo Superior de Investigaciones Científicas [CCHS-CSIC], Madrid

October 28
Near Eastern Studies and Digital Scholarship Conversations @IAS Joint Lecture ✦ *Hidden Gem of a Bygone Era: A Polythematic Work from a Rasulid Era* ✦ **Kinga Dévényi**, Corvinus University of Budapest; The Oriental Collection of the Library of the Hungarian Academy of Sciences

November 11
Near Eastern Studies Lecture ✦ *The Egyptian Army in the Six-Day Arab-Israeli War* ✦ **Khaled Fahmy**, University of Cambridge; Member, School of Historical Studies

November 17
IAS Ethiopian Studies Series ✦ *The Beta Israel and Ethiopian Christian Views of Jews and Judaism* ✦ Panelists: **Steven Kaplan**, The Hebrew University of Jerusalem; **Sophia Dege-Müller**, Ruhr-Universität Bochum; **Marcia Kupfer**, Independent Scholar, Washington, DC; **Aaron Butts**, Catholic University of America; Visitor, School of Historical Studies ✦ Moderator: **Samantha L. Kelly**, Rutgers, The State University of New Jersey; Member, School of Historical Studies ✦ Conveners for this series are: **Suzanne Conklin Akbari**, Professor, School of Historical Studies; **Aaron Butts**; **Samantha L. Kelly**; **Sabine Schmidtke**, Professor, School of Historical Studies

November 18
Near Eastern Studies Seminar ✦ *Early Modern Pilgrimage: Literature and Practice in the Arab East* ✦ **Björn Bentlage**, Orientalisches Institut, Martin-Luther-Universität Halle-Wittenberg; Member, School of Historical Studies

December 2
Near Eastern Studies Seminar ✦ *Understanding Sect and Sectarianism in the Early Modern Middle East: Ottomans, Safavids, and the Qizilbash* ✦ **Ayşe Baltacıoğlu-Brammer**, New York University; Member, School of Historical Studies

December 9
Near Eastern Studies Seminar ✦ *Compendium of Pleasure: a 10th Century (?) Arabic Erotic Manual and its Sources* ✦ **Pernilla Myrne**, University of Gothenburg; Member, School of Historical Studies

December 16
Near Eastern Studies Seminar ✦ *Beyond and Beside Text: What Objects Can Tell Us* ✦ **Amanda Phillips**, University of Virginia; Member, School of Historical Studies

January 27
Near Eastern Studies Seminar ✦ *Historical Consciousness and the Rise of the Ottoman Empire in the Fifteenth Century* ✦ **Dimitri J. Kastritsis**, University of St Andrews; Member, School of Historical Studies

February 3
Near Eastern Studies and Digital Scholarship Conversations @IAS Joint Lecture ✦ *The History of the Arabic Book: A New Chapter* ✦ **Mathew Barber**, The Aga Khan University, KITAB; **Lorenz Nigst**, The Aga Khan University, KITAB; **Sarah Bowen Savant**, The Aga Khan University-ISMC; **Peter Verkinderen**, The Aga Khan University, KITAB

February 10
Near Eastern Studies Lecture ✦ *The European Qur'an***:** *The Qur'ān in European Religious and Cultural History* ✦ **Mercedes García-Arenal**, Consejo Superior de Investigaciones Científicas [CCHS-CSIC], Madrid; **Jan Loop**, Københavns Universitet; **John Tolan**, Université de Nantes; **Roberto Tottoli**, Universita degli Studi di Napoli L'Orientale

February 19
IAS Ethiopian Studies Series ✦ *The Turn to the Medieval in Ethiopian Studies—The Turn to Ethiopia in Medieval Studies I* ✦ Panelists: **Andrea Achi**, Department of Medieval Art and The Cloisters at the Metropolitan Museum; **Marie-Laure Derat**, Centre National de la Recherche Scientifique; **Kristen Windmuller-Luna**, Cleveland Museum of Art; **Felege-Selam Yirga**, The University of Tennessee Knoxville

February 24
Near Eastern Studies Lecture ✦ *Early Modern European Humanism and the Syriac New Testament* ✦ **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac

March 10
Near Eastern Studies Seminar ✦ *Preserving a Medieval Syriac 'Treasure' of 'Vocalized Words and Readings' from the Bible and Related Literature* ✦ **Jonathan Loopstra**, University of Northwestern–St. Paul; Member, School of Historical Studies

March 17
Near Eastern Studies and Digital Scholarship Conversations @IAS Joint Lecture ✦ *An Egyptian Sheikh's Literary World* ✦ **Adam Mestyan**, Duke University and **Kathryn Schwarz**, University of Massachusetts Amherst

March 19
IAS Ethiopian Studies Series ✦ *The Turn to the Medieval in Ethiopian Studies—The Turn to Ethiopia in Medieval Studies II* ✦ Panelists: **Alessandro Bausi**, Universität Hamburg; **Verena B. Krebs**, Ruhr-Universität Bochum; **Eyob Derillo**, The British Library; **Samantha L. Kelly**, Rutgers, The State University of New Jersey; Member, School of Historical Studies

March 25
The Author's Voice Inaugural Talk ✦ *The Road to the Quran Keyword Database* ✦ **Elie Wardini**, Department of Asia, Middle Eastern and Turkish Studies, Stockholm University ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies, and **George A. Kiraz**, Research Associate, School of Historical Studies; Editor-in-Chief, Gorgias Press, in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

March 31
Near Eastern Studies Lecture ✦ *Castle to Castle: The Saadian Library in the El Escorial Collection* ✦ **François Déroche**, Collège de France, PSL, Paris and **Nuria de Castilla**, École Pratique des Hautes Études, PSL, Paris

April 14
Near Eastern Studies and Digital Scholarship Conversations @IAS Joint Lecture ✦ *Bibliotheca Arabica—A Digital Home for the Arabic Manuscript Tradition* ✦ **Verena Klemm**, Institute of Arabic Studies, University of Leipzig and **Stefanie Brinkmann**; **Boris Liebrenz**; **Thomas Efer**, Sächsische Akademie der Wissenschaften zu Leipzig

April 23
Near Eastern Studies and Digital Scholarship Conversations @IAS Joint Lecture ✦ *Simtho: The Syriac Thesaurus* ✦ Launch of a Syriac textual corpus portal hosted by **Sabine Schmidtke**, Professor, School of Historical Studies, and **George A. Kiraz**, Research Associate, School of Historical Studies; Simtho [simtho.bethmardutho.org]

May 20
IAS Ethiopian Studies Series ✦ *Beyond Ethiopia: The Islamic Intellectual History of the Horn of Africa* ✦ This is the fourth and final event of a webinar series IAS Ethiopian Studies ✦ Panelists: **Maria Bulakh**, Institute for Oriental and Classical Studies, National Research University Higher School of Economics, Moscow; **Alessandro Gori**, University of Copenhagen; **Hassen Muhammad Kawo**, University of Cape Town, South Africa; **Paul M. Love**, Al Akhawayn University; **Anne Regourd**, Centre National de la Recherche Scientifique, Paris

June 17
The Author's Voice ✦ *The Goddess Isis and the Kingdom of Meroe* ✦ **Solange Ashby**, Adjunct Assistant Professor, Barnard College ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies, and **George A. Kiraz**, Beth Mardutho: The Syriac Institute; Research Associate, School of Historical Studies and Editor-in-Chief, Gorgias Press, in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

School of Mathematics

July 1
Mathematical Conversations ✦ *The Reversibility Paradox: 130 Years after Loschmidt and Zermelo* ✦ **Laure Saint Reymond**, École normale supérieure de Lyon

July 3
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Infinite Staircases and Reflexive Polygons* ✦ **Ana Rita Pires**, University of Edinburgh

July 7
Theoretical Machine Learning Seminar ✦ *Machine Learning-Based Design (of Proteins, Small Molecules and Beyond)* ✦ **Jennifer Listgarten**, University of California, Berkeley

July 8
Mathematical Conversations ✦ *Weyl Laws and Dense Periodic Orbits* ✦ **Michael Hutchings**, University of California, Berkeley

July 9
Theoretical Machine Learning Seminar ✦ *Role of Interaction in Competitive Optimization* ✦ **Anima Anandkumar**, California Institute of Technology

July 10
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Knot Floer Homology and Bordered Algebras* ✦ **Peter Ozsváth**, Princeton University

July 14
Theoretical Machine Learning Seminar ✦ *Relaxing the I.I.D. Assumption: Adaptive Minimax Optimal Sequential Prediction with Expert Advice* ✦ **Jeffrey Negrea**, University of Toronto

July 15
Mathematical Conversations ✦ *On the Cap-Set Problem and the Slice Rank Polynomial Method* ✦ **Lisa Sauermann**, Stanford University

July 17
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 Minute Research Talks* ✦ **Yusuke Kawamoto**, École normale supérieure; **Shira Tanny**, Tel Aviv University; **Javier Martinez Aguinaga**, Complutense University of Madrid

July 21
Theoretical Machine Learning Seminar ✦ *Graph Nets: The Next Generation* ✦ **Max Welling**, University of Amsterdam

July 22
Mathematical Conversations ✦ *Singularities of Solutions of the Hamilton-Jacobi Equation. A Toy Model: Distance to a Closed Subset* ✦ **Albert Fathi**, Georgia Institute of Technology

July 23
Theoretical Machine Learning Seminar ✦ *Priors for Semantic Variables* ✦ **Yoshua Bengio**, Université de Montréal

July 24
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Pontryagin–Thom for Orbifold Bordism* ✦ **John Pardon**, Princeton University

July 28
Theoretical Machine Learning Seminar ✦ *Generalized Energy-Based Models* ✦ **Arthur Gretton**, University College London

July 30
Theoretical Machine Learning Seminar ✦ *Efficient Robot Skill Learning via Grounded Simulation Learning, Imitation Learning from Observation, and Off-Policy Reinforcement Learning* ✦ **Peter Stone**, The University of Texas at Austin

August 4
Theoretical Machine Learning Seminar ✦ *Nonlinear Independent Component Analysis* ✦ **Aapo Hyvarinen**, University of Helsinki

August 6
Theoretical Machine Learning Seminar ✦ *A Blueprint of Standardized and Composable Machine Learning* ✦ **Eric Xing**, Carnegie Mellon University

August 11
Theoretical Machine Learning Seminar ✦ *Statistical Learning Theory for Modern Machine Learning* ✦ **John Shawe Taylor**, University College London

August 13
Theoretical Machine Learning Seminar ✦ *Latent State Discovery in Reinforcement Learning* ✦ **John Langford**, Microsoft Research

August 18
Theoretical Machine Learning Seminar ✦ *From Speech AI to Finance AI and Back* ✦ **Li Deng**, Citadel

August 20
Theoretical Machine Learning Seminar ✦ *Event Sequence Modeling with the Neural Hawkes Process* ✦ **Jason Eisner**, Johns Hopkins University

August 25
Theoretical Machine Learning Seminar ✦ *Learning-Based Sketching Algorithms* ✦ **Piotr Indyk**, Massachusetts Institute of Technology

August 27
Theoretical Machine Learning Seminar ✦ *Multi-Output Prediction: Theory and Practice* ✦ **Inderjit Dhillon**, University of Texas at Austin

September 4
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Hamiltonian Classification and Unlinkedness of Fibres in Cotangent Bundles of Riemann Surfaces* ✦ **Georgios Dimitroglou Rizell**, Uppsala University

September 8
Virtual Workshop on Missing Data Challenges in Computation, Statistics and Applications ✦ *Statistical Modeling and Missing Data* ✦ **Rod Little**, University of Michigan ✦ *Supervised Learning with Missing Values* ✦ **Julie Josse**, L'Institut Polytechnique de Paris ✦ *Missing Data in Single Cell Studies: Augmentation, Integration, and Discovery* ✦ **Barbara Englehardt**, Princeton University ✦ *Experimental Evaluation of Computer-Assisted Human Decision Making: A Missing Data Approach* ✦ **Kosuke Imai**, Harvard University

September 9
Geometric and Modular Representation Theory Seminar ✦ *Broué's Abelian Defect Group Conjecture I* ✦ **Jay Taylor**, University of Southern California; Member, School of Mathematics

Virtual Workshop on Missing Data Challenges in Computation, Statistics and Applications ✦ *Model-Based Clustering of High-Dimensional Data: Pitfalls & Solutions* ✦ **David Dunson**, Duke University ✦ *Causal Inference with Binary Outcomes Subject to Both Missingness and Misclassification* ✦ **Grace Yi**, University of Wisconsin-Oshkosh ✦ *Co-Manifold Learning with Missing Data* ✦ **Eric Chi**, North Carolina State University ✦ *Regularization and Spurious Correlations in Sparse Single-Cell Transcriptomes* ✦ **Mickey Atwal**, Cold Spring Harbor Laboratory

September 10
Joint IAS/Princeton University Number Theory Seminar ✦ *An Asymptotic Version of the Prime Power Conjecture for Perfect Difference Sets* ✦ **Sarah Peluse**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

Virtual Workshop on Missing Data Challenges in Computation, Statistics and Applications ✦ *Statistical Challenges with Single Cell RNA-Seq Technologies* ✦ **Rafael Irizarry**, Harvard University ✦ *Gene Expression Recovery in Single Cell Transcriptomic Data* ✦ **Nancy Zhang**, University of Pennsylvania ✦ *Synthesizing Medical Images Using Generative Adversarial Networks; Applications, Promises, and Pitfalls* ✦ **Sanmi Koyejo**, University of Illinois at Urbana-Champaign ✦ *High-Dimensional Omics Data Analysis with Missing Values* ✦ **Anru Zhang**, University of Wisconsin-Madison

September 11
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Reeb Dynamics in Dimension 3 and Broken Book Decompositions* ✦ **Vincent Colin**, Université de Nantes

Virtual Workshop on Missing Data Challenges in Computation, Statistics and Applications ✦ *Metric and Manifold Repair for Missing Data* ✦ **Anna Gilbert**, Yale University ✦ *Low-Rank Matrix Recovery from Quantized or Count Observations* ✦ **Mark Davenport**, Georgia Institute of Technology ✦ *Low Algebraic Dimension Matrix Completion* ✦ **Laura Balzano**, Member, School of Mathematics

September 16
Geometric and Modular Representation Theory Seminar ✦ *Broué's Abelian Defect Group Conjecture II* ✦ **Daniel Juteau**, Centre National de la Recherche Scientifique/Université Paris Diderot; Member, School of Mathematics

September 17
Joint IAS/Princeton University Number Theory Seminar ✦ *Equivariant Localization, Parity Sheaves, and Cyclic Base Change* ✦ **Tony Feng**, Member, School of Mathematics

September 18
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Fukaya Category for Landau-Ginzburg Orbifolds and Berglund-Hübsch Homological Mirror Symmetry for Curve Singularities* ✦ **Cheol Hyun Cho**, Seoul National University

September 22
Short Talks by Postdoctoral Members ✦ *Spectral Geometry on Metric Graphs* ✦ **Lior Alon**, Member, School of Mathematics ✦ *On the (Computational) Approximability of Quadratic Maximization over Convex Sets* ✦ **Vijay Bhattiprolu**, Member, School of Mathematics ✦ *Affine Springer Fibers and the Small Quantum Group* ✦ **Pablo Boixeda Alvarez**, Member, School of Mathematics ✦ *Non Smooth Spaces with Ricci Curvature Bounded from Below* ✦ **Elia Bruè**, Member, School of Mathematics ✦ *Symplectic Topology of Open Manifolds* ✦ **Laurent Côté**, Member, School of Mathematics ✦ *Modular Representation Theory of p-adic Groups* ✦ **Andrea Dotto**, Member, School of Mathematics

September 23
Short Talks by Postdoctoral Members ✦ *A Tale of Two Bases* ✦ **Anne Dranowski**, Member, School of Mathematics ✦ *Open Problem(s) in p-Cell Theory* ✦ **Lars Jensen**, Member, School of Mathematics ✦ *Quasi-Modular Forms from Elliptic Noether-Lefschetz Theory* ✦ **Francois**

Greer, Member, School of Mathematics ✦ *Some Representations of Special Linear Groups* ✦ **Nate Harman**, Member, School of Mathematics ✦ *Noncommutative Resolutions and Intersection Cohomology for Quotient Singularities* ✦ **Tudor Padurariu**, Member, School of Mathematics ✦ *On Globally Dissipative Euler Flows* ✦ **Hyunju Kwon**, Member, School of Mathematics

September 24

Joint IAS/Princeton University Number Theory Seminar ✦ *A Non-Archimedean Definable Chow Theorem* ✦ **Abhishek Oswal**, Member, School of Mathematics

September 25

Short Talks by Postdoctoral Members ✦ *Eisenstein Ideals: A Link between Geometry and Arithmetic* ✦ **Emmanuel Lecouturier**, Member, School of Mathematics ✦ *Koszul Duality Phenomenon for the Hecke Category* ✦ **Shotaro Makisumi**, Member, School of Mathematics ✦ *Lévy Matrices* ✦ **Patrick Lopatto**, Member, School of Mathematics ✦ *Cohomology of Line Bundles on Flag Varieties* ✦ **Linyuan Liu**, Member, School of Mathematics ✦ *Tame Topologies in Non-Archimedean Geometry* ✦ **Abhishek Oswal**, Member, School of Mathematics ✦ *Applications of the Trace of Frobenius: Past, Present, and Future* ✦ **Tony Feng**, Member, School of Mathematics

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Triangulated Persistence Categories* ✦ **Jun Zhang**, Université de Montréal

September 29

Short Talks by Postdoctoral Members ✦ *Asymptotic Enumeration Problems on the Hamming Cube* ✦ **Jinyoung Park**, Member, School of Mathematics ✦ *1% Cocycles and Finding Vertices of Squares* ✦ **Sarah Peluse**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics ✦ *Whittaker Functions and Lattice Models* ✦ **Henrik Gustafsson**, Member, School of Mathematics ✦ *Extension Complexity of (Low-Dimensional) Polytopes* ✦ **Lisa Sauermann**, Stanford University; Member, School of Mathematics ✦ *Spectral Numbers of Quantum Cohomologies* ✦ **Sara Tukachinsky**, Member, School of Mathematics ✦ *Falconer Distance Set Problem* ✦ **Hong Wang**, Member, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *An Introductory Survey on Expanders and Their Applications* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

September 30

Geometric and Modular Representation Theory Seminar ✦ *Finite Groups as Algebraic Groups in Defining Characteristic* ✦ **Raphaël Rouquier**, University of California, Los Angeles; Member, School of Mathematics

October 1

Moonshine Seminar ✦ *Introduction and Organizational Meeting* ✦ **Akshay Venkatesh**, Robert and Luisa Fernholz Professor, School of Mathematics

Short Talks by Postdoctoral Members ✦ *Automorphic Periods and Relative Trace Formula* ✦ **Jingwei Xiao**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics ✦ *The Geometric Satake Equivalence* ✦ **Jize Yu**, Member, School of Mathematics ✦ *Representations of p-adic Groups for Non-Experts* ✦ **Jessica Fintzen**, University of Cambridge and Duke University; Member, School of Mathematics ✦ *Hierarchies of Contact Manifolds* ✦ **Zhengyi Zhou**, Member, School of Mathematics ✦ *On Unimodular Groups Allowing Small Measure Growth* ✦ **Ruixiang Zhang**, University of Wisconsin-Madison; Member, School of Mathematics ✦ *Cohomological Vanishing for Moduli of Curves* ✦ **Emanuel Reinecke**, Member, School of Mathematics

October 2

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Embedding Ellipsoids into the One-Point Blowup of CP^2* ✦ **Dusa McDuff**, Columbia University

October 5

Computer Science/Discrete Mathematics Seminar I ✦ *Splitting Necklaces: Existence, Hardness and Approximation* ✦ **Noga Alon**, Princeton University

Analysis Seminar ✦ *Quantifying Nonorientability and Filling Multiples of Embedded Curves* ✦ **Robert Young**, New York University; von Neumann Fellow, School of Mathematics

Members' Seminar ✦ *How to Diagonalize a Functor* ✦ **Benjamin Elias**, University of Oregon; von Neumann Fellow, School of Mathematics

October 6

Working Group on Stratified Homotopy Theory ✦ *Introduction and Overview* ✦ **Peter Haine**, Massachusetts Institute of Technology

Computer Science/Discrete Mathematics Seminar II ✦ *Simplified Lifting Theorems in Communication Complexity via Sunflowers* ✦ **Toniann Pitassi**, University of Toronto; Visiting Professor, School of Mathematics

October 7

Mathematical Conversations ✦ *Robustness, Verifiability and Privacy in ML* ✦ **Shafi Goldwasser**, Simons Institute and University of California, Berkeley

Geometric and Modular Representation Theory Seminar ✦ *Finite Groups as Algebraic Groups in Non-Defining Characteristic* ✦ **Raphaël Rouquier**, University of California, Los Angeles; Member, School of Mathematics

October 8

Joint IAS/Princeton University Number Theory Seminar ✦ *Representations of p-adic Groups and Applications* ✦ **Jessica Fintzen**, University of Cambridge and Duke University; Member, School of Mathematics

Moonshine Seminar ✦ *Factorization Algebras* ✦ **Jacob Lurie**, Professor, School of Mathematics

October 9

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *The Arnold Conjecture, Spectral Invariants and C^0 Symplectic Topology* ✦ **Lev Buhovsky**, Tel Aviv University

Workshop on Topology: Identifying Order in Complex Systems ✦ *Parameters in Indexed Homology* ✦ **Simon Cho**, University of Michigan

October 12

Computer Science/Discrete Mathematics Seminar I ✦ *Explicit Near-Fully X-Ramanujan Graphs* ✦ **Xinyu Wu**, Carnegie Mellon University

Analysis Seminar ✦ *Towards Universality of the Nodal Statistics on Metric Graphs* ✦ **Lior Alon**, Member, School of Mathematics

Members' Seminar ✦ *Stability, Non-Approximated Groups and High-Dimensional Expanders* ✦ **Alexander Lubotzky**, Hebrew University of Jerusalem; Visiting Professor, School of Mathematics

October 13

Working Group on Stratified Homotopy Theory ✦ *Exodromy for Stratified Topological Spaces (after MacPherson)* ✦ **Remy van Dobben De Bruyn**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *Arithmetic Progressions and Spectral Structure* ✦ **Thomas Bloom**, University of Cambridge

October 14

Mathematical Conversations ✦ *Peg Problems* ✦ **Joshua Greene**, Boston College

Stability and Testability ✦ *Introduction to Stability and Testability* ✦ **Alexander Lubotzky**, Hebrew University of Jerusalem; Visiting Professor, School of Mathematics

Geometric and Modular Representation Theory Seminar ✦ *An Introduction to Affine Grassmanians and the Geometric Satake Equivalence* ✦ **Jize Yu**, Member, School of Mathematics

October 15

Joint IAS/Princeton University Number Theory Seminar ✦ *Heights and Dynamics over Arbitrary Fields* ✦ **Carney Alexander**, University of Rochester

Moonshine Seminar

October 16

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Mirror Symmetry for Chain Type Polynomials* ✦ **Umut Varolgunes**, Stanford University

October 19

Computer Science/Discrete Mathematics Seminar I ✦ *A Parallel Repetition Theorem for the GHZ Game* ✦ **Justin Holmgren**, Massachusetts Institute of Technology

Analysis Seminar ✦ *Spectral Statistics of Lévy Matrices* ✦ **Patrick Lopatto**, Member, School of Mathematics

Members' Seminar ✦ *Log-Concavity, Matroids and Expanders* ✦ **Cynthia Vinzant**, North Carolina State University; von Neumann Fellow, School of Mathematics

October 20

SL2 Seminar ✦ *Representations of $GL_2(F_q)$ in Defining Characteristic: A Number-Theorist's Perspective* ✦ **Matthew Emerton**, University of Chicago

Working Group on Stratified Homotopy Theory ✦ *Model Categories and Simplicial Homotopy Theory* ✦ **Charles Weibel**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *The Threshold for the Square of a Hamilton Cycle* ✦ **Jinyoung Park**, Member, School of Mathematics

October 21

Mathematical Conversations ✦ *The Mumford-Shah Conjecture* ✦ **Silvia Ghinassi**, University of Washington; Visitor, School of Mathematics

Stability and Testability ✦ *Stability and Testability —A Computational Perspective* ✦ **Jonathan Mosheiff**, Carnegie Mellon University

Geometric and Modular Representation Theory Seminar ✦ *(Equivariant) Cohomology of the Affine Grassmannian and Ginzburg's Picture* ✦ **Linyuan Liu**, University of Sydney; Member, School of Mathematics

October 22

Joint IAS/Princeton University Number Theory Seminar ✦ *On the Locally Analytic Vectors of the Completed Cohomology of Modular Curves* ✦ **Lue Pan**, University of Chicago

Moonshine Seminar

October 23

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Examples Related to Viterbo's Conjectures* ✦ **Michael Hutchings**, University of California, Berkeley

Workshop on Topology: Identifying Order in Complex Systems ✦ *How to Describe, Analyze and Interrogate Dynamics of Gene Regulatory Networks* ✦ **Tomas Gedeon**, Montana State University

October 26

Computer Science/Discrete Mathematics Seminar I ✦ *Fractionally Log-Concave and Sector-Stable Polynomials: Counting Planar Matchings and More* ✦ **Nima Anari**, Stanford University

Analysis Seminar ✦ *Kolmogorov, Onsager and a Stochastic Model for Turbulence* ✦ **Susan Friedlander**, University of Southern California; Member, School of Mathematics

Members' Seminar ✦ *Paper Moebius Bands* ✦ **Richard Schwartz**, Brown University; Member, School of Mathematics

October 27

SL2 Seminar ✦ *Simple Modules for SL2 via BN-Pairs* ✦ **Lars Thorge Jensen**, Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *Quick Introduction to Quasicategories* ✦ **Allen Yuan**, Columbia University and the Massachusetts Institute of Technology

Computer Science/Discrete Mathematics Seminar II ✦ *On the Extension Complexity of Random Polytopes* ✦ **Lisa Sauermann**, Stanford University; Member, School of Mathematics

October 28

Mathematical Conversations ✦ *Wild Low-Rank Maps* ✦ **Robert Young**, New York University; von Neumann Fellow, School of Mathematics

Stability and Testability ✦ *Stability, Testability and Property (T)* ✦ **Oren Beker**, University of Cambridge

Geometric and Modular Representation Theory Seminar ✦ *Derived Equivariant Cohomology of the Affine Grassmannian and Bezrukavnikov and Finkelberg's Equivalences* ✦ **Anne Dranowski**, Member, School of Mathematics

October 29

Joint IAS/Princeton University Number Theory Seminar ✦ *An Explicit Supercuspidal Local Langlands Correspondence* ✦ **Tasho Kaletha**, University of Michigan; von Neumann Fellow, School of Mathematics

Moonshine Seminar

October 30

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 Minute Research Talks* ✦ **Simon Allais**, École normale supérieure de Lyon; **Orsola Capovilla-Searle**, Duke University; **Julian Chaidez**, University of California, Berkeley

November 2

Computer Science/Discrete Mathematics Seminar I ✦ *Anti-Concentration and the Gap-Hamming Problem* ✦ **Anup Rao**, University of Washington

Analysis Seminar ✦ *Falconer Distance Set Problem Using Fourier Analysis* ✦ **Hong Wang**, Member, School of Mathematics

Members' Seminar ✦ *Metric Embeddings, Uniform Rectifiability, and the Sparsest Cut Problem* ✦ **Robert Young**, New York University; von Neumann Fellow, School of Mathematics

November 3

SL2 Seminar ✦ *Decomposition Numbers in Defining Characteristic* ✦ **Andrea Dotto**, Member, School of Mathematics

November 4

Mathematical Conversations ✦ *Three-Term Arithmetic Progressions in Sets of Integers* ✦ **Olof Sisask**, Stockholm University

Stability and Testability ✦ *Stability and Sofic Approximations for Product Groups and Property (Tau)* ✦ **Adrian Ioana**, University of California, San Diego

Geometric and Modular Representation Theory Seminar ✦ *The Derived Geometric Satake Equivalence of Bezrukavnikov and Finkelberg* ✦ **Jize Yu**, Member, School of Mathematics

November 5

Joint IAS/Princeton University Number Theory Seminar ✦ *Strong Approximation for the Markoff Equation via Nonabelian Level Structures on Elliptic Curves* ✦ **William Chen**, Columbia University

Moonshine Seminar

November 6

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Secondary Coproducts in Morse and Floer Homology* ✦ **Kai Cieliebak**, University of Augsburg

Workshop on Topology: Identifying Order in Complex Systems ✦ *Algebraic and Topological Models for DNA Recombination* ✦ **Natasa Jonoska**, University of South Florida

November 9

Computer Science/Discrete Mathematics Seminar I ✦ *Associativity Testing* ✦ **Ben Green**, University of Oxford

Analysis Seminar ✦ *Transverse Measures and Best Lipschitz and Least Gradient Maps* ✦ **Karen Uhlenbeck**, University of Texas at Austin; Distinguished Visiting Professor, School of Mathematics

Members' Seminar ✦ *Some Analogies between Arithmetic and Topology* ✦ **Tony Feng**, Member, School of Mathematics

November 10

SL2 Seminar ✦ *Blocks and Defect Groups of SLn* ✦ **Nate Harman**, Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *Part II of Talks* ✦ **Charles Weibel**, **Allen Yuan**, Rutgers, The State University of New Jersey; Member, School of Mathematics and Visitor, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *Modular Zeros in the Character Table of the Symmetric Group* ✦ **Sarah Peluse**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

November 11

Mathematical Conversations ✦ *Deep Learning for the Working Mathematician* ✦ **Carlos Tschudi Simpson**, CNRS, Université de Nice Sophia Antipolis; Visiting Professor, School of Mathematics

Stability and Testability ✦ *Flexible Stability and Nonsoficity* ✦ **Peter Burton**, University of Texas at Austin

Geometric and Modular Representation Theory Seminar ✦ *Iwahori-Whittaker Category and Geometric Casselman-Shalika* ✦ **Tony Feng**, Member, School of Mathematics

November 12

Joint IAS/Princeton University Number Theory Seminar ✦ *Effective Height Bounds for Odd-Degree Totally Real Points on Some Curves* ✦ **Levent Alpoge**, Columbia University

Moonshine Seminar

November 13

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Quantum Cohomology as a Deformation of Symplectic Cohomology* ✦ **Nicolas Sheridan**, University of Edinburgh

November 16

Computer Science/Discrete Mathematics Seminar I ✦ *Indistinguishability Obfuscation from Well-Founded Assumptions* ✦ **Huijia Rachel Lin**, University of Washington

Analysis Seminar ✦ *On Hölder Continuous Globally Dissipative Euler Flows* ✦ **Hyunju Kwon**, Member, School of Mathematics

Virtual Workshop on Recent Developments in Geometric Representation Theory ✦ *Theta Intertwining Sheaves* ✦ **Zhiwei Yun**, Massachusetts Institute of Technology ✦ *Modular Perverse Sheaves on the Affine Flag Variety* ✦ **Laura Rider**, University of Georgia ✦ *The Integral Coefficient Geometric Satake Equivalence in Mixed Characteristic* ✦ **Jize Yu**, Member, School of Mathematics

November 17

Working Group on Stratified Homotopy Theory ✦ *The Covariant Model Structure and Straightening/Unstraightening* ✦ **John Pardon**, Princeton University

Computer Science/Discrete Mathematics Seminar II ✦ *Factorization through L2, Rounding and Duality* ✦ **Vijay Bhattiprolu**, Member, School of Mathematics

Virtual Workshop on Recent Developments in Geometric Representation Theory ✦ *Coherent Categorification of Quantum Loop sl(2)* ✦ **Peng Shan**, Tsinghua University; Member, School of Mathematics ✦ *The Picard Group of the Stable Module Category of a Finite Group* ✦ **Jesper Grodal**, University of Copenhagen; Member, School of Mathematics ✦ *Path Isomorphisms between Quiver Hecke and Diagrammatic Bott-Samelson Endomorphism Algebras* ✦ **Amit Hazi**, University of London ✦ *The Center of the Small Quantum Group* ✦ **Pablo Boixeda Alvarez**, Member, School of Mathematics

November 18

Mathematical Conversations ✦ *Higher Order Fourier Analysis and Generalizations of Szemerédi's Theorem* ✦ **Sarah Peluse**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

Virtual Workshop on Recent Developments in Geometric Representation Theory ✦ *2-Verma Modules* ✦ **Gregoire Naisse**, **Pedro Vaz**, University College London; University College London ✦ *Representations on KU-Modules* ✦ **David Treumann**, Boston College ✦ *Stability and Periodicity in Modular Representation Theory* ✦ **Nate Harman**, Member, School of Mathematics ✦ *Cohomology of Line Bundles on Flag Varieties in Positive Characteristic* ✦ **Linyuan Liu**, University of Sydney; Member, School of Mathematics

Stability and Testability ✦ *Surface Groups Are Flexibly Stable* ✦ **Nir Lazarovich**, Technion – Israel Institute of Technology

November 19

Joint IAS/Princeton University Number Theory Seminar ✦ *Ramanujan Conjecture and the Density Hypothesis* ✦ **Shai Evra**, Princeton University

Virtual Workshop on Recent Developments in Geometric Representation Theory ✦ *Induction of p-Cells and Localization* ✦ **Lars Thorge Jensen**, Member, School of Mathematics ✦ *Reverse Plane Partitions and Modules for the Preprojective Algebra* ✦ **Anne Dranowski**, Member, School of Mathematics ✦ *Unitriangularity and Decomposition Matrices of Unipotent Blocks* ✦ **Jay Taylor**, University of Southern California; Member, School of Mathematics ✦ *Generalized Affine Grassmannian Slices, Truncated Shifted Yangians, and Hamiltonian Reduction* ✦ **Joel Kamnitzer**, University of Toronto

November 20

Moonshine Seminar

Virtual Workshop on Recent Developments in Geometric Representation Theory ✦ *Macdonald Polynomials and Decomposition Numbers for Finite Unitary Groups* ✦ **Olivier Dudas**, Institut de mathématiques de Jussieu–Paris Rive Gauche ✦ *Real and Symmetric Springer Theory* ✦ **David Nadler**, University of California, Berkeley ✦ *Curved Hecke Categories* ✦ **Shotaro Makusumi**, Columbia University; Member, School of Mathematics ✦ *Perverse Sheaves on Configuration Spaces, Hopf Algebras and Parabolic Induction* ✦ **Mikhail Kapranov**, Kavli Institute for the Physics and Mathematics of the Universe, University of Tokyo

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Persistence and Triangulation in Lagrangian Topology* ✦ **Paul Biran**, Eidgenössische Technische Hochschule Zürich

Workshop on Topology: Identifying Order in Complex Systems ✦ *Topological Methods for Characterizing the Relationship between Polymer Entanglement and Viscoelasticity* ✦ **Eleni Panagiotou**, University of Tennessee, Chattanooga

November 23

Computer Science/Discrete Mathematics Seminar I ✦ *New Isoperimetric Inequalities for Convex Bodies* ✦ **Amir Yehudayoff**, Technion – Israel Institute of Technology

Analysis Seminar ✦ *Boundary Regularity and Stability for Spaces with Ricci Curvature Bounded Below* ✦ **Elia Bruè**, Member, School of Mathematics

Members' Seminar ✦ *Growth, Isoperimetry and Liouville Property for Random Walks on Groups* ✦ **Anna Erschler**, École normale supérieure; Member, School of Mathematics

November 24

SL2 Seminar ✦ *Derived Equivalences for Blocks of Cyclic Defect* ✦ **Jay Taylor**, University of Southern California; Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *The Joyal Model Structure on Simplicial Sets and Equivalence with Simplicial Categories* ✦ **Linus Hamann**, Princeton University

Computer Science/Discrete Mathematics Seminar II ✦ *Factorization through L2, Rounding and Duality Part 2* ✦ **Vijay Bhattiprolu**, Member, School of Mathematics

November 25

Stability and Testability ✦ *Approximations of Groups, Subquotients of Infinite Direct Products and Equations over Groups* ✦ **Lev Glebsky**, Universidad Autónoma de San Luis Potosí

November 27

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 Minute Research Talks* ✦ **Yu Wei Fan**, University of California, Berkeley; **Surena Hozoori**, Georgia Institute of Technology; **Marcelo Atallah**, University of Montreal

November 30

Computer Science/Discrete Mathematics Seminar I ✦ *Thresholds for Random Subspaces, aka, LDPC Codes Achieve List-Decoding Capacity* ✦ **Mary Wootters**, Stanford University

Analysis Seminar ✦ *Sharp Nonuniqueness for the Navier-Stokes Equations* ✦ **Xiaoyutao Luo**, Duke University

Members' Seminar ✦ *Support Varieties for Modular Representations* ✦ **Eric M. Friedlander**, University of Southern California; Member, School of Mathematics

December 1

SL2 Seminar ✦ *The ABG Equivalence* ✦ **Pablo Boixeda Alvarez**, Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *Cartesian Fibrations* ✦ **Arpon Raksit**, Stanford University

Computer Science/Discrete Mathematics Seminar II ✦ *Getting the Most from Our Data* ✦ **Paul Valiant**, Brown University; Member, School of Mathematics

December 2

Mathematical Conversations ✦ *Isolated Points on Curves* ✦ **Bianca Viray**, University of Washington

Stability and Testability ✦ *Stability, Cohomology Vanishing, and Non-Approximable Groups* ✦ **Andreas Thom**, University of Dresden

Geometric and Modular Representation Theory Seminar ✦ *Geometric Satake Equivalence: A Historical Survey* ✦ **George Lusztig**, Massachusetts Institute of Technology; Member, School of Mathematics

December 3

Joint IAS/Princeton University Number Theory Seminar ✦ *A Unitary Analogy of Friedberg-Jacquet and Guo-Jacquet Periods and Central Values of Standard L Functions on GL(2n)* ✦ **Jingwei Xiao**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

Moonshine Seminar

December 4

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *The Singular Weinstein Conjecture and the Contact/Beltrami Mirror* ✦ **Eva Miranda**, Universitat Politècnica de Catalunya

Workshop on Topology: Identifying Order in Complex Systems ✦ *Raytracing and Raymarching Simulations of Non-Euclidean Geometries* ✦ **Henry Segerman**, Oklahoma State University

December 7

Computer Science/Discrete Mathematics Seminar I ✦ *Extractor-Based Approach to Proving Memory-Sample Lower Bounds for Learning* ✦ **Sumegha Garg**, Harvard University

Analysis Seminar ✦ *Stability of Discontinuous Solutions for Inviscid Compressible Flows* ✦ **Alexis Vasseur**, University of Texas at Austin

Members' Seminar ✦ *NP-Hard Problems Naturally Arising in Knot Theory* ✦ **Anastasiia Tsvietkova**, Rutgers, The State University of New Jersey

December 8

Working Group on Stratified Homotopy Theory ✦ *Cartesian Model Structure and Marked Simplicial Sets* ✦ **Carlos Tschudi Simpson**, CNRS, Université de Nice Sophia Antipolis; Visiting Professor, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *High Dimensional Expanders and Ramanujan Complexes* ✦ **Alexander Lubotzky**, Hebrew University of Jerusalem; Visiting Professor, School of Mathematics

December 9

Mathematical Conversations ✦ *Determinants, Hyperbolicity, and Interlacing* ✦ **Cynthia Vinzant**, North Carolina State University; von Neumann Fellow, School of Mathematics

Stability and Testability ✦ *Vanishing of Cohomology for Groups Acting on Buildings* ✦ **Izhar Oppenheim**, Ben Gurion University

Geometric and Modular Representation Theory Seminar ✦ *Lefschetz Operators, Hodge-Riemann Forms, and Representations* ✦ **Peter Fiebig**, Friedrich-Alexander-Universität Erlangen-Nürnberg; Member, School of Mathematics

December 10

Joint IAS/Princeton University Number Theory Seminar ✦ *On the Liouville Function at Polynomial Arguments* ✦ **Joni Teräväinen**, University of Oxford

Moonshine Seminar

December 11

Workshop on Turbulence ✦ *Status of Experiments and Simulations on Scaling Problems in Turbulence* ✦ **Katepalli Sreenivasan**, New York University ✦ *Fluid Turbulence, Thermal Noise and Spontaneous Stochasticity* ✦ **Gregory Eyink**, Johns Hopkins University ✦ *Turbulence as Gibbs Statistics of Vortex Sheets* ✦ **Alexander Migdal**, New York University

Moonshine Seminar

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Hierarchies of Contact Manifolds via Rational SFT* ✦ **Zhengyi Zhou**, Member, School of Mathematics

December 14

Analysis Seminar ✦ *The Singular Set in the Stefan Problem* ✦ **Joaquim Serra**, Eidgenössische Technische Hochschule Zürich

Members' Seminar ✦ *A Feynman Approach to Dynamic Rate Markov Processes* ✦ **William Massey**, Princeton University; Member, School of Mathematics

December 15

SL2 Seminar ✦ *Cohomology: Qualitative and Stable Results* ✦ **Eric M. Friedlander**, University of Southern California; Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *(Homotopy) Limits and Colimits* ✦ **Tony Feng**, Member, School of Mathematics

December 16

Mathematical Conversations ✦ *The Perceptron Problem* ✦ **Nike Sun**, Massachusetts Institute of Technology

Stability and Testability ✦ *Hilbert-Schmidt Stability of Groups via C^*-Algebras* ✦ **Tatiana Shulman**, Polish Academy of Science

Geometric and Modular Representation Theory Seminar ✦ *Hecke Category via Derived Convolution Formalism* ✦ **Dima Arinkin**, University of Wisconsin-Madison

December 17

Moonshine Seminar

January 11

Analysis Seminar ✦ *The Ground State Energy of Dilute Bose Gases* ✦ **Soeren Fournais**, Aarhus University; Member, School of Mathematics

January 12

Working Group on Stratified Homotopy Theory ✦ *Presheaves and the Yoneda Lemma* ✦ **Robin Carlier**, École normale supérieure de Lyon

January 13

Stability and Testability ✦ *The PCP Theorem, Locally Testable Codes, and Property Testing* ✦ **Irit Dinur**, Weizmann Institute of Science

Geometric and Modular Representation Theory Seminar ✦ *Introduction to Smith Theory* ✦ **Tony Feng**, Member, School of Mathematics

January 14

Moonshine Seminar

January 15

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Symplectic Implosion* ✦ **Lisa Jeffrey**, University of Toronto

January 19

SL2 Seminar ✦ *A Categorical Approach to Representations in Defining Characteristic* ✦ **Nate Harman**, Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *Adjoint Functors* ✦ **Emanuel Reinecke**, Member, School of Mathematics

January 20

Stability and Testability ✦ *Stability and Invariant Random Subgroups* ✦ **Henry Bradford**, University of Cambridge

Geometric and Modular Representation Theory Seminar ✦ *The Linkage Principle and the Tilting Character Formula via Smith-Treumann Theory* ✦ **Daniel Juteau**, CNRS, Université Paris Diderot; Member, School of Mathematics

January 21

Joint IAS/Princeton University Number Theory Seminar ✦ *Ax-Lindemann-Weierstrass Theorem (ALW) for Fuchsian Automorphic Functions* ✦ **Joel Nagloo**, The City University of New York

Moonshine Seminar

Quantum Groups Seminar ✦ *Introduction to Quantized Enveloping Algebras* ✦ **Leonardo Maltoni**, Sorbonne University

January 22

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Pseudo-Rotations vs. Rotations* ✦ **Basak Gurel**, University of Central Florida

January 25

Computer Science/Discrete Mathematics Seminar I ✦ *An Improved Exponential-Time Approximation Algorithm for Fully-Alternating Games against Nature* ✦ **Andrew Drucker**, University of Chicago

Analysis Seminar ✦ *Bogoliubov Theory for Trapped Bose-Einstein Condensates* ✦ **Benjamin Schlein**, University of Zurich

Members' Seminar ✦ *A Nonabelian Brunn-Minkowski Inequality* ✦ **Ruixiang Zhang**, University of Wisconsin-Madison; Member, School of Mathematics

January 26

SL2 Seminar ✦ *Why Do We Care about Characters of Tilting Modules?* ✦ **Shotaro Makisumi**, Columbia University; Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *Accessible and Presentable ∞-Categories* ✦ **Sophie Morel**, École normale supérieure de Lyon

Computer Science/Discrete Mathematics Seminar II ✦ *Log-Concave Polynomials in Theory and Applications* ✦ **Cynthia Vinzant**, North Carolina State University; von Neumann Fellow, School of Mathematics

January 27

Mathematical Conversations ✦ *Möbius Disjointness* ✦ **Peter Sarnak**, Professor, School of Mathematics

Stability and Testability ✦ *Stability of Amenable Groups via Ergodic Theory* ✦ **Arie Levit**, Yale University

Geometric and Modular Representation Theory Seminar ✦ *The Hecke Category Action on the Principal Block via Smith Theory* ✦ **Geordie Williamson**, University of Sydney; Distinguished Visiting Professor, School of Mathematics

January 28

Moonshine Seminar

Quantum Groups Seminar ✦ *Introduction to Quantized Enveloping Algebras* ✦ **Leonardo Maltoni**, Sorbonne University

Short Talks by Postdoctoral Members ✦ *Exponential Exact Algorithms for NP Complete Problems* ✦ **Or Zamir**, Member, School of Mathematics ✦ *Distribution Properties of Hodge and Tate Loci* ✦ **Salim Tayou**, Member, School of Mathematics ✦ *Cohomology of Arithmetic Groups and Endoscopy* ✦ **Mathlide Gerbelli-Gauthier**, Member, School of Mathematics

January 29

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 Minute Research Talks* ✦ **Alexandre Jannaud**, Sorbonne University; **Tim Large**, Massachusetts Institute of Technology; **Oliver Edtmair**, University of California, Berkeley

February 1

Computer Science/Discrete Mathematics Seminar I ✦ *Graph Density Inequalities, Sums of Squares and Tropicalization* ✦ **Annie Raymond**, University of Massachusetts Amherst

Analysis Seminar ✦ *Index Theorems for Nodal Count and a Lateral Variation Principle* ✦ **Gregory Berkolaiko**, Texas A&M University

February 2

SL2 Seminar ✦ *User's Guide to Computing with Tilting Modules* ✦ **Benjamin Elias**, University of Oregon; von Neumann Fellow, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *∞-Topoi* ✦ **Ian Coley**, Rutgers, The State University of New Jersey

Computer Science/Discrete Mathematics Seminar II ✦ *Log-Concave Polynomials in Theory and Applications—Part 2* ✦ **Cynthia Vinzant**, North Carolina State University; von Neumann Fellow, School of Mathematics

February 3

Mathematical Conversations ✦ *How Hard Is It to Tell Two Knots Apart?* ✦ **Anastasiia Tsvietkova**, Rutgers, The State University of New Jersey; von Neumann Fellow, School of Mathematics

Stability and Testability ✦ *Permutation Stability of Grigorchuk Groups* ✦ **Tianyi Zheng**, University of California, San Diego

Geometric and Modular Representation Theory Seminar ✦ *The K-Ring of Steinberg Varieties* ✦ **Pablo Boixeda Alvarez**, Member, School of Mathematics

February 4

Moonshine Seminar

Quantum Groups Seminar ✦ *Center of Quantum Group* ✦ **Arun Kannan**, Massachusetts Institute of Technology

February 5

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Algebraic Torus Actions on Fukaya Categories and Tameness of Change in Floer Homology under Symplectic Isotopies* ✦ **Yusuf Baris Kartal**, Princeton University

February 8

Computer Science/Discrete Mathematics Seminar I ✦ *Total Functions in the Polynomial Hierarchy* ✦ **Robert Kleinberg**, Cornell University

Analysis Seminar ✦ *Planarity in Higher Codimension Mean Curvature Flow* ✦ **Keaton Naff**, Columbia University

Members' Seminar ✦ *The Top-Heavy Conjecture for Vectors and Matroids* ✦ **Tom Braden**, University of Massachusetts Amherst; Member, School of Mathematics

February 9

SL2 Seminar ✦ *Tilting Character Computations* ✦ **Geordie Williamson**, University of Sydney; Distinguished Visiting Professor, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *Overview and Homotopy Theory of Stratified Spaces* ✦ **Remy Van Dobben De Bruyn**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *High Dimensional Expanders* ✦ **Shai Evra**, Princeton University

February 10

Mathematical Conversations ✦ *Quantum Integer Valued Polynomials* ✦ **Nate Harman**, Member, School of Mathematics

Stability and Testability ✦ *Non-Amenable Groups Admitting No Sofic Approximation by Expander Graphs* ✦ **Gabor Kun**, Alfréd Rényi Institute of Mathematics

Geometric and Modular Representation Theory Seminar ✦ *Equivariantization and De-Equivariantization* ✦ **Shotaro Makisumi**, Columbia University; Member, School of Mathematics

February 11

Joint IAS/Princeton University Number Theory Seminar ✦ *Cohomology of Arithmetic Groups and Endoscopy* ✦ **Mathilde Gerbelli-Gauthier**, Member, School of Mathematics

Moonshine Seminar

Quantum Groups Seminar ✦ *Center of Quantum Group* ✦ **Arun Kannan**, Massachusetts Institute of Technology

February 12

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Non-Displaceable Lagrangian Links in Four-Manifolds* ✦ **Cheuk Yu Mak**, University of Edinburgh

February 15

Computer Science/Discrete Mathematics Seminar I ✦ *Monotone Arithmetic Circuit Lower Bounds via Communication Complexity* ✦ **Arkadev Chattopadhyay**, Tata Institute of Fundamental Research

February 16

SL2 Seminar ✦ *Tilting Character Computations II* ✦ **Lars Thorge Jensen**, Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *Complete Segal Spaces and Spatial Décollage* ✦ **Ian Coley**, Rutgers, The State University of New Jersey

Computer Science/Discrete Mathematics Seminar II ✦ *High Dimensional Expanders—Part 2* ✦ **Shai Evra**, Princeton University

February 17

Mathematical Conversations ✦ *Why Is* $N_{\Gamma_0(12)}^{\text{new}}(\lambda)$ *of Cocompact Type?* ✦ **Terrence Blackman**, Medgar Evers College, The City University of New York; Visitor, School of Mathematics

Stability and Testability ✦ *Matrix Stability of Crystallographic Groups* ✦ **Soren Eilers**, University of Copenhagen

Geometric and Modular Representation Theory Seminar ✦ *Gaitsgory's Central Sheaves* ✦ **Tom Braden**, University of Massachusetts Amherst; Member, School of Mathematics

February 18

Joint IAS/Princeton University Number Theory Seminar ✦ *Exceptional Jumps of Picard Rank of K3 Surfaces over Number Fields* ✦ **Salim Tayou**, Member, School of Mathematics

Moonshine Seminar

Quantum Groups Seminar ✦ *R-Matrices* ✦ **Elijah Bodish**, University of Oregon

February 19

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Intrinsic Mirror Symmetry and Categorical Crepant Resolutions* ✦ **Daniel Pomerleano**, University of Massachusetts Boston

February 22

Computer Science/Discrete Mathematics Seminar I ✦ *Optimal Mixing of Glauber Dynamics: Entropy Factorization via High-Dimensional Expansion* ✦ **Zongchen Chen**, Georgia Institute of Technology

Analysis Seminar ✦ *Spread of Infections in Random Walkers* ✦ **Allan Sly**, Princeton University

Members' Seminar ✦ *Astrophysical Fluid Dynamics* ✦ **James Stone**, Professor, School of Natural Sciences

February 23

SL2 Seminar ✦ *Billiards and Boats* ✦ **Lars Thorge Jensen**, Member, School of Mathematics

Working Group on Stratified Homotopy Theory ✦ *∞-Topoi in Topology and Geometry* ✦ **Emanuel Reinecke**, Member, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *Introduction to Laplacian Linear Systems for Undirected Graphs* ✦ **John Peebles**, Member, School of Mathematics

February 24

Mathematical Conversations ✦ *Space Vectors Forming Rational Angles* ✦ **Bjorn Poonen**, Massachusetts Institute of Technology

Stability and Testability ✦ *Norm Stability in the Unitary Case from Voiculescu to Gromov-Lawson* ✦ **Shmuel Weinberger**, University of Chicago

Geometric and Modular Representation Theory Seminar ✦ *The Affine Hecke Category Is a Monoidal Colimit* ✦ **James Tao**, Massachusetts Institute of Technology

February 25

Joint IAS/Princeton University Number Theory Seminar ✦ *Selmer Groups and a Cassels-Tate Pairing for Finite Galois Modules* ✦ **Alexander Smith**, Massachusetts Institute of Technology

Moonshine Seminar

Quantum Groups Seminar ✦ *R-Matrices* ✦ **Elijah Bodish**, University of Oregon

February 26

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Twisted Generating Functions and the Nearby Lagrangian Conjecture* ✦ **Sylvain Courte**, Université Grenoble Alpes

March 1

Computer Science/Discrete Mathematics Seminar I ✦ *Rainbow Structures, Latin Squares & Graph Decompositions* ✦ **Benny Sudakov**, Eidgenössische Technische Hochschule Zürich

Analysis Seminar ✦ *Graph Comparison* ✦ **Anton Petrunin**, Pennsylvania State University

Members' Seminar ✦ *The Value of Errors in Proofs* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

March 2

Working Group on Stratified Homotopy Theory ✦ *Shape Theory and Stone ∞-Topoi* ✦ **Jacob Lurie**, Professor, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *Solving Laplacian Systems of Directed Graphs* ✦ **John Peebles**, Member, School of Mathematics

March 3

Mathematical Conversations ✦ *Newton, Euler, Navier, and Green* ✦ **Susan Friedlander**, University of Southern California; Member, School of Mathematics

Stability and Testability ✦ *Topological Obstructions to Matrix Stability of Discrete Groups* ✦ **Marius Dadarlat**, Purdue University

Geometric and Modular Representation Theory Seminar ✦ *On Two Geometric Realizations of the Anti-Spherical Module* ✦ **Tsao Hsien Chen**, University of Minnesota Twin Cities; Member, School of Mathematics

March 4

Joint IAS/Princeton University Number Theory Seminar ✦ *Monoidal Structures on GL(2)-Modules and Abstractly Automorphic Representations* ✦ **Gal Dor**, Tel Aviv University

Moonshine Seminar

Quantum Groups Seminar ✦ *Braid Group Actions and PBW Type Basis* ✦ **Calder Morton Ferguson**, Massachusetts Institute of Technology

March 5

Ruth and Irving Adler Expository Lecture in Mathematics ✦ *From Superconductors to Coulomb Gases: Crystallization Questions* ✦ **Sylvia Serfaty**, New York University

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Periodic Floer Homology and the Large-Scale Geometry of Hofer's Metric on the Sphere* ✦ **Sobhan Seyfaddini**, Institut de Mathématiques de Jussieu-Paris Rive Gauche

Workshop on Topology: Identifying Order in Complex Systems ✦ *Persistent Matchmaking* ✦ **Uli Bauer**, Technical University of Munich

March 8

Computer Science/Discrete Mathematics Seminar I ✦ *Strong Refutation of Semi-Random Boolean CSPs* ✦ **Venkatesan Guruswami**, Carnegie Mellon University

Members' Seminar ✦ *Higher Representation Theory* ✦ **Raphaël Rouquier**, University of California, Los Angeles; Member, School of Mathematics

March 9

SL2 Seminar ✦ *A Friendly Introduction to Microlocal Sheaves* ✦ **Michael McBreen**, Chinese University of Hong Kong

Working Group on Stratified Homotopy Theory ✦ *Oriented Pushouts and Oriented Fibre Products* ✦ **Keyao Peng**, Institut Fourier Grenoble Alpes

Computer Science/Discrete Mathematics Seminar II ✦ *Random k-out Subgraphs* ✦ **Or Zamir**, Member, School of Mathematics

March 10

Mathematical Conversations ✦ *Many Interacting Quantum Particles: Open Problems, and a New Point of View on an Old Problem* ✦ **Ian Jauslin**, Princeton University

Stability and Testability ✦ *Constraint Metric Approximation and Constraint Stability* ✦ **Liviu Paunescu**, Romanian Academy

Geometric and Modular Representation Theory Seminar ✦ *Two Geometric Realizations of the Affine Hecke Algebra I* ✦ **Pablo Boixeda Alvarez**, Member, School of Mathematics

March 11

Joint IAS/Princeton University Number Theory Seminar ✦ *Some Remarks on Landau-Siegel Zeros* ✦ **Alexandru Zaharescu**, University of Illinois at Urbana-Champaign

Moonshine Seminar

Quantum Groups Seminar ✦ *Continuation from Last Time* ✦ **Calder Morton Ferguson**, Massachusetts Institute of Technology

March 12

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Inverting Primes in Weinstein Geometry* ✦ **Oleg Lazarev**, Harvard University

March 15

Computer Science/Discrete Mathematics Seminar I ✦ *Local Proofs with Arbitrarily Small Encoding Overhead* ✦ **Noga Ron Zewi**, Haifa University

Analysis Seminar ✦ *The Dissipation Properties of Transport Noise* ✦ **Franco Flandoli**, Scuola Normale Superiore di Pisa

Members' Seminar ✦ *Estimating the Mean of a Real Valued Distribution* ✦ **Paul Valiant**, Brown University; von Neumann Fellow, School of Mathematics

March 16

SL2 Seminar ✦ *Microlocal Sheaves II: Morphisms, Microperverse Sheaves and Regular Singularities* ✦ **Michael McBreen**, Chinese University of Hong Kong

Working Group on Stratified Homotopy Theory ✦ *Localisations and Base Change Theorems* ✦ **Carlos Tschudi Simpson**, CNRS, Université de Nice Sophia Antipolis

Computer Science/Discrete Mathematics Seminar II ✦ *Polynomial Systems and Mixed Volumes* ✦ **Ricky I. Liu**, North Carolina State University; Member, School of Mathematics

March 17

Mathematical Conversations ✦ *Embedded Contact Homology of Prequantization Bundles* ✦ **Jo Nelson**, Rice University

Stability and Testability ✦ *Approximate Representations of Symplectomorphisms via Quantization* ✦ **Leonid Polterovich**, Tel Aviv University

Geometric and Modular Representation Theory Seminar ✦ *Affine Hecke Category and Noncommutative Springer Resolution* ✦ **Roman Bezrukavnikov**, Massachusetts Institute of Technology; Member, School of Mathematics

March 18

Joint IAS/Princeton University Number Theory Seminar ✦ *The Shafarevich Conjecture for Hypersurfaces in Abelian Varieties* ✦ **Will Sawin**, Columbia University

Moonshine Seminar

Quantum Groups Seminar ✦ *Algebraic Groups and All in Characteristic p* ✦ **Ivan Loseu**, Yale University; Member, School of Mathematics

March 19

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Lagrangian Configurations and Hamiltonian Maps* ✦ **Egor Shelukhin**, University of Montreal

Workshop on Topology: Identifying Order in Complex Systems ✦ *Physics of Functional Networks* ✦ **Henrik Ronellenfitsch**, Williams College

March 22

Computer Science/Discrete Mathematics Seminar I ✦ *The Abstract Chromatic Number* ✦ **Leonardo Nagami Coregliano**, University of Chicago

Members' Colloquium ✦ *String Topology and the Intersection Product* ✦ **Nathalie Wahl**, University of Copenhagen; Member, School of Mathematics

Analysis Seminar ✦ *A Stationary Set Method for Estimating Oscillatory Integrals* ✦ **Ruixiang Zhang**, University of Wisconsin-Madison; Member, School of Mathematics

March 23

SL2 Seminar ✦ *Microlocal Sheaves III: Regular Singularities and Riemann-Hilbert* ✦ **Michael McBreen**, Chinese University of Hong Kong

Working Group on Stratified Homotopy Theory ✦ *Stratified ∞-Topoi and Toposic Décollage* ✦ **Clark Barwick**, University of Edinburgh

Computer Science/Discrete Mathematics Seminar II ✦ *Amortized Circuit Complexity, Formal Complexity Measures, and Catalytic Algorithms* ✦ **Jeroen Zuiddam**, New York University

March 24

Mathematical Conversations ✦ *Surfaces and Point Processes* ✦ **Jayadev Athreya**, University of Washington

Stability and Testability ✦ *Why Was Connes' Embedding Conjecture Refuted and There Are Still No Known Non-Hyperlinear Groups?* ✦ **Michael Chapman**, Hebrew University of Jerusalem

Geometric and Modular Representation Theory Seminar ✦ *Parabolic Version of the Two Realizations Theorem and Applications to Modular Representation Theory* ✦ **Ivan Loseu**, Yale University; Member, School of Mathematics

March 25

Joint IAS/Princeton University Number Theory Seminar ✦ *The Local Gan-Gross-Prasad Conjecture for Real Unitary Groups* ✦ **Hang Xue**, The University of Arizona

Moonshine Seminar

Quantum Groups Seminar ✦ *Quantum Groups at Roots of Unity* ✦ **Jay Taylor**, University of Southern California; Member, School of Mathematics

March 26

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 minute Research Talks* ✦ **Jesse Huang**, University of Illinois at Urbana-Champaign; **Shaoyun Bai**, Princeton University; **Thomas Melistas**, University of Georgia

March 29

Computer Science/Discrete Mathematics Seminar I ✦ *Approximating Max Cut with Subexponential Linear Programs* ✦ **Tselil Schramm**, Stanford University

Analysis Seminar ✦ *Mean-Field Limits for Coulomb-Type Dynamics* ✦ **Sylvia Serfaty**, New York University

Workshop on Representation Theory and Geometry ✦ *Towards Canonical Bases in Homology of Symplectic Resolutions* ✦ **Roman Bezrukavnikov**, Massachusetts Institute of Technology; Member, School of Mathematics ✦ *Smith Theory and Langlands Functoriality* ✦ **Tony Feng**, Member, School of Mathematics ✦ *Modular Perverse Sheaves on Symplectic Singularities* ✦ **Tom Braden**, University of Massachusetts Amherst; Member, School of Mathematics

March 30

Working Group on Stratified Homotopy Theory ✦ *Exodromy Correspondence for Stratified ∞-Topoi* ✦ **Remy van Dobben De Bruyn**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

Workshop on Representation Theory and Geometry ✦ *From Weyl Modules to Simple Modules in Many Small Steps* ✦ **George Lusztig**, Massachusetts Institute of Technology ✦ *Flag Manifolds over Semifields I* ✦ **Huanchen Bao**, National University of Singapore; Member, School of Mathematics ✦ *Springer, Procesi and Cherednik* ✦ **Ivan Loseu**, Yale University; Member, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *Computational–Statistical Gaps and the Group Testing Problem* ✦ **Fotis Iliopoulos**, Member, School of Mathematics

March 31

Workshop on Representation Theory and Geometry ✦ *Webs in Type C* ✦ **Benjamin Elias**, University of Oregon; von Neumann Fellow, School of Mathematics ✦ *New Isolated Symplectic Singularities with Trivial Fundamental Group* ✦ **Daniel Juteau**, CNRS, Université Paris Diderot; Member, School of Mathematics ✦ *Rationality Properties of Complex Characters of Finite Groups* ✦ **Pham Tiep**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Stability and Testability ✦ *Ultrametric Stability Problems* ✦ **Francesco Fournier Facio**, Eidgenössische Technische Hochschule Zürich

April 1

Joint IAS/Princeton University Number Theory Seminar ✦ *Eisenstein Series, p-adic Deformations, Galois Representations, and the Group G_2* ✦ **Sam Mundy**, Columbia University

Moonshine Seminar

Quantum Groups Seminar ✦ *Quantum Groups at Roots of Unity* ✦ **Jay Taylor**, University of Southern California; Member, School of Mathematics

Workshop on Representation Theory and Geometry ✦ *A Hecke Action on the Principal Block of a Semisimple Algebraic Group* ✦ **Simon Riche**, Université Paris 6; Member, School of Mathematics ✦ *Approximating Tilting Modules* ✦ **Peter Fiebig**, Friedrich-Alexander-Universität Erlangen-Nürnberg; Member, School of Mathematics ✦ *Stokes Phenomena, Poisson-Lie Groups and Quantum Groups* ✦ **Valerio Toledano Laredo**, Northeastern University; Member, School of Mathematics

April 2

Workshop on Representation Theory and Geometry ✦ *Representations of p-adic Groups* ✦ **Jessica Fintzen**, University of Cambridge and Duke University; Member, School of Mathematics ✦ *Lax 2-Tensor Constructions* ✦ **Raphaël Rouquier**, University of California, Los Angeles; Member, School of Mathematics ✦ *Double Covers of Tori and the Local Langlands Correspondence* ✦ **Tasho Kaletha**, University of Michigan

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Categorical Non-Properness in Wrapped Floer Theory* ✦ **Sheel Ganatra**, University of Southern California

Workshop on Topology: Identifying Order in Complex Systems ✦ *The Missing Link* ✦ **Vidit Nanda**, University of Oxford

April 3

Workshop on Representation Theory and Geometry ✦ *Towards Derived Satake Equivalence for Symmetric Varieties* ✦ **Tsao Hsien Chen**, University of Minnesota Twin Cities; Member, School of Mathematics ✦ *Flag Manifolds over Semifields II* ✦ **Xuhua He**, Chinese University of Hong Kong; Member, School of Mathematics ✦ *The Drinfeld-Sokolov Reduction of Admissible Representations of Affine Lie Algebras* ✦ **Gurbir Dhillon**, Yale University

April 5

Computer Science/Discrete Mathematics Seminar I ✦ *Pandora's Box with Correlations: Learning and Approximation* ✦ **Shuchi Chawla**, University of Wisconsin-Madison

Members' Colloquium ✦ *The Earth's Dynamo: A Mathematical Model* ✦ **Susan Friedlander**, University of Southern California; Member, School of Mathematics

Analysis Seminar ✦ *Yang-Mills Instantons, Quivers and Bows* ✦ **Sergey Cherkis**, University of Arizona; Member, School of Mathematics

April 6

Working Group on Stratified Homotopy Theory ✦ *Stratified Étale Homotopy Theory and Galois Categories* ✦ **Zhiyu Zhang**, Massachusetts Institute of Technology

Computer Science/Discrete Mathematics Seminar II ✦ *How Difficult Is It to Certify That a Random 3SAT Formula Is Unsatisfiable?* ✦ **Toniann Pitassi**, University of Toronto; Visiting Professor, School of Mathematics

April 7

Mathematical Conversations ✦ *For a Given Finite Group G, Which Spaces Can Be the Fixed Point Set of a G-Action on a Given Compact Space?* ✦ **Sylvain Cappell**, New York University

Stability and Testability ✦ *Approximations of Infinite Groups* ✦ **Goulnara Arzhantseva**, Universität Wien

Geometric and Modular Representation Theory Seminar ✦ *K-Motives and Koszul Duality in Geometric Representation Theory* ✦ **Jens Eberhardt**, Max Planck Institute

April 8

Joint IAS/Princeton University Number Theory Seminar ✦ *Low Moments of Character Sums* ✦ **Adam Harper**, University of Warwick

Moonshine Seminar

Quantum Groups Seminar ✦ *Representations of Quantum Groups at Roots of 1* ✦ **Jize Yu**, Member, School of Mathematics

April 9

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Relative Quantum Cohomology and Other Stories* ✦ **Sara Tukachinsky**, Member, School of Mathematics

April 12

Computer Science/Discrete Mathematics Seminar I ✦ *Privacy as Stability, for Generalization* ✦ **Katrina Legitt**, Hebrew University of Jerusalem

Members' Colloquium ✦ *Character Bounds for Finite Simple Groups* ✦ **Pham Tiep**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Analysis Seminar ✦ *Long Time Dynamics of 2D Euler and Nonlinear Inviscid Damping* ✦ **Hao Jia**, University of Minnesota Twin Cities

April 13

SL2 Seminar ✦ *Meldings and the Codimension-Three Conjecture* ✦ **Kari Vilonen**, University of Melbourne

Working Group on Stratified Homotopy Theory ✦ *Pyknotic/Condensed Mathematics and l-adic Exodromy Theorem* ✦ **Linus Hamann**, Princeton University

April 14

Mathematical Conversations ✦ *Embedding Symplectic Ellipsoids and Diophantine Equations* ✦ **Dusa McDuff**, Barnard College, Columbia University

Geometric and Modular Representation Theory Seminar ✦ *Microlocal Sheaves on Certain Affine Springer Fibers* ✦ **Zhiwei Yun**, Massachusetts Institute of Technology

April 15

Joint IAS/Princeton University Number Theory Seminar ✦ *Beilinson-Bloch Conjecture for Unitary Shimura Varieties* ✦ **Chao Li**, Columbia University

Moonshine Seminar

Quantum Groups Seminar ✦ *Representations of Quantum Groups at Roots of 1* ✦ **Jize Yu**, Member, School of Mathematics

April 16

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 Minute Research Talks* ✦ **Maxim Jeffs**, Harvard University; **Côme Dattin**, University of Nante; **Bingyu Zhang**, Université Grenoble Alpes

Workshop on Topology: Identifying Order in Complex Systems ✦ *From Geometry to Topology: Inverse Theorems for Distributed Persistence* ✦ **Paul Bendich**, Duke University

April 19

Analysis Seminar ✦ *From Hyperbolic Billiards to Statistical Physics* ✦ **Peter Nandori**, Yeshiva University; Member, School of Mathematics

Marston Morse Lectures ✦ *Statistical Physics of Random CSPs* ✦ **Nike Sun**, Massachusetts Institute of Technology

April 20

SL2 Seminar ✦ *Perverse Sheaves on Grassmannians via Microlocal Geometry* ✦ **Tom Braden**, University of Massachusetts Amherst; Member, School of Mathematics

Computer Science/Discrete Mathematics Seminar II ✦ *On Chen's Recent Breakthrough on the Kannan-Lovasz-Simonovits Conjecture and Bourgain's Slicing Problem* ✦ **Ronen Eldan**, Weizmann Institute of Science; Visitor, School of Mathematics

April 21

Mathematical Conversations ✦ *Floer's Jungle: 35 Years of Floer Theory* ✦ **Siobhan Roberts**, Independent Scholar; **Helmut Hofer**, Hermann Weyl Professor, School of Mathematics

Marston Morse Lectures ✦ *Probabilistic Analysis of Random CSPs* ✦ **Nike Sun**, Massachusetts Institute of Technology

April 22

Joint IAS/Princeton University Number Theory Seminar ✦ *Kolyvagin's Conjecture and Higher Congruences of Modular Forms* ✦ **Naomi Sweeting**, Harvard University

Moonshine Seminar

Quantum Groups Seminar ✦ *Kazhdan-Lusztig Category* ✦ **Jin Cheng Guu**, Stony Brook University

April 23

Marston Morse Lectures ✦ *On the Ising Perceptron Model* ✦ **Nike Sun**, Massachusetts Institute of Technology

April 26

Analysis Seminar ✦ *Mean Curvature Flow in High Co-Dimension* ✦ **William Minicozzi**, Massachusetts Institute of Technology

Computer Science/Discrete Mathematics Seminar II ✦ *On Chen's Recent Breakthrough on the Kannan-Lovasz-Simonovits Conjecture and Bourgain's Slicing Problem—Part II* ✦ **Ronen Eldan**, Weizmann Institute of Science; Visitor, School of Mathematics

April 27

SL2 Seminar ✦ *Invariance and Monodromy of Microlocal Sheaves* ✦ **David Nadler**, University of California, Berkeley

April 28

Mathematical Conversations ✦ *Math and Computation: Some Principles, Anecdotes and Questions* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

April 29

Joint IAS/Princeton University Number Theory Seminar ✦ *On the Canonical, fpqc and Finite Topologies: Classical Questions, New Answers (And Conversely)* ✦ **Yves Andre**, Institut de Mathématiques de Jussieu–Paris Rive Gauche

Moonshine Seminar

April 30

Workshop on Topology: Identifying Order in Complex Systems ✦ *Twisted Topological Tangles or: The Knot Theory of Knitting* ✦ **Elisabetta Matsumoto**, Georgia Institute of Technology

May 3

Members' Colloquium ✦ *Addressing the Growing Distrust in Algorithms with Mathematics* ✦ **Shafi Goldwasser**, University of California, Berkeley; Visiting Professor, School of Mathematics

Analysis Seminar ✦ *Korevaar-Schoen Energy Revisited* ✦ **Nicola Gigli**, International School for Advanced Studies (SISSA)

May 4

Computer Science/Discrete Mathematics Seminar II ✦ *On Chen's Recent Breakthrough on the Kannan-Lovasz-Simonovits Conjecture and Bourgain's Slicing Problem—Part III* ✦ **Ronen Eldan**, Weizmann Institute of Science; Visitor, School of Mathematics

May 5

Mathematical Conversations ✦ *Discrete Random Surfaces* ✦ **Amol Aggarwal**, Columbia University

Geometric and Modular Representation Theory Seminar ✦ *Towards a Modular "2 Realizations" Equivalence* ✦ **Simon Riche**, Université Clermont Auvergne; Member, School of Mathematics

May 6

Joint IAS/Princeton University Number Theory Seminar ✦ *Groups with Bounded Generation: Old and New* ✦ **Andrei S. Rapinchuk**, University of Virginia

Moonshine Seminar

Quantum Groups Seminar ✦ *Kazhdan-Lusztig Category* ✦ **Jin Cheng Guu**, Stony Brook University

May 7
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Unexpected Fillings, Singularities, and Plane Curve Arrangements* ✦ **Laura Starkston**, University of California, Davis

May 10
Computer Science/Discrete Mathematics Seminar I ✦ *A Complexity-Theoretic Perspective on Fairness* ✦ **Michael P. Kim**, University of California, Berkeley; Visitor, School of Mathematics

May 11
SL2 Seminar ✦ *Automorphic Gluing Functor in Betti Geometric Langlands* ✦ **David Nadler**, University of California, Berkeley

May 12
Mathematical Conversations ✦ *Symmetries in Symbolic Dynamics* ✦ **Bryna Kra**, Northwestern University

Celebration of Women in Mathematics ✦ *Interview with Dr. Monica Vazirani* ✦ **Monica Vazirani**, University of California, Davis

Geometric and Modular Representation Theory Seminar ✦ *Frobenius Exact Symmetric Tensor Categories* ✦ **Pavel Etingof**, Massachusetts Institute of Technology

May 13
Joint IAS/Princeton University Number Theory Seminar ✦ *Expansion and Parity* ✦ **Maksym Radziwill**, California Institute of Technology

Quantum Groups Seminar ✦ *Kazhdan-Lusztig Equivalence* ✦ **Pablo Boixeda Alvarez**, Member, School of Mathematics

May 14
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Caustics of Lagrangian Homotopy Spheres with Stably Trivial Gauss Map* ✦ **Daniel Alvarez Gavela**, Massachusetts Institute of Technology

May 17
Analysis Seminar ✦ *Eigenfunction Concentration via Geodesic Beams* ✦ **Yaiza Canzani**, University of North Carolina

May 24
2021 Women and Mathematics ✦ *Representation Theory & Combinatorics of the Symmetric Group and Related Structures* ✦ **Monica Vazirani**, University of California, Davis ✦ *Representation Theory & Categorification* ✦ **Catharina Stroppel**, University of Bonn

Analysis Seminar ✦ *The Schrödinger Equations as Inspiration of Beautiful Mathematics* ✦ **Gigliola Staffilani**, Massachusetts Institute of Technology

May 25
2021 Women and Mathematics ✦ *Representation Theory & Combinatorics of the Symmetric Group and Related Structures* ✦ **Monica Vazirani**, University of California, Davis ✦ *Representation Theory & Categorification* ✦ **Catharina Stroppel**, University of Bonn

May 26
2021 Women and Mathematics ✦ *Geometric Categorifications of the Hecke Algebra* ✦ **Laura Rider**, University of Georgia ✦ *Beyond Abstract Algebra* ✦ **Chelsea Walton**, Rice University

May 27
Joint IAS/Princeton University Number Theory Seminar ✦ *Character Estimates for Classical Finite Simple Groups* ✦ **Michael Larsen**, Indiana University, Bloomington

2021 Women and Mathematics ✦ *Representation Theory & Combinatorics of the Symmetric Group and Related Structures* ✦ **Monica Vazirani**, University of California, Davis ✦ *Representation Theory & Categorification* ✦ **Catharina Stroppel**, University of Bonn

Quantum Groups Seminar ✦ *Kazhdan-Lusztig Equivalence* ✦ **Pablo Boixeda Alvarez**, Member, School of Mathematics

May 28
2021 Women and Mathematics ✦ *Representation Theory & Combinatorics of the Symmetric Group and Related Structures* ✦ **Monica Vazirani**, University of California, Davis ✦ *Representation Theory & Categorification* ✦ **Catharina Stroppel**, University of Bonn

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 Minute Research Talks* ✦ **Oguz Savk**, Boğaziçi University; **Irene Seifert**, Heidelberg University; **Hang Yuan**, Stony Brook University

June 4
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Degenerations of Kahler Forms on K3 Surfaces, and Some Dynamics* ✦ **Simion Filip**, University of Chicago

June 7
Analysis Seminar ✦ *Geodesics and Laplace Spectrum on 3D Contact Sub-Riemannian Manifolds: The Reeb Flow* ✦ **Yves Colin De Verdiere**, Institut Fourier

June 8
Computer Science/Discrete Mathematics Reading Seminar ✦ *A Universal Law of Robustness via Isoperimetry—A Paper by Bubeck and Sellke* ✦ **Ronen Eldan**, Weizmann Institute of Science; Visitor, School of Mathematics

June 11
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *The Homotopy Type of the Space of Tight Contact Structures and the Overtwisted Mirage* ✦ **Francisco Presas**, Instituto de Ciencias Matemáticas (ICMAT)

June 14
Analysis Seminar ✦ *Local Dissipation of Energy for Continuous Incompressible Euler Flows* ✦ **Phillip Isett**, University of Texas at Austin, California Institute of Technology

June 18
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *On the Spatial Restricted Three-Body Problem* ✦ **Agustin Moreno**, Uppsala University

June 22
Computer Science/Discrete Mathematics Reading Seminar ✦ *Tensor Rank* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

June 25
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20 Minute Research Talks* ✦ **Mohan Swaminathan**, Princeton University; **Ben Wormleighton**, Washington University; **Jonathan Zung**, Princeton University

School of Natural Sciences

ASTROPHYSICS EVENTS

November 2
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Robust Measurements of the Large-Scale Clustering of Galaxies and Quasars* ✦ **Mehdi Rezaie**, Ohio University

November 3
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Galactic Archaeology with Gaia and Large Spectroscopic Surveys* ✦ **Keith Hawkins**, University of Texas at Austin

November 5
Institute for Advanced Study Astrophysics Seminar ✦ *Wave Dark Matter* ✦ **Lam Hui**, Columbia University

November 9
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *A New Calibration Method of Sub-Halo Orbital Evolution for Semi-Analytic Models* ✦ **Shengqi Yang**, New York University ✦ *Iterative Optimal Filtering for CMB Maps* ✦ **Adri Duivenvoorden**, Princeton University

November 10
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *2020 Update on JWST: Time Domain, Cluster Lensing and Caustic Transit Searches for First Light Objects* ✦ **Rogier Windhorst**, Arizona State University

November 12
Institute for Advanced Study Astrophysics Seminar ✦ *White Dwarfs in the HET Dark Energy Experiment* ✦ **Barbara Castanheira-Endl**, Baylor University

November 16
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Binning Is Sinning: Clustering Estimation Without Bins* ✦ **Kate Storey-Fisher**, New York University ✦ *A New Paradigm for Particle Cosmology* ✦ **Azadeh Maleknejad**, CERN

November 17
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *New Probes of Black Hole Variability* ✦ **Daryl Haggard**, McGill University

November 19
Institute for Advanced Study Astrophysics Seminar ✦ *Venus: Moment of Inertia and Length of Day* ✦ **Jean-Luc Margot**, University of California, Los Angeles

November 23
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Tutorial on the EFT-Based Full-Shape Likelihood* ✦ **Misha Ivanov**, New York University, and collaborators

November 24
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Galaxy Clusters: The Largest Particle Accelerators in the Universe* ✦ **Gianfranco Brunetti**, IRA-INAF

November 30
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Galaxy Power Spectrum in General Relativity* ✦ **Nastassia Grimm**, Zurich University ✦ *Towards the Ultimate Cosmological Estimator* ✦ **Francisco Villaescusa-Navarro**, Princeton University

December 1
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The NASA Parker Solar Probe Mission at the Edge of the Solar Streamer Belt* ✦ **Stuart Bale**, University of California, Berkeley

December 3
Institute for Advanced Study Astrophysics Seminar ✦ *Characterizing the Architectures of Planetary Populations with Kepler and Next-Generation Doppler Surveys* ✦ **Eric Ford**, Penn State University

December 7
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Tutorial on ACT DR4* ✦ **Zach Atkins**, Princeton University

December 14
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *General Discussion* ✦ **Giovanni Cabass**, Member, School of Natural Sciences

January 25
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Measurements of the Kinetic Sunyaev Zel'dovich Effect Without Bias From Velocity Reconstruction: A Forward Modeling Approach* ✦ **Minh Nguyen**, Max-Planck-Institut für Astrophysik

February 1
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *KSZ Velocity Reconstruction: Properties From N-body Simulations and the Halo Model* ✦ **Utkarsh Giri**, Perimeter Institute

February 2
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The Impact of Cosmic-Rays on Galaxy Formation* ✦ **Eliot Quataert**, Princeton University

February 4
Institute for Advanced Study Astrophysics Seminar ✦ *Constraining the Neutron Star Equation of State with Gravitational Wave Events* ✦ **Carolyn Raithel**, Member, School of Natural Sciences

February 8
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *What is the Price of Abandoning Dark Matter? Cosmological Constraints on Alternative Gravity Theories* ✦ **David Spergel**, Princeton University

February 9
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Black Hole Physics at the Horizon Scale* ✦ **Feryal Ozel**, University of Arizona

February 11
Institute for Advanced Study Astrophysics Seminar ✦ *Structure and Dynamics of the Galactic Stellar Halo* ✦ **Helmer Koppelman**, Member, School of Natural Sciences

February 16
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Cosmology with Gravitational Lens Time Delays* ✦ **Sherry Suyu**, Max Planck Institute for Astrophysics

February 18
Institute for Advanced Study Astrophysics Seminar ✦ *Zoology of Graviton Non-Gaussianities During Inflation* ✦ **Giovanni Cabass**, Member, School of Natural Sciences

February 22
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *General Discussion* ✦ **Giovanni Cabass**, Member, School of Natural Sciences

February 23
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Probing Red Giants with Kepler* ✦ **Jørgen Christensen-Dalsgaard**, Aarhus University

February 25
Institute for Advanced Study Astrophysics Seminar ✦ *Star Formation and Feedback in Low-Mass Molecular Clouds—a 3D View* ✦ **Steffi Walch-Gassner**, University of Cologne

March 1
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Information Content of Higher-Order Galaxy Correlation Functions* ✦ **Lado Samushia**, Kansas State University; **Francisco Villaescusa-Navarro**, Princeton University

March 2
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Making Sense of Stellar Rotation in Low Mass Stars: Gyrochronology, Magnetism, and a Sun in Transition* ✦ **Jennifer van Saders**, University of Hawaii

March 4
Institute for Advanced Study Astrophysics Seminar ✦ *Cosmology and More, From ACT* ✦ **Jo Dunkley**, Princeton University; Member, School of Natural Sciences

March 8
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Constraining the Nature of Dark Matter with Stellar Streams in the Milky Way* ✦ **Jo Bovy**, University of Toronto

March 11
Institute for Advanced Study Astrophysics Seminar ✦ *Stellar Clustering Connecting the Formation and Evolution of Galaxies to the Formation and Evolution of Us* ✦ **Diederik Kruijssen**, University of Heidelberg

March 15
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *From Locality and Unitarity to Cosmological Correlators* ✦ **Sadra Jazayeri**, Institut d'Astrophysique de Paris

March 16
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *From Galaxies to Faces: Recognizing the Implications of Artificial Intelligence in Astronomy and Society* ✦ **Brian Nord**, University of Chicago and Fermilab

March 18
Institute for Advanced Study Astrophysics Seminar ✦ *Instabilities and Dissipation in Collisionless Magnetized Turbulence* ✦ **Lev Arzamasskiy**, Member, School of Natural Sciences

March 22
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Strong Lensing of Gravitational Waves* ✦ **Macarena Lagos**, Columbia University ✦ *Beyond Perturbation Theory in Inflation* ✦ **Paolo Creminelli**, International Centre for Theoretical Physics (ICTP)

March 23
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The Nearby Universe—A Laboratory to Study the Cosmic Build-up of Dust and Metals in Galaxies* ✦ **Julia Roman-Duval**, Space Telescope Science Institute

March 25
Institute for Advanced Study Astrophysics Seminar ✦ *Constraints on the Maximum Mass of Neutron Stars from Gravitational Wave Events and Prospects for Electromagnetic Precursor Emission from Inspiralling Neutron Star Binaries* ✦ **Elias Most**, Member, School of Natural Sciences

March 29
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Merging Deep Learning with Physical Models for the Analysis of Modern Cosmological Surveys* ✦ **François Lanusse**, CosmoStat Laboratory at CEA Saclay ✦ *Cosmology with Cluster Weak Lensing* ✦ **David Weinberg**, Ohio State University; Member, School of Natural Sciences

March 30
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *A NICER View of Neutron Stars* ✦ **Anna Watts**, University of Amsterdam

April 1
Institute for Advanced Study Astrophysics Seminar ✦ *Tidal Deformation and Dissipation of Rotating Black Holes* ✦ **Horng Sheng Chia**, Member, School of Natural Sciences

April 5
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Self-Interacting Neutrinos, the Hubble Parameter Tension, and the Cosmic Microwave Background* ✦ **Thejs Brinckmann**, Stony Brook University; **Adri Duivenvoorde**, Princeton University

April 6
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Protoplanetary Disk Structure and Young Planet Population* ✦ **Zhaohuan Zhu**, University of Nevada, Las Vegas

April 8
Institute for Advanced Study Astrophysics Seminar ✦ *Some Trends in Milky Way Research* ✦ **Ken Freeman**, Australian National University

April 12
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *How, and How Not, to Obtain the Redshift Distribution from Probabilistic Photometric Redshifts* ✦ **Alex Malz**, German Centre of Cosmological Lensing

April 13
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Unveiling the Secrets of Jupiter with the Juno Mission* ✦ **Yamila Miguel**, Leiden Observatory

April 15
Institute for Advanced Study Astrophysics Seminar ✦ *Constraints to Ultralight Axion Dark Matter Particles Mass: the Effect of Self-Interactions* ✦ **Alma González-Morales**, Universidad de Guanajuato

April 19
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Exploring Fundamental Physics with Friends and Neighbors* ✦ **Zachary Slepian**, Florida University

April 20
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Exoplanets and the Search for Extraterrestrial Life* ✦ **Ignas Snellen**, Leiden Observatory

April 26
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Topics in Inflationary Cosmology: Reheating, Gauge Fields and Gravitational Waves* ✦ **Kaloian Lozanov**, University of Illinois at Urbana-Champaign

April 27
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The Inner Workings of Starbursts* ✦ **Alberto Bolatto**, University of Maryland

April 29
Institute for Advanced Study Astrophysics Seminar ✦ *R-Process Transients* ✦ **Jennifer Barnes**, Columbia University

May 3
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Getting Ready for Euclid, Rubin and Roman* ✦ **Adam Amara**, Institute of Cosmology and Gravitation, Portsmouth ✦ *General Discussion* ✦ **Kazuyuki Akitsu**, Member, School of Natural Sciences

May 6
Institute for Advanced Study Astrophysics Seminar ✦ *Powerful Activity in Galaxies—the Wonder Years (aka Generation Alpha)* ✦ **Steffi Baum**, University of Manitoba

May 10
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Narrowing the Mass Range of Ultra-light Dark Matter* ✦ **Elisa Ferreira**, Max Planck Institute for Astrophysics, Garching ✦ *Paper Presentation on CosmicRIM* ✦ **Chirag Modi**, Flatiron Institute

May 13
Institute for Advanced Study Astrophysics Seminar ✦ *Physics of Enigmatic Fast Radio Bursts* ✦ **Pawan Kumar**, University of Texas at Austin

May 17
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Bootstrap Rules for Cosmological Correlators* ✦ **Hayden Lee**, Harvard University ✦ *Narrowing the Mass Range of Ultra-light Dark Matter* ✦ **Elisa Ferreira**, Max Planck Institute for Astrophysics

May 24
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Unlocking the Nature of Dark Matter with Gravitational Lensing* ✦ **Cora Dvorkin**, Harvard University ✦ *Massive Galileons and Vainshtein Screening: A Numerical Perspective* ✦ **Daniela Saadeh**, University of Portsmouth

HIGH ENERGY THEORY ACTIVITIES

September 14
High Energy Theory Seminar ✦ *Non-Symmetries, Naturalness, and Two-Dimensional Adjoint QCD* ✦ **Zohar Komargodski**, Simons Center for Geometry and Physics, Stony Brook University

September 18
High Energy Theory Seminar ✦ *Light-Rays and Detectors in Wilson-Fisher Theory* ✦ **Petr Kravchuk**, Member, School of Natural Sciences

September 23
Physics Group Meeting ✦ *A Primer on Quantum Shannon Theory* ✦ **Adam Levine**, Member, School of Natural Sciences

September 28
High Energy Theory Seminar ✦ *The Holographic Map as a Conditional Expectation* ✦ **Thomas Faulkner**, University of Illinois at Urbana-Champaign

September 30
Physics Group Meeting ✦ *Introduction to Min and Max Entropies* ✦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

October 2
High Energy Theory Seminar ✦ *Dispersive CFT Sum Rules* ✦ **Dalimil Mazac**, Member, School of Natural Sciences

October 12
High Energy Theory Seminar ✦ *Compressible Quantum Matter: General Constraints, Emergent Symmetries, and Anomalies* ✦ **Senthil Todadri**, Massachusetts Institute of Technology

October 14
Physics Group Meeting ✦ *Turbulence, CFT and Random Geometry* ✦ **Yaron Oz**, Tel Aviv University; Member, School of Natural Sciences

October 16
High Energy Theory Seminar ✦ *Exact Models of Many-body Quantum Scars* ✦ **Fiona Burnell**, University of Minnesota Twin Cities; Junior Visiting Professor, School of Natural Sciences

October 21
Physics Group Meeting ✦ *Discreteness and Integrality in 2D CFT* ✦ **Sridip Pal**, Member, School of Natural Sciences

October 26
High Energy Theory Seminar ✦ *Leading Order Corrections to the Quantum Extremal Surface Prescription* ✦ **Geoffrey Penington**, University of California, Berkeley

October 28
Physics Group Meeting ✦ *Open Quantum Field Theory and Holography* ✦ **Felix Haehl**, Member, School of Natural Sciences

October 30
High Energy Theory Seminar ✦ *Some Comments on Wormholes and Factorization* ✦ **Phil Saad**, Member, School of Natural Sciences

November 9
High Energy Theory Seminar ✦ *Adventures in Gapless Topological Phases* ✦ **Ryan Thorngren**, Harvard University

November 11
Physics Group Meeting ✦ *Feynman Integrals and Intersection Theory* ✦ **Sebastian Mizera**, Member, School of Natural Sciences

November 13
High Energy Theory Seminar ✦ *Universality in Asymptotic Bounds and their Saturation in 2D CFT* ✦ **Sridip Pal**, Member, School of Natural Sciences

November 23
High Energy Theory Seminar ✦ *Progress on Celestial Holography* ✦ **Andrew Strominger**, Harvard University

December 2
Physics Group Meeting ✦ *Signatures of Global Symmetry Violation in Relative Entropies and Replica Wormholes* ✦ **Henry Lin**, Princeton University

December 7–9
Workshop on Qubits and Black Holes ✦ *Free Energy from Replica Wormholes* ✦ **Netta Engelhardt**, Massachusetts Institute of Technology ✦ *Quantum Tasks in Holography* ✦ **Alex May**, University of British Columbia ✦ *Real-Time Gravitational Replicas* ✦ **Mukund Rangamani**, University of California, Davis ✦ *Pseudorandomness and the AdS/CFT Correspondence* ✦ **Adam Bouland**, University of California, Berkeley ✦ *Liouville and JT Quantum Gravity—Holography and Matrix Models* ✦ **Thomas Mertens**, Ghent University ✦ *Entropic Order Parameters for the Phases of QFT* ✦ **Javier Magan**, Instituto Balseiro, Centro Atómico de Bariloche ✦ *Programmable Non-Local Interactions: Towards Fast Scrambling with Cold Atoms* ✦ **Monika Schleier-Smith**, Stanford University ✦ *Comments about Wormholes and Quantum Noise* ✦ **Douglas Stanford**, Stanford University ✦ *Some Comments on Energy Inequalities* ✦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences ✦ *Inside the Hologram: The Bulk Observer's Experience* ✦ **Lampros Lamprou**, Massachusetts Institute of Technology ✦ *Quantum Minimal Surfaces from Quantum Error Correction* ✦ **Chris Akers**, Massachusetts Institute of Technology ✦ *Life Without Pythons Would Be So Simple* ✦ **Geoffrey Penington**, University of California, Berkeley

December 11
High Energy Theory Seminar ✦ *Twisted Holography and Koszul Duality* ✦ **Natalie Paquette**, Member, School of Natural Sciences

December 14
High Energy Theory Seminar ✦ *Causality and Effective Field Theories* ✦ **Simon Caron-Huot**, McGill University

December 16
Physics Group Meeting ✦ *Mathematical Challenges in Incompressible Hydrodynamics* ✦ **Camillo De Lellis**, IBM von Neumann Professor, School of Mathematics

January 25
High Energy Theory Seminar ✦ *Classical Aspects of Black Hole Interiors* ✦ **Jorrit Kruthoff**, Stanford University

January 27
Physics Group Meeting ✦ *Review of Neural Networks* ✦ **Michail Tsodyks**, C.V. Starr Professor, Simons Center for Systems Biology

January 29
High Energy Theory Seminar ✦ *SQCD and Pairs of Pants* ✦ **Shlomo Razamat**, Technion–Israel Institute of Technology; Junior Visiting Professor, School of Natural Sciences

February 1
High Energy Theory Seminar ✦ *A Categorical and Holographic View of Symmetry* ✦ **Xiao-Gang Wen**, Massachusetts Institute of Technology

February 15
High Energy Theory Seminar ✦ *Fault-Tolerant Qubit from a Constant Number of Components* ✦ **Patrick Hayden**, Stanford University

February 17
Physics Group Meeting ✦ *Probing Strings with Quantum Extremal Surfaces* ✦ **Adam Levine**, Member, School of Natural Sciences

February 19
High Energy Theory Seminar ✦ *Comments on the Quantum Field Theory of the Coulomb Gas Formalism* ✦ **Daniel Kapec**, Member, School of Natural Sciences

February 24
Physics Group Meeting ✦ *CFTs and Wightman Axioms in Higher Dimensions* ✦ **Petr Kravchuk**, Member, School of Natural Sciences

March 1
High Energy Theory Seminar ✦ *Firewalls in General Relativity* ✦ **Surjeet Rajendran**, Johns Hopkins University

March 5
High Energy Theory Seminar ✦ *4d Chern-Simons Theory and a Stringy Point of View on the Bethe/Gauge Correspondence for Superspin Chains* ✦ **Nafiz Ishtiaque**, Member, School of Natural Sciences

March 15
High Energy Theory Seminar ✦ *N=2* SU(2) Supersymmetric Yang-Mills Theory and Four-Manifold Invariants* ✦ **Gregory Moore**, Rutgers, The State University of New Jersey

March 17
Physics Group Meeting ✦ *Towards a String Dual of SYK: An Informal Discussion* ✦ **Herman Verlinde**, Princeton University

March 19
High Energy Theory Seminar ✦ *Size and Momentum of an Infalling Particle in the Black Hole Interior* ✦ **Ying Zhao**, Member, School of Natural Sciences

March 25
Physics Group Meeting ✦ *Tensor Networks and Phases of Matter: A Discussion* ✦ **Fiona Burnell**, University of Minnesota Twin Cities; Junior Visiting Professor, School of Natural Sciences

March 29
High Energy Theory Seminar ✦ *Some Half-Baked Thoughts about de Sitter Space* ✦ **Leonard Susskind**, Stanford University

April 2
High Energy Theory Seminar ✦ *Superconformal Initial Conditions of the Lightcone 6d (2,0) Theory* ✦ **Matthew Heydeman**, Member, School of Natural Sciences

April 7
Physics Group Meeting ✦ *Chaotic Scattering of Highly Excited Strings* ✦ **Vladimir Rosenhaus**, Member, School of Natural Sciences

April 12
High Energy Theory Seminar ✦ *Causal Bulk Reconstruction and the Python's Lunch* ✦ **Arvin Shahbazi-Moghaddam**, Stanford University

April 16
High Energy Theory Seminar ✦ *Spontaneously Broken Boosts in CFTs* ✦ **Sridip Pal**, Member, School of Natural Sciences

April 21
Physics Group Meeting ✦ *Anomalies and Emergent Symmetries on the Lattice and in the Continuum* ✦ **Shu-Heng Shao**, Member, School of Natural Sciences

April 26
High Energy Theory Seminar ✦ *Khovanov Homology from Mirror Symmetry* ✦ **Mina Aganagic**, University of California, Berkeley

April 30
High Energy Theory Seminar ✦ *Worldsheet Correlators in AdS3* ✦ **Lorenz Eberhardt**, Member, School of Natural Sciences

May 3
High Energy Theory Seminar ✦ *Conformal Colliders Meet the LHC* ✦ **Ian Moult**, Stanford University

May 5
Physics Group Meeting ✦ *Review of Measurement-Induced Dynamic Quantum Phase Transitions* ✦ **David Huse**, Princeton University

May 17
High Energy Theory Seminar ✦ *Superstring Amplitudes in Genus 0 and Double Copy* ✦ **Francis Brown**, University of Oxford

June 7
High Energy Theory Seminar ✦ *Quantum Computing and the Difficulty of Simulating Quantum Many-Body Systems* ✦ **Ignacio Cirac**, Max-Planck Institut für Quantenoptik

July 9
High Energy Theory Seminar ✦ *Naturalness and Muon Anomalous Magnetic Moment* ✦ **Keisuke Harigaya**, Member, School of Natural Sciences

July 23
High Energy Theory Seminar ✦ *The p-spin Glass Model: A Holographer's Perspective*✦ **Felix Haehl**, Member, School of Natural Sciences

SIMONS CENTER FOR SYSTEMS BIOLOGY EVENTS

July 16
Mathematical Physics Webinar Rutgers University ✦ *Thermalized sheets, shells and cylinders: curvature matters* ✦ **David Nelson**, Harvard University

August 6
Mathematical Physics Seminar Rutgers University ✦ *Active processes for deriving observed deviations from equilibrium distributions* ✦ **Christian Maes**, KU Leuven

August 20
Mathematical Physics Seminar Rutgers University ✦ *Apparent action-at-a-distance in gene regulation* ✦ **William Bialek**, Princeton University and The City University of New York Graduate Center

September 16
Mathematical Physics Seminar Rutgers University ✦ *Duality and boundary-driven non-equilibrium systems* ✦ **Cristian Giardina**, Modena and Reggio Emilia University

October 13
Cancer Convergence Education Network Seminar ✦ *Understanding cancer evasion of apoptosis and how to restore it to foster precision medicine* ✦ **Joan Montero**, Institute for Bioengineering of Catalonia

October 20
Cancer Convergence Education Network Seminar ✦ *On a "Hunt" for immunogenic neoantigens* (*Cancer-specific gene expression errors as a novel source of shared neoantigens*) ✦ **Vladimir Roudko**, Memorial Sloan Kettering Cancer Center

October 21
Mathematical Physics Seminar Rutgers University ✦ *Sloppy models, differential geometry, and why science works* ✦ **James P. Sethna**, Cornell University

November 3
Cancer Convergence Education Network Seminar ✦ *Harnessing NK cells to the treatment of cancer* ✦ **Michal Sheffer**, Dana Farber Cancer Institute

November 4
Mathematical Physics Seminar Rutgers University ✦ *Dynamical Landscape and Multistability of the Earth's Climate* ✦ **Valerio Lucarini**, University of Reading

November 10
Cancer Convergence Education Network Seminar ✦ *Targeting Repeat RNAs in Cancer* ✦ **Mihir Rajukar**, Harvard University

November 16
Cancer Convergence Education Network Seminar ✦ *Mathematical modeling and control of cancer networks: applications to metastatic reprogramming and cancer drug resistance* ✦ **Jorge Gómez Tejeda Zañudo**, Dana Farber Cancer Institute

November 18
Cancer Convergence Education Network Seminar ✦ *T cell response to SARS-COV-2* ✦ **Harlan Robins**, Adaptive Biotechnologies

November 24
Cancer Convergence Education Network Seminar ✦ *On HLA expression and immune escape* ✦ **Ioan Filip**, Columbia University

November 25
Mathematical Physics Seminar Rutgers University ✦ *Population extinction and growth on a fluctuating fitness seascape* ✦ **Mehran Kardar**, Massachusetts Institute of Technology

December 7
Cancer Convergence Education Network Seminar ✦ *Mobile repeat elements in cancer* ✦ **Alexander Solovyov**, Memorial Sloan Kettering Cancer Center

December 9
Cancer Convergence Education Network Seminar ✦ *Viruses Decoded* ✦ **Raúl Rabadán**, Columbia University

December 15
Cancer Convergence Education Network Seminar ✦ *The evolutionary dynamics and fitness landscape of Clonal Hematopoiesis and Acute Myeloid Leukemia* ✦ **Caroline Watson**, University of Cambridge

January 5
Cancer Convergence Education Network Seminar ✦ *Ex-vivo stimulation of CAR T cell pre-infusion products predicts clinical response in pediatric ALL* ✦ **Steven Woodhouse**, University of Pennsylvania

January 20
Cancer Convergence Education Network Seminar ✦ *Diversity and Similarity in the Adaptive Immune System* ✦ **Yuval Elhanati**, Memorial Sloan Kettering Cancer Center

February 10
Cancer Convergence Education Network Seminar ✦ *COVID-19 genetic arms race: evolution and treatment* ✦ **Mickey Atwal**, Cold Spring Harbor Laboratory/Regeneron

February 10
Mathematical Physics Webinar Rutgers University ✦ *Ecological Chaos and Microbial Diversity* ✦ **Daniel Fisher**, Stanford University

February 17
Mathematical Physics Seminar Rutgers University ✦ *The life and death of turbulence* ✦ **Nigel Goldenfeld**, University of Illinois at Urbana-Champaign

February 24
Mathematical Physics Seminar Rutgers University ✦ *Self-propelled Topological Defects* ✦ **Julia M. Yeomans**, University of Oxford

March 10
Mathematical Physics Seminar Rutgers University ✦ *Modeling sea ice in a warming climate* ✦ **Kenneth M. Golden**, University of Utah

March 17
Mathematical Physics Seminar Rutgers University ✦ *A dynamical model of the visual cortex* ✦ **Lai-Sang Young**, New York University

March 24
Mathematical Physics Seminar Rutgers University ✦ *Active Topology* ✦ **Cristina Marchetti**, University of California, Santa Barbara

March 24
Cancer Convergence Education Network Seminar ✦ *Is aging a genetically-transmitted viral disease?* ✦ **Andrei Gudkov**, Roswell Park Comprehensive Cancer Center

April 21
Mathematical Physics Seminar Rutgers University ✦ *Multiple Equilibria and Resilience in Large Complex Systems: beyond May-Wigner model* ✦ **Yan Fyodorov**, King's College London

May 5
Mathematical Physics Webinar Rutgers University ✦ *Geometry of Concept Manifolds* ✦ **Haim Sompolinsky**, Hebrew University and Harvard University

May 12
Mathematical Physics Seminar Rutgers University ✦ *Statistical physics of learning in neural networks: the importance of data structure* ✦ **Marc Mézard**, Laboratoire de Physique de l'École normale supérieure, PSL University, Paris

May 19
Mathematical Physics Seminar Rutgers University ✦ *Vector computations in the fly brain* ✦ **Larry Abbott**, Columbia University

June 7
Cancer Convergence Education Network Seminar ✦ *Probing Metabolism with Imaging Mass Spectrometry* ✦ **Shawn Davidson**, Princeton University

June 16
Mathematical Physics Seminar Rutgers University ✦ *Entropy and entropoids* ✦ **Daan Frenkel**, University of Cambridge

June 30
Mathematical Physics Seminar Rutgers University ✦ *Analogies and differences between equilibrium and non-equilibrium thermodynamics of classical systems* ✦ **Giovanni Jona-Lasinio**, Sapienza University of Rome

July 12
Cancer Convergence Education Network Informal Talks from Convergence 3 ✦ *Probing tumor-immune interactions using organoid-based cancer models* ✦ **Tyler Jacks**, Massachusetts Institute of Technology ✦ *Probing tumor metabolism using Iso-imaging* ✦ **Shawn Davidson**, Princeton University ✦ *The p53 proline domain: hot spot mutations, phenotypes and protein protein interactions* ✦ **Arnold J. Levine**, Professor Emeritus, School of Natural Sciences

July 19–20
Cancer Convergence Education Network Workshop on Cancer Interception ✦ *Understanding blood cancers through the lens of evolution* ✦ **Jamie Blundell**, University of Cambridge ✦ *Random Matrix Theory* ✦ **Raúl Rabadán**, Columbia University ✦ *Decoding the Tumor Immune Microenvironment of Human Lung Cancer* ✦ **Kurt Schalper**, Yale University ✦ *T cell Receptors, AI and Cancer* ✦ **Harlan Robins**, Adaptive Biotechnologies ✦ *Rethinking Cancer Diagnosis and Cure with AI* ✦ **Regina Barzilay**, Massachusetts Institute of Technology ✦ *AI Driven Molecular Design and Therapeutics* ✦ **Tommi Jaakkola**, Massachusetts Institute of Technology ✦ *Multiomic Single Cell Sequencing Facilitates Accurate Deep Learning Prediction of TCR-Antigen Binding* ✦ **Mickey Atwal**, CSHL/Regeneron ✦ *Detect and treat: A Theranostic Approach* ✦ **Julie Sutcliffe**, University of California, Davis ✦ *First and Next Deneratin KRAS Inhibitors* ✦ **Kevan Shokat**, University of California, San Francisco ✦ *Considerations for Health Disparities and Economic Outcomes* ✦ **Cathy Bradley**, University of Colorado ✦ *Improved Survival but Continued Disparities in Cancer: Planning the Future with Precision Oncology but Assessing the Past through the Rear-View Mirror* ✦ **Edith Mitchell**, Sidney Kimmel Cancer Center, Thomas Jefferson University ✦ *New Technologies; Geographies of Inequality* ✦ **Barbara Harthorn**, University of California, Santa Barbara ✦ *Towards a World without Disease* ✦ **William Hait**, J&J Innovation ✦ *Novel instrumentation for cancer research* ✦ **Scott Manalis**, Massachusetts Institute of Technology ✦ *Inducing Antigen-specific T cells with Engineered Commensals* ✦ **Michael Fischbach**, Stanford University ✦ *Single Cell Sequencing Uncovers the Immune System's Response to Tumors* ✦ **Drew Pardoll**, Johns Hopkins Medical School

July 26
Cancer Convergence Education Network Informal Talks from Convergence 3 ✦ *Some recent organoids models for human diseases* ✦ **Hans Clevers**, Hubrecht Institute, Utrecht ✦ *The influence of the microbiota on tumor development* ✦ **Kenya Honda**, Keio University ✦ *Understanding human cancer biology using organoids* ✦ **Toshiro Sato**, Keio University

July 28
Cancer Convergence Education Network Informal Talks from Convergence 3 ✦ *Modeling microbe-human interactions at the intestinal mucosa* ✦ **Man-Wah Tan**, Genentech ✦ *Novel instrumentation for cancer research* ✦ **Scott Manalis**, Massachusetts Institute of Technology ✦ *Organoid modeling of intra-tumoral and peripheral immune interactions* ✦ **Calvin Kuo**, Stanford University ✦ *Dissecting plasticity in advanced human cancer* ✦ **Karuna Ganesh**, Memorial Sloan Kettering Cancer Center ✦ *Inducing antigen-specific T cells with engineered commensals* ✦ **Michael Fischbach**, Stanford University

August 11
Mathematical Physics Seminar Rutgers University ✦ *What can Maxwell's demon do? An experimental and theoretical study of the factors that limit the performance of information-fueled engines* ✦ **John Bechhoefer**, Simon Fraser University

August 25
Mathematical Physics Seminar Rutgers University ✦ *Embedding of Low-Dimensional Attractor Manifolds by Neural Networks* ✦ **Remi Monasson**, École normale supérieure, Paris

September 1
Mathematical Physics Seminar Rutgers University ✦ *Population Dynamics in Neural Systems* ✦ **Sara A. Solla**, Northwestern University

Another seminar series which the Members in the Simons Center for Systems Biology group attended on regular basis were the seminars at the Center for Studies in Physics and Biology at the Rockefeller University. See these links for more information and a link to the two attached Rockefeller sites.

https://www.rockefeller.edu/research/interdisciplinary-centers/center-studies-physics-biology/seminars/

https://www.rockefeller.edu/research/interdisciplinary-centers/center-studies-physics-biology/past-seminars/

School of Social Science

September 8
Science and the State Theme Seminar
Orientation Session

September 17
Social Science Introductory Session
Social Science Welcome Party

September 21
Social Science Seminar ✦ *The Scientist-in-Chief: Executive Authority and Technocratic Charisma in the Obama Administration* ✦ **Alondra Nelson**, Harold F. Linder Professor, School of Social Science

September 22
Science and the State Theme Seminar ✦ *Science, Technology and the State: Inextricable and Co-Emergent* ✦ Readings curated by **Alondra Nelson**, Harold F. Linder Professor, School of Social Science, and **Charis Thompson**, London School of Economics; Visiting Professor, School of Social Science

September 28
Social Science Seminar ✦ *Justification and Vindication in Ethics and Politics* ✦ **David Owen**, University of Southampton; Visiting Professor, School of Social Science

October 5
Social Science Seminar ✦ *How Scientific Knowledge and Ignorance Build Non-issues. The Non-emergence of Environmental and Occupational Health Issues* ✦ **Emmanuel Henry**, Université Paris-Dauphine; Member, School of Social Science

October 6
Science and the State Theme Seminar ✦ *Territory and Borders* ✦ Readings curated by **Joshua Barkan**, University of Georgia; Member, School of Social Science, and **David Owen**, University of Southampton; Visiting Professor, School of Social Science

October 12
Social Science Seminar ✦ *Cyrus Eaton and the Battle over Pugwash Internationalism, 1957–1962* ✦ **Waqar H. Zaidi**, Lahore University of Management Sciences; Member, School of Social Science

October 19
Social Science Seminar ✦ *Intimate Inscriptions: Race, Sex, Labor and the Survival of the Feudal* ✦ **Anne Norton**, University of Pennsylvania; Member, School of Social Science

October 20
Science and the State Theme Seminar ✦ *State and Quantification* ✦ Readings curated by **Florence Jany-Catrice**, Université de Lille, and **Joy Rohde**, University of Michigan, Ann Arbor; Members, School of Social Science

October 23
Special Seminar ✦ **Nicholas Lemann**, Columbia University

October 26
Social Science Seminar ✦ *High Rises. When "Social Integration" Makes "Violent Divisions"* ✦ **Fabien Truong**, Université Paris 8; Member, School of Social Science

October 30
On Violence Reading Group ✦ Organized by **Nusrat Chowdhury**, Amherst College; Member, School of Social Science

November 2
Social Science Seminar ✦ *"Modern Life Begins with Slavery": Toni Morrison and the Imagination of Freedom* ✦ **Lawrie Balfour**, University of Virginia; Member, School of Social Science

November 3
Science and the State Theme Seminar ✦ *U.S. Election Day and the Future of the Political* ✦ Readings curated by **Alondra Nelson**, Harold F. Linder Professor, School of Social Science, and **Charis Thompson**, London School of Economics; Visiting Professor, School of Social Science

November 9
Social Science Seminar ✦ *Master Peace: Violence, Expertise and Subject Formation in Lebanon* ✦ **Nikolas Kosmatopoulos**, American University of Beirut; Member, School of Social Science

November 13
On Violence Reading Group ✦ Organized by **Nusrat Chowdhury**, Amherst College; Member, School of Social Science

November 16
Social Science Seminar ✦ *A Political Economy of Macroeconomic Indicators. Increasingly Discreet Conflicts around the Measurement of Inflation* ✦ **Florence Jany-Catrice**, Université de Lille; Member, School of Social Science

November 17
Science and the State Theme Seminar ✦ *Corporations, States, and Technoscience* ✦ Readings curated by **Emmanuel Henry**, Université Paris-Dauphine, and **Christo Sims**, University of California, San Diego; Members, School of Social Science

November 23
Social Science Seminar ✦ *Workers, the Fascist Allure, and the Transformation of the Left* ✦ **David Ost**, Hobart and William Smith Colleges; Member, School of Social Science

November 30
Social Science Seminar ✦ *Knowledge, Behaviour, and Policy. Questioning the Epistemic Presuppositions of Behavioural Public Policymaking* ✦ **Magdalena Małecka**, University of Helsinki; Member, School of Social Science

December 1
Science and the State Theme Seminar ✦ *Climate Change and the State* ✦ Readings curated by **Alondra Nelson**, Harold F. Linder Professor, School of Social Science, **Ryo Morimoto**, Princeton University, and **Sarah E. Vaughn**, University of California, Berkeley; Members, School of Social Science

December 7
Social Science Seminar ✦ *Mekonsippi: The Politics and Poetics of Black Anti-Vietnam War Activism* ✦ **Robyn C. Spencer**, Lehman College, The City University of New York; Member, School of Social Science

December 8
Reading Group organized by **Alondra Nelson**, Harold F. Linder Professor, School of Social Science

December 11
On Violence Reading Group ✦ Organized by **Nusrat Chowdhury**, Amherst College; Member, School of Social Science

December 14
Social Science Seminar ✦ *Computation, Evolution, Construction: Three Tools for Re-Imagining the Social* ✦ **Jacob Gates Foster**, University of California, Los Angeles; Member, School of Social Science

December 15
Science and the State Theme Seminar ✦ *Science and the State in Times of Covid-19* ✦ Readings curated by **Diana Graizbord**, University of Georgia, and **Sonja van Wichelen**, University of Sydney; Members, School of Social Science

January 25
Social Science Seminar ✦ *We Are Become Life: From Existential Threat to Selecting Society* ✦ **Charis Thompson**, London School of Economics; Visiting Professor, School of Social Science

January 26
Science and the State Theme Seminar ✦ *Debrief with the Newly-Appointed Deputy Director for Science and Society in the Biden-Harris Administration* ✦ **Alondra Nelson**, Harold F. Linder Professor, School of Social Science

February 1
Social Science Seminar ✦ *Indications of Democracy: Evaluation Expertise and the Politics of Accountability in Mexico* ✦ **Diana Graizbord**, University of Georgia; Member, School of Social Science

February 8
Social Science Seminar ✦ *Enlightenment Against Political Economy* ✦ **Arnaud Orain**, Université Paris 8; Joint Member, School of Historical Studies and School of Social Science

February 9
Science and the State Theme Seminar ✦ *Extraction, Circulation, Capitalism* ✦ Readings curated by **Nikolas Kosmatopoulos**, American University of Beirut, and **Waqar H. Zaidi**, Lahore University of Management Sciences; Members, School of Social Science

February 16
Social Science Seminar ✦ *Staying in Place: The Colored Methodist Episcopal Church and the Law of Property after the American Civil War* ✦ **Sarah Barringer Gordon**, University of Pennsylvania; Member, School of Social Science

Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Emmanuel Henry**, Université Paris-Dauphine; Member, School of Social Science

February 22
Social Science Seminar ✦ *Facing Authority: A Theory of Political Legitimacy* ✦ **Thomas Fossen**, Leiden University; Member, School of Social Science

February 23
Science and the State Theme Seminar ✦ *Behavioral Sciences, Social Policy, and the State* ✦ **Holger Straßheim**, Universität Bielefeld ✦ Readings curated by **Diana Graizbord**, University of Georgia, and **Magdalena Małecka**, University of Helsinki; Members, School of Social Science

March 1
Social Science Seminar ✦ *The Garden in the Machine: Architectural Politics in an Age of Climate Catastrophe* ✦ **Christo Sims**, University of California, San Diego; Member, School of Social Science

March 2
Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Diana Graizbord**, University of Georgia; Member, School of Social Science

March 8
Social Science Seminar ✦ *Mobs and Megaprojects: Rumor and the Political Life of Development in Bangladesh* ✦ **Nusrat Chowdhury**, Amherst College; Member, School of Social Science

March 9
Science and the State Theme Seminar ✦ *Method, Scale and Responsibility: Between the Local and the Planetary* ✦ **Anna L. Tsing**, University of California, Santa Cruz ✦ Readings curated by **Joshua Barkan**, University of Georgia, **Joy Rohde**, University of Michigan, Ann Arbor, **Christo Sims**, University of California, San Diego, and **Sonja van Wichelen**, University of Sydney; Members, School of Social Science

March 15
Social Science Seminar ✦ *A Genealogy of International Concessions: Legal Framings of the Corporate Control of Land* ✦ **Joshua Barkan**, University of Georgia; Member, School of Social Science

March 16
Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Christo Sims**, University of California, San Diego; Member, School of Social Science

March 22
Social Science Seminar ✦ *Machines of Government: Computers, Social Science, and American Democracy since 1945* ✦ **Joy Rohde**, University of Michigan, Ann Arbor; Member, School of Social Science

March 22–26
Summer Program in Social Science (Virtual Sessions)

March 23
Science and the State Theme Seminar ✦ *The Crisis of Expertise* ✦ **Gil Eyal**, Columbia University ✦ Readings curated by **Emmanuel Henry**, Université Paris-Dauphine and **Christo Sims**, University of California, San Diego; Members, School of Social Science, and **Alondra Nelson**, Harold F. Linder Professor, School of Social Science

March 29
Social Science Seminar ✦ *The Nuclear Ghost: Atomic Livelihood in Fukushima's Gray Zone* ✦ **Ryo Morimoto**, Princeton University; Member, School of Social Science

March 30
Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Jacob Gates Foster**, University of California, Los Angeles; Member, School of Social Science

April 2
Special Seminar ✦ *Ecological New Deal and Sovereign Debts in the Euro Zone* ✦ **Gaël Giraud**, Georgetown University

April 5
Social Science Seminar ✦ *The Limits to Computational Growth: Databases and Climate Change in the Caribbean* ✦ **Sarah E. Vaughn**, University of California, Berkeley; Member, School of Social Science

April 6
Science and the State Theme Seminar ✦ *The Nuclear State and Non-"Western" Science* ✦ **Abena Osseo-Asare**, University of Texas at Austin ✦ Readings curated by **Ryo Morimoto**, Princeton University; Member, School of Social Science; **Charis Thompson**, London School of Economics; Visiting Professor, School of Social Science; and **Alondra Nelson**, Harold F. Linder Professor, School of Social Science

April 8
Special Seminar ✦ *Science on a Mission: How Military Funding Shaped What We Do and Don't Know about the Ocean* ✦ **Naomi Oreskes**, Harvard University

April 12
Social Science Seminar ✦ *Injustice and Inequality in the Law: Legal Financial Obligations and Everyday Life* ✦ **Leslie Paik**, City College, The City University of New York; Member, School of Social Science

April 13
Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Joy Rohde**, University of Michigan, Ann Arbor; Member, School of Social Science

April 19
Social Science Seminar ✦ *The Piety of Terrorists: Islamic Translations of Violence in Terrorism Trials* ✦ **Aisha Ghani**, University of Minnesota Twin Cities; Member, School of Social Science

April 20
Science and the State Theme Seminar ✦ *Future States of Science and Capital* ✦ **Timothy Mitchell**, Columbia University ✦ Readings curated by **Nikolas Kosmatopoulos**, American University of Beirut; Member, School of Social Science, **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science, and **Alondra Nelson**, Harold F. Linder Professor, School of Social Science

April 26
Social Science Seminar ✦ *Corporeal Contentions* ✦ **Banu Bargu**, University of California, Santa Cruz; Member, School of Social Science

May 3
Social Science Seminar ✦ *Guiltlessly Guilty: Industrialized Animal Agriculture (and the Atomic Bomb) in an Age of Complicity* ✦ **Timothy Pachirat**, University of Massachusetts Amherst; Member, School of Social Science

May 4
Science and the State Theme Seminar ✦ Capstone Session ✦ **Audra Wolfe**

May 10
Social Science Seminar ✦ *After Biosovereignty: The Material Transfer Agreement in the Global South* ✦ **Sonja van Wichelen**, University of Sydney; Member, School of Social Science

May 11
Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Florence Jany-Catrice**, Université de Lille; Member, School of Social Science

May 18
Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Leslie Paik**, City College, The City University of New York; Member, School of Social Science

May 25
Science and Expertise Reading/Writing Group ✦ Discussion of paper submitted by **Sonja van Wichelen**, University of Sydney; Member, School of Social Science

Director's Office Events

July 16
Friends Talk ✦ *ATOMIC SPY: The Dark Lives of Klaus Fuchs* ✦ **Nancy Greenspan**

September 21
Virtual Welcome Day

September 29
Friends Virtual Talk ✦ Virtuosity, Season 2 ✦ **David Lang**, IAS Artist-in-Residence

October 1
Virtual Artist Salon ✦ *An American Tragedy: How we Abandoned the Elderly during Covid-19* ✦ **Frank Snowden**

October 16
Friends Lunch with a Member ✦ *Giving the Past a Digital Squeeze* ✦ **Aaron Hershkowitz**, Research Associate, School of Historical Studies

October 17
Edward T. Cone Concert Series ✦ *Music for Multiple Cellos* ✦ **Maya Beiser**

October 22
Public Policy Lecture ✦ *The Financial Economy: Where It Came from and What Might Come Next* ✦ **Nicholas Lemann**, Columbia University

October 24
Family Mathematics Talk ✦ *Life on the Infinite Farm* ✦ **Richard Schwartz**, Member, School of Mathematics

October 27
In Conversation with Labyrinth Books and IAS ✦ *Dissimilar Similitudes: Devotional Objects in Late Medieval Europe* ✦ **Caroline Walker Bynum**, Professor Emerita, School of Historical Studies; and **Brook A. Holmes**, Member, School of Historical Studies

October 28
Friends Virtual Talk ✦ *Testing Einstein's Theory of Gravity Using the First Image of a Black Hole* ✦ **Lia Medeiros**, NSF Astronomy and Astrophysics Fellow, School of Natural Sciences

October 31
Public Lecture ✦ *Risk and Credit 500 Years Before Modern France* ✦ **Francesca Trivellato**, Andrew W. Mellon Professor, School of Historical Studies

November 5
Artist Salon featuring **Alex Ross**

November 9
In Conversation with Labyrinth Books and IAS ✦ *On the Judgment of History* ✦ **Yve-Alain Bois**, Professor, School of Historical Studies; **Hal Foster**, Princeton University

November 13
Friends Lunch with a Member ✦ *Tantalizing Unsolved Problems* ✦ **Richard Schwartz**, Member, School of Mathematics

November 21
Edward T. Cone Concert Series ✦ *The Piano Equation* ✦ **Matthew Shipp**

December 2
In Conversation with Labyrinth Books and IAS ✦ *Brutal Aesthetics: Dubuffet, Bataille, Jorn, Paolozzi, Oldenburg* ✦ **Yve-Alain Bois**, Professor, School of Historical Studies; **Hal Foster**, Princeton University

December 3
Artist Salon ✦ *Readings from an In-Progress Verse Translation of The Iliad* ✦ **Emily Wilson**

December 11
Friends Lunch with a Member ✦ *Toni Morrison and the Revolutionary Work of Words* ✦ **Lawrie Balfour**, Friends of the Institute Member, School of Social Science

January 11
Virtual Welcome Hour for Term 2 Members

January 11
Virtual Talk given by Friend of the Institute, **Richard Preston**

February 4
Artist Salon ✦ *A Discussion with the Architects of Barack Obama's Presidential Center* ✦ **Billie Tsien** and **Tod Williams**, Founding Partners, Tod Williams Billie Tsien Architects

February 6
Family Science Talk ✦ *Black Holes* ✦ **Robbert Dijkgraaf**, IAS Director and Leon Levy Professor

February 19
Friends Lunch with a Member ✦ *Toward a Social Science of the Possible* ✦ **Jacob Gates Foster**, Infosys Member, School of Social Science

March 4
Artist Salon ✦ *Brutal Aesthetics—Dubuffet, Bataille, Jorn, Paolozzi, Oldenburg* ✦ **Hal Foster**, Princeton University

March 12
Friends Lunch with a Member ✦ *Sums of Four Squares and Beyond* ✦ **Tony Feng**, Friends of the Institute Member, School of Mathematics

March 17
Abel Prize Ceremony ✦ Community Celebration for Avi Wigderson ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

March 20
Edward T. Cone Concert Series ✦ *Other Rooms* ✦ **Pamela Z**

March 24
Friends Virtual Talk ✦ *Using Galactic Clocks to Map Dark Matter* ✦ **Sukanya Chakrabarti**, Member, School of Natural Sciences

April 7
Public Policy Lecture ✦ *Can Science Be Saved?* ✦ **Naomi Oreskes**, Henry Charles Lea Professor of the History of Science, Harvard University

April 13
Usefulness of Useless Knowledge ✦ **Robbert Dijkgraaf**, IAS Director and Leon Levy Professor

April 16
Friends Lunch with a Member ✦ *When Rome is not Rome* ✦ **John North Hopkins**, Friends of the Institute Member, School of Historical Studies

April 24
Edward T. Cone Concert Series ✦ *Middleground* ✦ **Jasper String Quartet**

April 30
Friends Lunch with a Member ✦ **Dalimil Mazac**, Founders' Circle Member, School of Natural Sciences

May 6
Public Lecture ✦ *Imitation Games* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

May 13
Artist Salon ✦ *Resist COVID/Take 6!* ✦ **Carrie Mae Weems**

June 15
End of Term Party (in-person)

Digital Scholarship @IAS

September 10
Digital Scholarship Conversations ✦ *HathiTrust Research Center Tools and Services* ✦ **Ryan Dubnicek**, HathiTrust Research Center

November 12
Digital Scholarship Conversations ✦ *Workshop on using Overleaf* ✦ **Overleaf** Technical Support Team.

April 9
Digital Scholarship Conversation ✦ *A Virtual Open House to Krateros* ✦ **Aaron Hershkowitz**, Manager, Krateros Project, School of Historical Studies

Program in Interdisciplinary Studies

AFTER HOURS CONVERSATIONS

October 1
How the Inside of a Black Hole Can Secretly Be on the Outside ✦ **Ahmed Almheiri**, Member, School of Natural Sciences

October 8
Modernism and Mathematics ✦ **Remy van Dobben de Bruyn**, Veblen Research Instructor, School of Mathematics

October 15
Conceiving the Global North Atlantic: Arthurian Literature and the Medieval Borders ✦ **Nahir Otaño Gracia**, Member, School of Historical Studies

October 29
The Telescope with 48 Eyes: Unveiling New Phenomena in our Universe with Lenses You Can Buy on Amazon ✦ **Shany Danieli**, Member, School of Natural Sciences

November 5
The Latinx Files: Race, Migration, and the Space Alien ✦ **Matthew Goodwin**, Visitor, School of Historical Studies

November 12
What We Owe to Refugees ✦ **David Owen**, Visiting Professor, School of Social Science

November 19
Bad Proofs of Good Theorems ✦ **Richard Schwartz**, Member, School of Mathematics

February 4
The Rhetoric of Rage: Challenging Injustice in Medieval Lyrics and Black Women's Protest Movements ✦ **Carissa Harris**, Member, School of Historical Studies

February 11
Flaring Heart of the Galaxy ✦ **Lena Murchikova**, Member, School of Natural Sciences

February 18
"Growth and Beyond": Why Measuring Progress Remains a Challenge? ✦ **Florence Jany-Catrice**, Member, School of Social Science

February 25
Multiplicity in Mathematical Literature from Bernhard Riemann to Italo Calvino ✦ **Philip Ording**, Visitor, Program in Interdisciplinary Studies

March 4
Using Machine Learning to Find Hidden Patterns in Violent Deaths ✦ **Jacob Gates Foster**, Infosys Member, School of Social Science

March 11
Building a Quantum Computer: A Mathematical Reflection ✦ **Terrence Blackman**, Visitor, School of Mathematics

March 18
Corporeal Contentions: What Can We Learn from Self-Injury as Protest? ✦ **Banu Bargu**, Member, School of Social Science

March 25
Human Memory Through the Prism of Mathematics ✦ **Misha Tsodyks**, C.V. Starr Professor, School of Natural Sciences

ACKNOWLEDGMENTS

(for the year ended June 30, 2021)

Each year, IAS convenes scholars to advance research across four Schools. With the freedom to follow their curiosity and collaborate with their colleagues, these scholars develop a deeper understanding of our world and the human experience. The gift of time at IAS is made possible with the support of an international network of philanthropic partners. We are extremely grateful to the individuals and organizations listed below for their visionary commitment and contributions. In fiscal year 2020–21, gifts and pledges to the endowment and IAS Fund for operating support totaled more than $49 million.

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Institute for Advanced Study—
Louis Bamberger and Mrs. Felix Fuld Foundation

Financial Statements
June 30, 2021 and 2020

(With Independent Auditors' Report Thereon)

Independent Auditors' Report

The Board of Trustees
Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation:

We have audited the accompanying financial statements of the Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation, which comprise the statements of financial position as of June 30, 2021 and 2020, and the related statements of activities and cash flows for the years then ended, and the related notes to the financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with U.S. generally accepted accounting principles; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation as of June 30, 2021 and 2020, and the changes in its net assets and its cash flows for the years then ended, in accordance with U.S. generally accepted accounting principles.

KPMG LLP

October 29, 2021

STATEMENTS OF FINANCIAL POSITION
JUNE 30, 2021 AND 2020

Assets		2021	2020
Cash and cash equivalents	$	18,197,439	3,814,747
Accounts receivable and other assets		2,971,032	3,933,664
Grants receivable		1,541,672	2,050,628
Contributions receivable, net		4,626,837	7,612,551
Mortgages receivable		3,499,626	5,244,841
Funds held by bond trustee		740,099	886,567
Operating lease right-of-use asset		119,919	—
Land, buildings and improvements, equipment, and rare book collection, net		134,599,181	134,365,491
Investments		1,133,411,467	806,966,477
Total assets	$	1,299,707,272	964,874,966
Liabilities and Net Assets			
Liabilities:			
Accounts payable and accrued expenses	$	11,737,370	10,880,698
Deferred revenue		10,023,764	10,330,177
Finance lease liability		2,183,672	—
Operating lease liability		119,919	—
Liabilities under split-interest agreements		1,508,768	1,333,720
Postretirement benefit obligation		22,078,537	24,618,666
Asset retirement obligation		1,230,146	1,198,947
Bond swap liability		2,371,138	3,323,339
Long-term debt, net		79,574,429	83,825,749
Total liabilities		130,827,743	135,511,296
Net assets:			
Net assets without donor restrictions:			
Undesignated		283,061,331	210,745,901
Designated for specific purposes		189,871,765	133,883,663
Total net assets without donor restrictions		472,933,096	344,629,564
Net assets with donor restrictions:			
Purpose restricted		405,966,969	225,473,040
Endowment fund corpus		289,979,464	259,261,066
Total net assets with donor restrictions		695,946,433	484,734,106
Total net assets		1,168,879,529	829,363,670
Total liabilities and net assets	$	1,299,707,272	964,874,966

See accompanying notes to financial statements.

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2021

	Without donor restrictions	With donor restrictions	Total
Operating revenues, gains, and other support:			
Private contributions and grants	$ 8,356,258	37,909,407	46,265,665
Government grants	—	4,733,371	4,733,371
Investment income, net	142,656,645	201,864,410	344,521,055
Auxiliary activity	2,943,143	—	2,943,143
Net assets released from restrictions— satisfaction of program restrictions	33,294,861	(33,294,861)	—
Total operating revenues, gains, and other support	187,250,907	211,212,327	398,463,234
Operating expenses:			
School of Mathematics	10,042,850	—	10,042,850
School of Natural Sciences	12,087,171	—	12,087,171
School of Historical Studies	8,945,741	—	8,945,741
School of Social Science	3,607,600	—	3,607,600
Libraries and other academic	3,825,773	—	3,825,773
Administration and general	16,029,563	—	16,029,563
Auxiliary activity	9,548,245	—	9,548,245
Total operating expenses	64,086,943	—	64,086,943
Change in net assets from operating activities	123,163,964	211,212,327	334,376,291
Nonoperating activities:			
Change in fair value of bond swap liability	952,201	—	952,201
Gain on sale of plant assets	471,985	—	471,985
Other components of net periodic pension cost	3,715,382	—	3,715,382
Total nonoperating activities	5,139,568	—	5,139,568
Change in net assets	128,303,532	211,212,327	339,515,859
Net assets—beginning of year	344,629,564	484,734,106	829,363,670
Net assets—end of year	$ 472,933,096	695,946,433	1,168,879,529

See accompanying notes to financial statements.

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2020

	Without donor restrictions	With donor restrictions	Total
Operating revenues, gains, and other support:			
Private contributions and grants	$ 52,000	25,804,143	25,856,143
Government grants	—	5,237,232	5,237,232
Investment income, net	19,932,768	24,119,369	44,052,137
Auxiliary activity	3,986,852	—	3,986,852
Net assets released from restrictions— satisfaction of program restrictions	38,036,354	(38,036,354)	—
Total operating revenues, gains, and other support	62,007,974	17,124,390	79,132,364
Operating expenses:			
School of Mathematics	11,411,097	—	11,411,097
School of Natural Sciences	12,672,231	—	12,672,231
School of Historical Studies	9,432,277	—	9,432,277
School of Social Science	3,975,617	—	3,975,617
Libraries and other academic	4,550,307	—	4,550,307
Administration and general	16,993,017	—	16,993,017
Auxiliary activity	10,082,297	—	10,082,297
Total operating expenses	69,116,843	—	69,116,843
Change in net assets from operating activities	(7,108,869)	17,124,390	10,015,521
Nonoperating activities:			
Change in fair value of bond swap liability	(534,395)	—	(534,395)
Gain on sale of plant assets	326,989	—	326,989
Other components of net periodic pension cost	(4,082,325)	—	(4,082,325)
Total nonoperating activities	(4,289,731)	—	(4,289,731)
Change in net assets	(11,398,600)	17,124,390	5,725,790
Net assets—beginning of year	356,028,164	467,609,716	823,637,880
Net assets—end of year	$ 344,629,564	484,734,106	829,363,670

See accompanying notes to financial statements.

STATEMENTS OF CASH FLOWS
YEARS ENDED JUNE 30, 2021 AND 2020

		2021	2020
Cash flows from operating activities:			
Change in net assets	$	339,515,859	5,725,790
Adjustments to reconcile change in net assets to net cash used in operating activities:			
Depreciation of plant assets		7,296,690	6,955,181
Contributions restricted for endowment and plant		(31,006,625)	(6,458,360)
Net appreciation on investments		(354,057,061)	(46,980,004)
Change in fair value of bond swap liability		(952,201)	534,395
Gain on sale of plant assets		(471,985)	(326,989)
Amortization of debt issuance costs		53,738	58,034
Amortization of bond discount		19,942	21,926
Amortization of finance right-of-use assets		518,080	—
Noncash lease expense		191,201	—
Changes in assets/liabilities:			
Receivables and other assets		3,216,803	(58,236)
Contributions receivable		2,985,714	8,338,582
Beneficial interest in remainder trust		—	1,968
Accounts payable and accrued expenses		856,672	1,446,845
Operating lease liability		(191,201)	—
Deferred revenue		(306,413)	2,976,396
Postretirement benefit obligation		(2,540,129)	5,033,884
Asset retirement obligation		31,199	26,584
Net cash used in operating activities		(34,839,717)	(22,704,004)
Cash flows from investing activities:			
Proceeds from sale of plant assets		1,241,418	1,489,392
Purchase of plant assets		(8,817,893)	(12,225,429)
Proceeds from sale of investments		332,397,452	292,127,469
Purchase of investments		(304,785,381)	(261,988,594)
Net cash provided by investing activities		20,035,596	19,402,838
Cash flows from financing activities:			
Contributions restricted for endowment and plant		31,006,625	6,458,360
Increase (decrease) in liabilities under split-interest agreements		175,048	(182,329)
Increase in finance lease liability		2,920,444	—
Principal payments on finance leases		(736,772)	—
Principal payments on long-term debt		(4,325,000)	(4,275,000)
Net cash provided by financing activities		29,040,345	2,001,031
Net increase (decrease) in cash, cash equivalents and restricted cash		14,236,224	(1,300,135)
Cash, cash equivalents and restricted cash—beginning of year		4,701,314	6,001,449
Cash, cash equivalents and restricted cash—end of year	$	18,937,538	4,701,314
Reconciliation of total cash, cash equivalents and restricted cash reported within the statements of financial position that sum to the total of the same such amounts shown above:			
Cash and cash equivalents	$	18,197,439	3,814,747
Funds held by bond trustee		740,099	886,567
Total cash, cash equivalents and restricted cash shown above	$	18,937,538	4,701,314
Supplemental data:			
Interest paid	$	2,871,358	3,073,691
Acquisition of equipment through finance leases		2,920,444	—
Right-of-use assets acquired under operating leases		311,120	—

See accompanying notes to financial statements.

(1) Organization and Summary of Significant Accounting Policies

(a) Organization

The Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation (the Institute), an independent, private institution devoted to the encouragement, support, and patronage of learning, was founded in 1930 as a community of scholars where intellectual inquiry could be carried out in the most favorable circumstances.

Focused on mathematics and classical studies at the outset, the Institute today consists of the School of Historical Studies, the School of Mathematics, the School of Natural Sciences, and the School of Social Science. Each school has a small permanent faculty, and some 190 fellowships are awarded annually to members visiting the Institute from other research institutions and universities throughout the world.

The Founders' original letter to the first trustees described the objectives of the Institute as follows: "The primary purpose is the pursuit of advanced learning and exploration in fields of pure science and high scholarship to the utmost degree that the facilities of the institution and the ability of the faculty and students will permit."

(b) Summary of Significant Accounting Policies

Basis of Presentation

The accompanying financial statements, which are presented on the accrual basis of accounting, have been prepared to focus on the Institute as a whole and to present net assets and revenues, expenses, gains, and losses based on the existence or absence of donor-imposed restrictions. Accordingly, net assets and changes therein are classified as follows:

- Without Donor Restrictions—Net assets not subject to donor-imposed stipulations. Net assets without donor restrictions may be designated for specific purposes by action of the Board of Trustees.
- With Donor Restrictions—Net assets subject to donor-imposed restrictions that will be met either by actions of the Institute or the passage of time. Also included in this category are net assets subject to donor-imposed restrictions to be maintained permanently by the Institute, including gifts and pledges wherein donors stipulate that the corpus of the gift be held in perpetuity and that only the income be made available for specific purposes. Other restricted items in this net asset category include annuity and life income gifts for which the ultimate purpose of the proceeds is subject to donor-imposed restrictions.

Revenues are reported as increases in net assets without donor restrictions unless use of the related asset is limited by donor-imposed restrictions. Expenses are reported as decreases in net assets without donor restrictions. Expiration of donor-imposed restrictions that simultaneously increase net assets without donor restrictions and decrease net assets with donor restrictions are reported as net assets released from restrictions.

In the statements of activities, the Institute includes in operations all revenue and expenses that are an integral part of its program and supporting activities. Change in the fair value of bond swap liability, gain on sale of plant assets and other components of net periodic pension cost are recognized as nonoperating activities.

(i) Cash and Cash Equivalents

Cash and cash equivalents consist of cash on hand and all highly liquid investments with an original maturity of three months or less, except for those managed as a component of the Institute's investment portfolio.

(ii) Mortgages Receivable

The Institute regularly offers first mortgages on primary residences to full-time faculty and senior administrative employees who have met certain requirements stipulated by the Board of Trustees.

(iii) Investments

Investments in marketable securities are reported in the financial statements at fair value based on published market quotations. Investments in limited partnerships and hedge funds are reported in the financial statements at estimated fair value using net asset value (NAV) or its equivalent as a practical expedient, based upon values provided by external investment managers or general partners, unless it is probable that all or a portion of the investment will be sold for an amount different from NAV. The Institute reviews and evaluates the

values provided by external investment managers and general partners and agrees with the valuation methods and assumptions used in determining the fair value of funds. These estimated fair values may differ significantly from the values that would have been used had a ready market for these securities existed. As of June 30, 2021 and 2020, the Institute had no plans or intentions to sell investments at amounts different from NAV.

The statements of activities recognize unrealized gains and losses on investments as increases and decreases, respectively, in net assets without donor restrictions unless their use is restricted by explicit donor stipulation or law. Gains and losses on the sale of investment securities are calculated using the specific-identification method.

(iv) Fair Value Measurements

Fair value is defined as the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. The fair value hierarchy requires an entity to maximize the use of observable inputs and minimize the use of unobservable inputs when measuring fair value. A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. The three levels of inputs used to measure fair value are as follows:

- Level 1: Quoted prices in active markets for identical assets or liabilities
- Level 2: Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities, quoted prices in markets that are not active, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities
- Level 3: Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the asset or liabilities.

Fair value estimates are made at a specific point in time based on available market information and judgments about the financial asset, including estimates of timing, amount of expected future cash flows, and the credit standing of the issuer. In some cases, the fair value estimates cannot be substantiated by comparison to independent markets. In addition, the disclosed fair value may not be realized in the immediate settlement of the financial asset and does not reflect any premium or discount that could result from offering for sale at one time an entire holding of a particular financial asset. Potential taxes and other expenses that would be incurred in an actual sale or settlement are not reflected in amounts disclosed.

NAV is used as a practical expedient for certain commingled funds, privately held investments, and securities held in partnership format for which a readily determinable fair value is not available, unless the Institute believes such NAV calculation is not measured in accordance with fair value.

These values may differ significantly from values that would have been used had a readily available market existed for such investments, and that difference could be material to the change in net assets of the Institute.

(v) Plant Assets and Depreciation

Proceeds from the sale of plant assets, if there are no donor-imposed restrictions, are transferred to operating funds or, if subject to donor-imposed restrictions, to amounts with donor restrictions for plant acquisitions. Depreciation is provided over the estimated useful lives of the respective assets on a straight-line basis (buildings and capital improvements 20–40 years, equipment 3–6 years).

(vi) Leases

The Institute determines if an arrangement is or contains a lease at inception of the contract. The right-of-use (ROU) assets represents the right to use the underlying assets for the lease term and the lease liabilities represent the obligation to make lease payments arising from the lease. ROU assets and ROU liabilities are recognized based on the present value of the future minimum lease payments over the lease term at commencement date. Lease expense for minimum lease payments is recognized on a straight-line basis over the lease term. A ROU asset and liability are not recognized for short-term leases with an initial term of twelve months or less. Operating leases are included in ROU assets and liabilities in the statements of financial position. Finance leases where the Institute is a lessee are included in land, buildings and improvements, equipment and rare book collections, net and in liabilities in the statements of financial position.

(vii) Split-Interest Agreements

The Institute is the beneficiary of various unitrusts, a pooled income fund, and a gift annuity fund. The Institute's interest in these split-interest agreements is reported as a contribution in the year received and is calculated as the difference between the fair value of the assets contributed to the Institute and the estimated

liability to the beneficiary. This liability is computed using actuarially determined rates and is adjusted annually to reflect changes in the life expectancy of the donor or annuitant, amortization of the discount, and other changes in the estimates of future payments. The assets held by the Institute under these arrangements are recorded at fair value as determined by quoted market prices and are included as a component of investments. The split-interest agreement assets that are held by the Institute are recorded at the fair value of the assets contributed to the trust and are classified in the fair value hierarchy based on the lowest level of any input that is significant to the fair value measurement as discussed in note 1(b)(iv). The split-interest agreement assets that are held by third party trustees are recorded at the fair value of the assets contributed to the trust and are classified within Level 3 of the fair value hierarchy.

(viii) Unamortized Debt Issuance Costs

Debt issuance costs represent costs incurred in connection with debt financing. Amortization of these costs is provided on the effective interest method extending over the remaining term of the applicable indebtedness.

(ix) Asset Retirement Obligation

The Institute recognizes the fair value of a liability for legal obligations associated with asset retirements in the period in which the obligation is incurred if a reasonable estimate of the fair value of the obligation can be made. When the liability is initially recorded, the Institute capitalizes the cost of the asset retirement obligation by increasing the carrying amount of the related long-lived asset. The liability is accreted to its present value each period and the capitalized cost associated with the retirement obligation is depreciated over the useful life of the related asset. Upon settlement of the obligation, any difference between the cost to settle the asset retirement obligation and the liability recorded is recognized as a gain or loss in the statements of activities.

(x) Contributions

Contributions, including unconditional promises to give, are recognized initially at fair value as revenues in the period received. Conditional promises to give are not recognized until they become unconditional, that is when the conditions on which they depend are met. Contributions of assets other than cash are recorded at their estimated fair value. Pledges of contributions to be received after one year are discounted at a risk-adjusted discount rate. The discount rates range from 0.16% to 0.29%. Amortization of discount is recorded as additional contribution revenue in accordance with donor-imposed restrictions, if any, on the contributions. The inputs to the fair value estimate are considered Level 3 in the fair value hierarchy.

Contributions of long-lived assets are reported as unconditional contribution revenue. Contributions restricted for the acquisition of grounds, buildings, and equipment are reported as revenue with donor restrictions. These contributions are reclassified to net assets without donor restrictions when the associated long-lived asset is placed in service.

Included in contributions are gifts from members of the Board of Trustees which are received in the normal course of business.

(xi) Grants

The Institute receives grants from a number of sources including corporations, foundations and governmental agencies. Grants are evaluated as to whether they qualify as contributions or exchange transactions as defined by U.S. GAAP and to determine if there are any donor restrictions.

Based on the Institute's review of grants received, the granting agency does not receive commensurate value for the grant and therefore grant income is considered a voluntary, nonreciprocal transaction that meets the definition of a contribution. Each grant also has one or more barriers that must be overcome which therefore categorize them as conditional contributions for the Institute. Grant revenue with donor imposed conditions is recorded initially as deferred revenue (if the funds are received in advance) and is reported as revenue as the conditions are satisfied. At the same time, the Institute records net assets released from restrictions to match the expenses incurred in satisfying the donor restrictions.

(xii) Auxiliary Activity

The Institute receives income and incurs expenses relating to the operations of a dining services facility and a housing complex on campus for the use by our community of scholars. The income and expenses are displayed on the statement of activities as Auxiliary Activity.

The revenue streams include income from the sale of food and beverages, rental income, laundry income and pet registration fees. These revenue streams, except for rental income, are recognized at the point in time in which the service is provided. Rental income is recognized over a period of time since the tenants are

simultaneously receiving and consuming the benefit of the service provided. Auxiliary income is recognized in the fiscal year in which the service is delivered.

(xiii) Functional Allocation of Expenses

The costs of providing program services and support services of the Institute have been summarized on a functional basis in the statements of activities. These costs include direct and indirect costs that have been allocated, on a consistent basis, among the programs and administrative expenses. Natural expenses are accounted for on a direct cost basis to the school or department upon which the expenses are incurred.

There are certain indirect costs that cannot be charged on a direct basis. The Institute allocates these costs (academic building expenses including costs to maintain the academic buildings, interest and depreciation) to the schools and supporting departments reported in the accompanying statement of activities on a square footage basis. Note 10 shows the relationship between the functional and natural classifications of expenses.

Fundraising expenses incurred by the Institute amounted to $2,473,780 and $2,265,661 for the years ended June 30, 2021 and 2020, respectively. This amount is included in administration and general expenses in the accompanying statements of activities.

(xiv) Tax Status

The Institute is exempt from federal income taxes pursuant to Section 501(c)(3) of the Internal Revenue Code (the Code) and is listed in the Internal Revenue Service Publication 78. The Institute has been classified as a public charity under Section 509(a) of the Code.

There are certain transactions that could be deemed unrelated business income and would result in a tax liability. Management reviews transactions to estimate potential tax liabilities using a threshold of more likely than not. It is management's estimation that there are no material tax liabilities that need to be recorded.

(xv) Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements. Estimates also affect the reported amounts of revenues and expenses during the reported period. Actual results could differ from those estimates.

(xvi) New Accounting Standards Adopted

In fiscal year 2021, the Institute adopted the provisions of the applicable Accounting Standards Updates (ASU), as follows:

ASU 2016-02, *Leases (Topic 842)*, which is effective for the Institute's fiscal year ended June 30, 2021 (as amended), and is designed to increase transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheet and disclosing key information about leasing arrangements. The Institute has adopted this ASU using the modified retrospective transition approach and the effective date method which allowed the Institute to apply the new leases standard at the adoption date of July 1, 2020. As such, the Institute is not required to adjust comparative periods or provide comparative period disclosures. The Institute also elected to use the transition package of practical expedients and short-term lease exemption. The discount rate is based on the risk-free rate using a period comparable with the remaining lease term. The Institute recognized right-of-use assets and lease liabilities of $311,120 for operating leases and right-of-use assets and lease liabilities of $1,967,353 for finance leases on July 1, 2020.

ASU 2018-13, *Fair Value Measurement Disclosure Framework – Changes to the Disclosure Requirements for Fair Value Measurement (Topic 820)*, which eliminate, modify and add additional disclosure requirements on fair value measurements. The two main amendments of future ASU include (1) removal of the requirement to report the amount and reason for transfer between Level 1 and Level 2 investments, and (2) remove the requirement to disclose the valuation process for Level 3 fair value measurements. The Institute applied these changes to the disclosures retrospectively.

ASU 2018-14, *Compensation – Retirement Benefits – Defined Benefit Plans – General, Disclosure Framework – Changes to the Disclosure Requirements for Defined Benefit Plans (Subtopic 715-20)*, which modifies the disclosure requirements for employers that sponsor defined benefit pension and/or other postretirement benefit plans. The ASU eliminates requirements for certain disclosures that are no longer considered cost beneficial, requires new disclosures that the Financial Accounting Standards Board considers pertinent and clarifies certain disclosure requirements. The Institute applied these changes to the disclosures retrospectively.

(xvii) Reclassifications

Certain reclassifications have been made to prior year amounts to conform with the current year presentation and as a result of the adoption of the new accounting standards.

(2) Contributions Receivable

Contributions receivable at June 30, 2021 and 2020 were as follows:

		2021	2020
Amounts expected to be collected:			
Less than one year	$	3,050,000	3,050,000
One to five years		1,600,000	4,650,000
		4,650,000	7,700,000
Discount for present value (0.16%–0.29%)		(23,163)	(87,449)
Total	$	4,626,837	7,612,551

At June 30, 2021, 97% of gross contributions receivable and 3.5% of contributions revenue are from one donor. At June 30, 2020, 97% of gross contributions receivable and 7% of contributions revenue are from one donor.

During fiscal year 2011, the Institute received two conditional pledges totaling $100 million to enhance the Institute's endowment fund. The pledges were conditioned on the Institute raising an additional $100 million in cash or pledges from third-party donors in the period January 1, 2011 through June 30, 2015, which have been met. The conditional pledge payments began in June 2011 and the last payment was received in the fiscal year ended June 30, 2020. As of June 30, 2020, all conditional pledge payments have been fully received and the Institute has recorded revenue totaling approximately $100.5 million relating to the pledges.

(3) Liquidity and Availability of Resources

Resources available to the Institute to fund general expenditures have seasonal variations during the year attributable to a concentration of contributions received at calendar and fiscal year-end and transfers from the endowment. The Institute actively manages its resources to align its cash inflows with anticipated outflows, including approving the endowment draw rate in accordance with policies approved by its Board of Trustees. As further described in note 8, the Institute has lines of credit which may be drawn on, if needed, to manage cash flows.

Financial assets and liquidity resources available within one year for general expenditures, such as operating expenses, scheduled principal and interest payments on debt, and capital constructions costs not financed with debt, at June 30, 2021 and 2020 were as follows:

		2021	2020
Financial assets:			
Cash and cash equivalents	$	18,197,439	3,814,747
Accounts receivable due less than 1 year		82,148	311,883
Mortgage receivable due less than 1 year		214,908	280,982
Contributions receivable due less than 1 year, net		3,050,000	3,050,000
Endowment appropriated for expenditure—operations		37,384,400	44,643,800
Total financial assets available within one year		58,928,895	52,101,412
Liquidity resources:			
Lines of credit		50,000,000	50,000,000
Total financial assets and liquidity resources available within one year	$	108,928,895	102,101,412

(4) Investments, Funds Held by Bond Trustee, and Beneficial Interest in Remainder Trust

(a) Overall Investment Objective

The overall investment objective of the Institute is to invest its assets in a prudent manner that will achieve a long-term rate of return sufficient to fund a portion of its annual operating activities and capital preservation. The Institute diversifies its investments among various managers and investment opportunities. Substantially all of the investments are pooled with each individual fund subscribing to or disposing of units on the basis of the market value per unit, determined on a quarterly basis. Major investment decisions are authorized by the Board's Investment Committee, which oversees the Institute's investment program in accordance with established guidelines.

(b) Allocation of Investment Strategies

The Institute may hold shares or units in traditional institutional funds, traditional stocks and fixed-income securities, as well as in alternative investment funds involving hedged strategies, private equity, and real asset strategies. Hedged strategies involve funds whose managers have the authority to invest in various asset classes at their discretion, including the ability to invest long and short. Funds with hedged strategies generally hold securities or other financial instruments for which a ready market exists and may include stocks, bonds, put or call options, swaps, currency hedges, and other instruments and are valued accordingly. Private equity funds employ buyout and venture capital strategies and focus on investments in turnaround situations. Real asset funds generally hold interests in public real estate investment trusts or commercial real estate through sole-member entities. Private equity and real asset strategies therefore often require the estimation of fair values by the fund managers in the absence of readily determinable market values. Because of the inherent uncertainties of valuation, these estimated fair values may differ significantly from values that would have been used had a ready market existed, and the differences could be material. Such valuations are determined by fund managers and generally consider variables such as operating results, comparable earnings multiples, projected cash flows, recent sales prices, and other pertinent information and may reflect discounts for the illiquid nature of certain investments held.

The following tables summarize the Institute's investments and other assets at fair value by major category in the fair value hierarchy as of June 30, 2021 and 2020, as well as related strategy, liquidity, and funding commitments:

	2021				
	Total	Level 1	Level 2	Level 3	Investment at NAV
Investments:					
Hedge funds—onshore:					
Emerging markets	$ 434,064	—	—	—	434,064
Multiple strategies	41,492,582	—	—	—	41,492,582
Hedge funds—offshore:					
Structured credit	16,047,789	—	—	—	16,047,789
Distressed/high-yield	188,041	—	—	—	188,041
Emerging markets	4,448	—	—	—	4,448
Equities—long bias	80,170,261	—	—	—	80,170,261
Equities—long/short	32,282,816	—	—	—	32,282,816
Fixed income arbitrage	4,129,649	—	—	—	4,129,649
Multiple strategies	162,802,291	—	—	—	162,802,291
Quantitative/CTA	78,621,456	—	—	—	78,621,456
Insurance	41,704,903	—	—	—	41,704,903
Bio tech/healthcare	22,343,516	—	—	—	22,343,516
Energy trading	43,988	—	—	—	43,988
Total	480,265,804	—	—	—	480,265,804
Limited partnerships	416,378,136	—	—	—	416,378,136
Exchange-traded funds	6,169,289	6,169,289	—	—	—
Cash equivalents	226,595,608	226,595,608	—	—	—
Other investments:					
Assets held under split-interest agreements:	4,002,630	2,624,380	—	651,474	726,776
Total investments	$ 1,133,411,467	235,389,277	—	651,474	897,370,716

Other assets:					
Funds held by bond trustee:					
Cash equivalents	$ 740,099	—	740,099	—	—
Total other assets	$ 740,099	—	740,099	—	—

	2020				
	Total	Level 1	Level 2	Level 3	Investment at NAV
Investments:					
Hedge funds—onshore:					
Emerging markets	$ 469,055	—	—	—	469,055
Multiple strategies	45,665,352	—	—	—	45,665,352
Hedge funds—offshore:					
Structured credit	12,497,447	—	—	—	12,497,447
Distressed/high-yield	881,523	—	—	—	881,523
Emerging markets	4,392	—	—	—	4,392
Equities—long bias	46,341,332	—	—	—	46,341,332
Equities—long/short	29,101,146	—	—	—	29,101,146
Fixed income arbitrage	15,981,337	—	—	—	15,981,337
Multiple strategies	158,723,859	—	—	—	158,723,859
Quantitative/CTA	66,419,641	—	—	—	66,419,641
Insurance	38,516,308	—	—	—	38,516,308
Bio tech/healthcare	18,938,505	—	—	—	18,938,505
Discretionary macro	12,835,007	—	—	—	12,835,007
Energy trading	43,988	—	—	—	43,988
Total	446,418,892	—	—	—	446,418,892
Limited partnerships	252,517,353	—	—	—	252,517,353
Exchange-traded funds	6,168,474	6,168,474	—	—	—
Cash equivalents	98,473,417	98,473,417	—	—	—
Other investments:					
Assets held under split-interest agreements:	3,388,341	2,230,468	—	533,632	624,241
Total investments	$ 806,966,477	106,872,359	—	533,632	699,560,486
Other assets:					
Funds held by bond trustee:					
Cash equivalents	$ 886,567	—	886,567	—	—
Total other assets	$ 886,567	—	886,567	—	—

The following tables present the Institute's activities for the years ended June 30, 2021 and 2020 for investments classified in Level 3:

Level 3 roll forward		2021 Assets held under split-interest agreement Fixed income securities
Fair value at June 30, 2020	$	533,632
Dispositions		(24,904)
Net appreciation (realized and unrealized)		142,746
Fair value at June 30, 2021	$	651,474

Level 3 roll forward		2020 Assets held under split-interest agreement Fixed income securities
Fair value at June 30, 2019	$	571,475
Dispositions		(17,862)
Net appreciation (realized and unrealized)		(19,981)
Fair value at June 30, 2020	$	533,632

The Institute's accounting policy is to recognize transfers between levels of the fair value hierarchy on the date of the event or change in circumstances that caused the transfer. There were no transfers between investments classified as Level 3 for the years ended June 30, 2021 and 2020. The total dispositions of investments classified as Level 3 are $24,904 and $17,862 for the years ended June 30, 2021 and 2020, respectively.

Private equity and venture capital investments are generally made through limited partnerships. Under the terms of such agreements, the Institute may be required to provide additional funding when capital or liquidity calls are made by fund managers. These partnerships have a limited existence, and they may provide for annual extensions for the purpose of disposing portfolio positions and returning capital to investors. However, depending on market conditions, the inability to execute the fund's strategy or other factors, a manager may extend the terms of a fund beyond its originally anticipated existence or may wind the fund down prematurely. The Institute cannot anticipate such changes because they generally arise from unforeseeable events, but should they occur, they could reduce liquidity or originally anticipated investment returns. Accordingly, the timing and amount of future capital or liquidity calls in any particular future year are uncertain. As of June 30, 2021, the Institute is obligated under certain limited partnership agreements to advance additional funding in the amount of $122,150,459, which is anticipated to be called over the next 10 years.

Investment liquidity for the years ended June 30, 2021 and June 30, 2020 are aggregated below based on redemption or sale period:

	2021			
	Fair value	Percent not eligible for redemption	Redemption frequency (if available)	Redemption notice period
Investments:				
Hedge funds—onshore:				
Emerging markets	$ 434,064 (a)	100%	Illiquid	Fund in liquidation
Multiple strategies	41,492,582 (b)	3%	Semi-Annual; Lockup	90 days notice; Fund in liquidation
Hedge funds—offshore:				
Structured credit	16,047,789 (c)	100%	Lockup	Fund subject to lockup
Distressed/high-yield	188,041 (d)	100%	Illiquid	Fund in liquidation
Emerging markets	4,448 (a)	100%	Illiquid	Fund in liquidation
Equities—long bias	80,170,261 (e)	80%	Annual; Lockup	Fund in liquidation; 3 year rolling lockup
Equities—long/short	32,282,816 (f)	19%	Quarterly; Illiquid	90 days notice; Fund in liquidation
Fixed income arbitrage	4,129,649 (g)		Quarterly	90 days notice
Multiple strategies	162,802,291 (b)	63%	Quarterly, Annual, Lockup, Illiquid	15-90 days notice; Fund in liquidation; Fund subject to lockup
Quantitative/CTA	78,621,456 (h)		Monthly, Quarterly	15-60 days notice
Insurance	41,704,903 (i)		Quarterly	60 days notice
Bio tech/healthcare	22,343,516 (j)		Quarterly	30-60 days notice
Energy trading	43,988 (k)	100%	Illiquid	Fund in liquidation
Total	480,265,804			
Limited partnerships	416,378,136 (l)	100%	Illiquid	Funds lockup up by agreement
Exchange-traded funds	6,169,289		Daily	
Cash equivalents	226,595,608		Daily	
Other investments:				
Assets held under split-interest agreements:	4,002,630	100%	Illiquid	Funds lockup up by agreement
Total investments	$ 1,133,411,467			

	2020			
	Fair value	Percent not eligible for redemption	Redemption frequency (if available)	Redemption notice period
Investments:				
Hedge funds—onshore:				
Emerging markets	$ 469,055 (a)	100%	Illiquid	Fund in liquidation
Multiple strategies	45,665,352 (b)	2%	Semi-Annual; Lockup	90 days notice; Fund in liquidation
Hedge funds—offshore:				
Structured credit	12,497,447 (c)	100%	Lockup	Fund subject to lockup
Distressed/high-yield	881,523 (d)	100%	Illiquid	Fund in liquidation
Emerging markets	4,392 (a)	100%	Illiquid	Fund in liquidation
Equities—long bias	46,341,332 (e)	80%	Annual; Lockup	Fund in liquidation; 3 year rolling lockup
Equities—long/short	29,101,146 (f)	29%	Quarterly; Illiquid	90 days notice; Fund in liquidation
Fixed income arbitrage	15,981,337 (g)		Quarterly	90 days notice
Multiple strategies	158,723,859 (b)	62%	Quarterly, Annual, Lockup, Illiquid	15-90 days notice; Fund in liquidation; Fund subject to lockup
Quantitative/CTA	66,419,641 (h)		Monthly, Quarterly	15-60 days notice
Insurance	38,516,308 (i)		Annual	60 days notice
Bio tech/healthcare	18,938,505 (j)		Quarterly	30-60 days notice
Discretionary macro	12,835,007 (m)		Monthly	5 days notice
Energy trading	43,988 (k)	100%	Illiquid	Fund in liquidation
Total	446,418,892			
Limited partnerships	252,517,353 (l)	100%	Illiquid	Funds lockup up by agreement
Exchange-traded funds	6,168,474		Daily	
Cash equivalents	98,473,417		Daily	
Other investments:				
Assets held under split-interest agreements:	3,388,341	100%	Illiquid	Funds lockup up by agreement
Total investments	$ 806,966,477			

(a) Emerging markets—This category includes investments in hedge funds that primarily invest in listed and non-listed equities primarily in emerging markets. The funds may also hold real estate and other non-traded non-corporate assets.

(b) Multiple strategies—This category includes investments in hedge funds that invest in event-related equity and credit, arbitrage, fixed income relative value, quantitative strategies, and other marketable assets and strategies.

(c) Structured credit—This category includes investments in hedge funds that preliminary invest in structured credit and/or structured credit derivative markets, both long and short.

(d) Distressed/high-yield—This category includes investments in hedge funds that primarily invest in distressed and/or high yield bonds.

(e) Equities—long bias—This category includes investments in hedge funds that invest primarily long listed equities with either minimal or no ability to short. The funds may also own non-listed equities up to certain thresholds of NAV.

(f) Equities—long/short—This category includes investments in hedge funds that invest primarily in long and short listed equities. The funds may also own non-listed equities up to certain thresholds of NAV.

(g) Fixed income arbitrage—This category includes investments in hedge funds that invest primarily in fixed-income markets using quantitative and/or fundamental strategies.

(h) Quantitative/CTA—This category includes investments in hedge funds that invest across multiple sectors and asset classes using quantitative tools to inform trading decisions. The funds may also own non-listed equities up to certain thresholds of NAV.

(i) Insurance—This category includes investments in hedge funds that write reinsurance and retrocessional contracts and/or invest in insurance linked securities, both long and short.

(j) Bio tech/healthcare—This category includes investments in hedge funds that invest in primarily in long and short listed equities focused on the healthcare sector. The funds may also own non-listed equities up to certain thresholds of NAV.

(k) Energy trading—This category includes investments in hedge funds that invest in energy and natural resources related equities and commodities.

(l) Limited partnerships—This category includes private equity partnerships, including buyout, growth, venture capital, and distressed investment funds, as well as natural resources and real estate funds. These investments cannot be redeemed but do make distributions as the underlying investments are liquidated. Most funds have a primary term of ten years.

(m) Discretionary macro—The category includes investments in hedge funds that invest across multiple sectors, asset classes, and geographies using fundamental analyses to inform thematic views which drive trading and investing decisions.

(c) Redemption Restrictions—Hedge Funds

At June 30, 2021, the Institute had hedge fund investments of approximately $480,265,800, of which approximately $121,660,800 was restricted from redemption for lock-up periods. At June 30, 2020, the Institute had hedge fund investments of approximately $446,419,000, of which approximately $95,504,900 was restricted from redemption for lock-up periods. Some of the investments with redemption restrictions allow early redemption for specified fees. The terms and conditions upon which an investor may redeem an investment vary, usually with the majority requiring 30 to 180 days' notice after the initial lock-up period.

The expirations of redemption lock-up periods are summarized in the table below:

		Amount
Fiscal year:		
2022	$	42,209,900
2023		70,326,400
2024 and thereafter		9,124,500
Total	$	121,660,800

(d) Redemption Restrictions—Limited Partnerships

At June 30, 2021 and 2020, the Institute had limited partnership investments of approximately $416,378,100 and $252,517,200, respectively, which were restricted from redemption for lock-up periods. Some of the investments with redemption restrictions allow early redemption for specified fees. The terms and conditions upon which an investor may redeem an investment vary, usually with the majority requiring 30 to 180 days' notice after the initial lock-up period.

		Amount
Fiscal year:		
2022	$	84,531,100
2023		14,929,300
2024		19,212,600
2025		61,235,000
2026		77,619,200
2027 and thereafter		158,850,900
Total	$	416,378,100

(e) Funds Held by Bond Trustee

Funds held by bond trustee represent funds held for debt service payments to be made for the various bond indentures. These funds are being held in trust by U.S. Bank.

(5) Investment Return and Endowment Spending Policy

Investment return consists of interest, dividends, and realized and unrealized gains and losses on investments. Each year, the Institute includes a portion of its endowment return in its operating budget, with the amount of such planned support determined using its spending policy. The policy of the Institute is to distribute for current spending a percentage of the fair value of pooled investments, which is determined by the Board of Trustees annually. The budgeted spending rate for operating and capital purposes was 6.04% and 6.64% for 2021 and 2020, respectively. The actual spending rate for operating and capital purposes was 5.20% and 5.97% for 2021 and 2020, respectively.

The following tables summarize the investment return and its classification in the statements of activities for the years ended June 30, 2021 and 2020:

		2021		
		Without donor restrictions	With donor restrictions	Total
Investment income, net of investment expenses	$	(3,592,028)	(5,943,978)	(9,536,006)
Net appreciation (realized and unrealized)		146,248,673	207,808,388	354,057,061
	$	142,656,645	201,864,410	344,521,055

		2020		
		Without donor restrictions	With donor restrictions	Total
Investment income, net of investment expenses	$	(901,203)	(2,026,664)	(2,927,867)
Net appreciation (realized and unrealized)		20,833,971	26,146,033	46,980,004
	$	19,932,768	24,119,369	44,052,137

(6) Endowment

The Institute's endowment consists of approximately 120 individual funds established for a variety of purposes including both donor-restricted endowment funds and funds designated by the Board of Trustees to function as endowments. Net assets associated with endowments, including funds designated by the Board of Trustees to function as endowments, are classified and reported based on the existence or absence of donor-imposed restrictions.

(a) Interpretation of Relevant Law

The Institute has interpreted the New Jersey-enacted version of the Uniform Prudent Management of Institutional Funds Act (UPMIFA) as allowing the Institute to appropriate for expenditure or accumulate so much of a donor-restricted endowment fund as the Institute determines is prudent for the uses, benefits, purposes, and duration for which the endowment fund is established, subject to the intent of the donor as expressed in the gift instrument. Unless stated otherwise in the gift instrument, the assets in a donor-restricted endowment fund are donor-restricted assets until appropriated for expenditure by the Board of Trustees of the Institute. As a result of applicable accounting guidance, the Institute classifies as net assets with donor restrictions (a) the original value of gifts donated to the permanent endowment, (b) the original value of subsequent gifts to the permanent endowment, and (c) the accumulations to the permanent endowment made in accordance with the direction of the applicable donor gift instrument at the time the accumulation is added to the fund. The remaining portion of the donor-restricted endowment fund that is not classified as endowment fund corpus within the net assets with donor restrictions is classified as net assets with donor purpose restrictions until those amounts are appropriated for expenditure in a manner consistent with the standard of prudence prescribed by UPMIFA.

From time to time, the fair value of assets associated with individual donor-restricted endowments may fall below the original corpus the fund included in net assets with donor restrictions due to unfavorable market fluctuations subsequent to the investment of the gift. Under the provisions of UPMIFA, spending from such endowment funds with deficiencies would be permitted. Deficiencies of this nature, which are reported in net assets with donor restrictions, totaled approximately $1,690,400 and $2,127,800 at June 30, 2021 and 2020, respectively. Subsequent gains that restore the fair value of the assets of the donor-purpose restricted endowment fund are classified as an increase in net assets with donor restrictions.

Below is a schedule which represents the composition of the Institute's endowment funds and funds designated by the Board of Trustees to function as endowments by type of fund as of June 30, 2021 and 2020:

	2021			
	Without donor restrictions	With donor restrictions		
		Original gift	Accumulated gains	Total
Undesignated	$ 267,483,100	—	—	267,483,100
Specific purpose designated funds	189,871,765	—	—	189,871,765
Donor—purpose restricted funds	—	32,036,804	345,972,520	378,009,324
Endowment fund corpus	—	289,979,464	—	289,979,464
	$ 457,354,865	322,016,268	345,972,520	1,125,343,653

	2020			
	Without donor restrictions	With donor restrictions		
		Original gift	Accumulated gains	Total
Undesignated	$ 195,167,670	—	—	195,167,670
Specific purpose designated funds	133,883,663	—	—	133,883,663
Donor—purpose restricted funds	—	28,936,721	167,170,268	196,106,989
Endowment fund corpus	—	259,261,066	—	259,261,066
	$ 329,051,333	288,197,787	167,170,268	784,419,388

Changes in the Institute's endowment funds and funds designated by the Board of Trustees to function as endowments for the fiscal years ended June 30, 2021 and 2020 were as follows:

	Without donor restrictions	With donor restrictions		
		Original gift	Accumulated gains	Total
Net assets, June 30, 2019	$ 340,453,885	269,782,957	166,145,736	776,382,578
Investment returns:				
Investment income, net	(1,559,997)	—	(2,015,900)	(3,575,897)
Net appreciation (realized and unrealized)	20,833,971	—	26,255,188	47,089,159
Total investment return	19,273,974	—	24,239,288	43,513,262
Contributions	52,000	18,414,830	—	18,466,830
Appropriation for expenditure—operations	(30,728,526)	—	(23,214,756)	(53,943,282)
Net assets, June 30, 2020	329,051,333	288,197,787	167,170,268	784,419,388
Investment returns:				
Investment income, net	(3,592,115)	—	(5,543,114)	(9,135,229)
Net appreciation (realized and unrealized)	146,248,673	—	206,965,782	353,214,455
Total investment return	142,656,558	—	201,422,668	344,079,226
Contributions	1,047,693	33,818,481	—	34,866,174
Appropriation for expenditure—operations	(15,400,719)	—	(22,620,416)	(38,021,135)
Net assets, June 30, 2021	$ 457,354,865	322,016,268	345,972,520	1,125,343,653

(b) Funds with Deficiencies

From time to time, the fair value of assets associated with individual donor restricted "true" endowment funds may fall below the level of the donor or UPMIFA requires to be retained as a fund of perpetual duration. Deficiencies of this nature are reported in net assets with donor restrictions. As of June 30, 2021, eight funds with an original gift of $3,137,675 were "underwater" by $1,690,439. As of June 30, 2020, eight funds with an original gift of $3,137,675 were "underwater" by $2,127,812.

(c) Return Objectives and Risk Parameters

The Institute has adopted investment and spending policies for endowment assets that attempt to provide a predictable stream of funding to programs supported by its endowment while seeking to maintain the purchasing power of the endowment assets.

(d) Strategies Employed for Achieving Objectives

The Institute manages its investments in accordance with a total return concept and the goal of maximizing returns within acceptable levels of risk. The Institute relies on a total return strategy in which investment returns are achieved through both capital appreciation (realized and unrealized) and current yield (dividends and interest). The Institute's spending policy is designed to provide a stable level of financial support and to preserve the real value of its endowment.

(7) Physical Plant

Physical plant and equipment are stated at cost at date of acquisition, less accumulated depreciation.

A summary of plant assets at June 30, 2021 and 2020 is as follows:

		2021	2020
Land	$	373,738	373,738
Land improvements		3,087,965	3,041,804
Buildings and improvements		201,631,562	197,630,912
Equipment		40,898,223	39,804,806
Rare book collection		203,508	203,508
Joint ownership property		5,054,512	5,361,177
Finance lease right-of-use asset		2,920,444	—
		254,169,952	246,415,945
Accumulated depreciation		(119,052,691)	(112,050,454)
Accumulated amortization—Finance lease right-of-use asset		(518,080)	—
Net book value	$	134,599,181	134,365,491

(8) Long-term Debt

A summary of long-term debt at June 30, 2021 and 2020 is as follows:

		2021	2020
2006 Series B—NJEFA	$	16,100,000	17,800,000
2006 Series C—NJEFA		13,100,000	13,700,000
2008 Series C—NJEFA		—	725,000
2012 Taxable		14,070,000	14,495,000
2015 Taxable		13,700,000	14,030,000
2017 Taxable		23,415,000	23,960,000
Long-term debt		80,385,000	84,710,000
Less:			
Unamortized bond discount		(232,247)	(252,189)
Unamortized debt issuance costs		(578,324)	(632,062)
Total long-term debt	$	79,574,429	83,825,749

Interest expense on long-term debt for the years ended June 30, 2021 and 2020 was $2,839,410 and $3,011,400, respectively.

(a) 2006 Series B

In July 2006, the Institute received proceeds of the New Jersey Educational Facilities Authority (the Authority) offering of $29,600,000 Revenue Bonds, 2006 Series B of the Institute for Advanced Study Issue. The 2006 Series B Bonds were issued to finance the advance refunding of the outstanding 1997 Series G Bonds, the partial advance refunding of the 2001 Series A Bonds, and to pay a portion of certain costs incidental to the sale and issuance of the 2006 Series B Bonds.

(b) 2006 Series C

In March 2007, the Institute received proceeds of the Authority offering of $20,000,000 Revenue Bonds, 2006 Series C of the Institute for Advanced Study Issue. Proceeds were used to finance the costs of construction, renovating, and equipping certain educational facilities of the Institute to fund capitalized interest on the 2006 Series C Bonds during the renovation and construction and to pay certain costs incidental to the sale and issuance of the 2006 Series C Bonds.

(c) 2008 Series C

In March 2008, the Institute received proceeds of the Authority offering of $11,255,000 Revenue Bonds, 2008 Series C of the Institute for Advanced Study Issue. The 2008 Series C Bonds were issued to finance the advance refunding of outstanding 1997 Series F Bonds, the advance refunding of outstanding 1997 Series G, and to pay a portion of certain costs incidental to the sale and issuance of the 2008 Series C Bonds.

(d) 2012 Taxable

In December 2012, the Institute received proceeds of $17,320,000 Taxable Bonds, 2012 Series of the Institute for Advanced Study Issue, which were issued at a discount of approximately $92,000. The 2012 Taxable Bonds were used to finance the advance refunding of outstanding 2001 Series A Bonds, to fund renovations to the Members Housing facility and the costs of renovation and equipping certain educational facilities of the Institute and to pay certain costs incidental to the sale and issuance of the 2012 Taxable Bonds.

(e) 2015 Taxable

In November 2015, the Institute received proceeds of $15,300,000 Taxable Bonds, 2015 Series of the Institute for Advanced Study Issue, which were issued at a discount of approximately $80,000. The 2015 Taxable Bonds were used to fund capital projects at the Institute and for other corporate purposes of the Institute and to pay certain costs incidental to the sale and issuance of the 2015 Taxable Bonds.

(f) 2017 Taxable

In November 2017, the Institute received proceeds of $25,000,000 Taxable Bonds, 2017 Series of the Institute for Advanced Study Issue, which were issued at a discount of approximately $84,000. The 2017 Taxable Bonds were used to fund capital projects at the Institute and for other corporate purposes of the Institute and to pay certain costs incidental to the sale and issuance of the 2017 Taxable Bonds.

(g) Interest Rates

The 2006 Series B and C Bonds bear interest at variable rates. The bonds were issued in the weekly mode with weekly rates determined by Lehman Brothers Inc., as a Remarketing Agent and paid monthly. The maximum interest rate on the 2006 Bonds shall be twelve percent (12%) per annum. The 2006 bonds are subject to redemption at various prices and require principal payments and sinking fund installments through July 1, 2031 (Series B) and July 1, 2036 (Series C). The obligation to pay the Authority on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute. On September 18, 2008, the Institute entered into a contract with JPMorgan Chase Bank to take over as a remarketing agent, replacing Lehman Brothers Inc.

The 2008 Series C Bonds bear interest at rates ranging from 3% to 5% per annum, payable semiannually, are subject to redemption at various prices and require principal payments and sinking fund installments through July 1, 2021. The obligation to pay the Authority on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute.

The 2012 Taxable bonds bear interest at rates ranging from 0.388% to 3.892% per annum, payable semiannually, are subject to redemption at various prices and require principal payments and sinking fund installments through December 1, 2042. The obligation to make the interest payments on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation to the Institute.

The 2015 Taxable bonds bear interest at rates ranging from 0.906% to 4.394% per annum, payable semiannually,

are subject to redemption at various prices and require principal payments and sinking fund installments through December 1, 2045. The obligation to make the interest payments on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation to the Institute.

The 2017 Taxable bonds bear interest at rates ranging from 1.713% to 3.732% per annum, payable semiannually, are subject to redemption at various prices and require principal payments and sinking fund installments through November 1, 2047. The obligation to make the interest payments on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation to the Institute.

(h) Bond Swap Agreement

On December 22, 2008, the Institute entered into a swap agreement with Wells Fargo Bank covering $28,900,000 of outstanding 2006 Series B Bonds that required the Institute to pay a fixed rate of 3.7702% to Wells Fargo Bank in exchange for Wells Fargo Bank agreeing to pay the Institute a variable rate equal to 67% of the USD-LIBOR-BBA rate with a term of three months, payable monthly, on an identical notional amount. The notional value of the 2006 Series B Bond is $22,300,000. The effective date of the swap was December 22, 2008, and the termination date of the swap agreement coincides with the maturity of the bonds, which is July 1, 2031.

The Institute entered into this swap agreement with the intention of lowering its effective interest rate. At June 30, 2021 and 2020, the fair value of the interest rate swap was ($2,371,138) and ($3,323,339), respectively. The change in fair value recognized during the years ended June 30, 2021 and 2020 in the amount of $952,201 and ($534,395), respectively, is reported in the statements of activities in change in fair value of bond swap liability. The swap agreement utilizes Level 2 inputs to measure fair value. The fair value of the interest rate swap was determined using pricing models developed based on the LIBOR swap rate and other market data. Under the swap agreement, the Institute may be required to post collateral to the counterparty if certain triggering events (rates and dollar thresholds) are met. As of June 30, 2021 and 2020, there was no requirement to post collateral imposed by the swap counterparty.

The bonds are repayable as follows at June 30, 2021:

		Amount
Year ending June 30:		
2022	$	3,735,000
2023		3,965,000
2024		4,105,000
2025		4,145,000
2026		4,385,000
2027 through 2048		60,050,000
Total	$	80,385,000

The 2006 Series B, 2006 Series C, and 2008 Series C bonds are secured by a pledge of revenues pursuant to the respective Loan Agreements.

(i) Lines of Credit

As of June 30, 2021 and 2020, the Institute had unsecured loan agreements representing a line of credit. As of June 30, 2021 and 2020, the agreements provide for borrowings up to $50,000,000, of which $30,000,000 is available through June 2021 and $20,000,000 is available through March 2022. The $30,000,000 line of credit, which expired in June 2021, was replaced with a new line of credit in July 2021. The new line of credit is available through July 2024. Interest payments are due on demand and interest accrues for the $30,000,000 line of credit at LIBOR rate plus 50 basis points, which is 0.74% as of June 30, 2021 and for the $20,000,000 line of credit at the LIBOR rate plus 90 basis points, which was 1.14% as of June 30, 2021. There were no borrowings in fiscal year 2021 or 2020 against the lines of credit. No interest expense was incurred for the years ended June 30, 2021 and 2020.

(j) Standby Bond Purchase Agreement

On July 17, 2017, in connection with the substitution of the Standby Bond Purchase Agreements, the 2006 Bonds were subject to mandatory tender for purchase and were remarketed with an alternate liquidity facility on July 17, 2017. The 2006 Bonds continue to be in the Weekly Mode, with J.P. Morgan Securities LLC serving as a Remarketing Agent for the Bonds. Each Series of the 2006 Bonds are secured by a new Standby Bond Purchase Agreement issued by TD Bank, N.A.

(9) Pension Plans and Other Postretirement Benefits

Separate voluntary defined-contribution retirement plans are in effect for faculty members and eligible staff personnel, both of which provide for annuities, which are funded, to the Teachers Insurance and Annuity Association and/or the College Retirement Equities Fund. Contributions are based on the individual participant's compensation in accordance with the formula set forth in the plan documents on a nondiscriminatory basis. Contributions for the years ended June 30, 2021 and 2020 totaled approximately $2,258,600 and $2,692,000, respectively.

In addition to providing pension benefits, the Institute provides certain health care and life insurance benefits for retired employees and faculty. Substantially all of the Institute's employees may become eligible for these benefits if they meet minimum age and service requirements. The Institute accrues these benefits over a period in which active employees become eligible under existing benefit plans.

The components of net periodic postretirement benefit cost other than the service cost component are included in a line item in the nonoperating activities section of the statement of activities.

The following table provides a reconciliation of the change in benefit obligation of the plan at June 30, 2021 and 2020. There are no plan assets at June 30, 2021 or 2020.

		2021	2020
Postretirement benefit obligation:			
Retirees	$	7,779,523	6,957,427
Fully eligible active plan participants		2,791,592	4,628,169
Other active plan participants		11,507,422	13,033,070
Postretirement benefit obligation	$	22,078,537	24,618,666
Change in benefit obligation:			
Benefit obligation at beginning of year	$	24,618,666	19,584,782
Service cost		1,175,253	951,559
Interest cost		648,132	676,845
Benefits paid		(391,984)	(426,711)
Actuarial (gain)/loss		(3,971,530)	3,832,191
Benefit obligation at end of year		22,078,537	24,618,666
Change in plan assets:			
Plan assets at beginning of year		—	—
Actual return on assets		—	—
Employer contributions		391,984	426,711
Benefits paid		(391,984)	(426,711)
Plan assets at end of year		—	—
Funded states at end of year	$	22,078,537	24,618,666
Components of net periodic benefit cost:			
Service cost	$	1,175,253	951,559
Interest cost		648,132	676,845
Amortization of net (gain)/loss		(3,971,530)	3,832,191
Net periodic postretirement benefit cost	$	(2,148,145)	5,460,595
Amounts recognized in the statement of financial position consist of the following:			
Postretirement benefit obligation liability	$	(22,078,537)	(24,618,666)

	2021	2020
Benefit obligation assumptions		
Weighted average discount rate	2.80 %	2.66 %
Net periodic cost benefit assumptions		
Weighted average discount rate	2.66 %	3.50 %

Assumed health care cost trend rates at June 30:

	2021	2020
Health care cost trend rate assumed for next year	6.20 %	6.50 %
Rate to which the cost trend rate is assumed to decline (ultimate trend rate)	5.00 %	5.00 %
Year that the rate reaches the ultimate trend rate	2030	2030

Projected payments for each of the next five fiscal years and thereafter through 2031 are as follows:

	Amount
Year ending June 30:	
2022	$ 494,000
2023	516,000
2024	544,000
2025	566,000
2026	593,000
2027 through 2031	3,650,000

The Institute funds claims as they are incurred. The Institute does not expect to contribute any amounts in fiscal year 2021 or 2020, except as needed to provide for benefit payments.

(10) Natural Allocation of Expenses

The costs of providing program services and support services of the Institute have been summarized on a functional basis in the statement of activities. The following chart shows the relationship between the functional and natural classifications of expenses. Certain operating costs have been allocated among the functional categories as disclosed in note 1(b).

Expenses by natural classification for the year ended June 30, 2021 consist of the following:

	2021							
	Schools of				Library and other academic	Administration and general	Auxiliary Activity	Total
	Mathematics	Natural Sciences	Historical Studies	Social Science				
Salaries	$ 2,885,756	4,068,140	3,627,974	1,090,492	1,517,521	9,031,224	1,447,366	23,668,473
Stipends	4,096,875	3,611,427	2,363,803	1,347,963	112,500	—	—	11,532,568
Employee benefits and taxes	853,579	1,252,073	1,244,477	295,703	495,731	3,515,152	475,134	8,131,849
Materials and supplies	29,500	43,609	43,034	32,532	28,588	576,885	246,180	1,000,328
Conferences and travel	205,002	180,933	269,738	132,077	68,940	145,144	222,875	1,224,709
Insurance, legal and professional fees	19,236	3,965	77,404	—	351,232	2,181,308	168,829	2,801,974
Occupancy (inc. utilities and real estate taxes)	—	—	—	—	—	1,043,528	1,453,727	2,497,255
Interest expense	—	—	—	—	—	1,438,226	1,405,158	2,843,384
Books and periodicals	—	1,026	—	—	681,200	2,966	339	685,531
Other expenses	742,461	1,099,772	268,151	193,966	409,672	(871,328)	43,408	1,886,102
Depreciation	58,232	350,751	58,969	17,662	160,389	3,083,538	4,085,229	7,814,770
Subtotal	8,890,641	10,611,696	7,953,550	3,110,395	3,825,773	20,146,643	9,548,245	64,086,943
Academic building allocation	1,152,209	1,475,475	992,191	497,205	—	(4,117,080)	—	—
	$ 10,042,850	12,087,171	8,945,741	3,607,600	3,825,773	16,029,563	9,548,245	64,086,943

Expenses by natural classification for the year ended June 30, 2020 consist of the following:

	2020							
	Schools of				Library and other academic	Administration and general	Auxiliary Activity	Total
	Mathematics	Natural Sciences	Historical Studies	Social Science				
Salaries	$ 2,886,231	4,505,316	3,630,502	1,098,726	1,528,996	9,663,125	1,783,160	25,096,056
Stipends	5,081,973	3,309,575	2,560,054	1,533,777	109,200	—	—	12,594,579
Employee benefits and taxes	1,069,198	1,590,453	1,312,528	379,580	512,096	3,307,260	549,624	8,720,739
Materials and supplies	30,018	44,610	35,814	40,623	41,961	540,381	277,902	1,011,309
Conferences and travel	438,823	522,008	427,316	177,011	702,050	645,088	396,166	3,308,462
Insurance, legal and professional fees	38,803	140,329	161,115	—	535,122	2,302,334	167,060	3,344,763
Occupancy (inc. utilities and real estate taxes)	—	—	—	—	—	957,715	1,443,666	2,401,381
Interest expense	—	—	—	—	—	1,564,092	1,447,308	3,011,400
Books and periodicals	285	3,863	939	—	720,961	13,192	386	739,626
Other expenses	616,015	805,873	215,604	213,881	247,947	(208,876)	42,903	1,933,347
Depreciation	40,132	201,204	46,774	10,044	151,974	2,530,931	3,974,122	6,955,181
Subtotal	10,201,478	11,123,231	8,390,646	3,453,642	4,550,307	21,315,242	10,082,297	69,116,843
Academic building allocation	1,209,619	1,549,000	1,041,631	521,975	—	(4,322,225)	—	—
	$ 11,411,097	12,672,231	9,432,277	3,975,617	4,550,307	16,993,017	10,082,297	69,116,843

(11) Net Assets

Net assets are comprised of the following at June 30, 2021 and 2020:

		2021	2020
Net assets without donor restrictions:			
Undesignated	$	283,061,331	210,745,901
Designated for specific purpose funds:			
School of Mathematics		23,567,195	16,550,293
School of Natural Sciences		30,503,136	21,940,767
School of Historical Studies		24,623,032	17,511,076
School of Social Science		2,304,745	1,592,425
Libraries and other academic		100,595,920	71,394,109
Administration and general		8,277,737	4,894,993
Designated for specific purpose funds		189,871,765	133,883,663
Total net assets without donor restrictions	$	472,933,096	344,629,564
Net assets with donor restrictions and appropriation through endowment spending policy:			
Subject to expenditure for specific purpose:			
School of Mathematics	$	49,290,773	28,587,218
School of Natural Sciences		56,772,548	22,918,517
School of Historical Studies		60,817,527	36,239,165
School of Social Science		87,402,028	57,761,434
Libraries and other academic		16,744,384	7,227,021
Administration and general		134,939,709	72,739,685
Net assets with donor-purpose restrictions		405,966,969	225,473,040
Net assets held as endowed fund corpus to generate income for specified purposes		289,979,464	259,261,066
Total net assets with donor restrictions	$	695,946,433	484,734,106

(12) Leases

The Institute evaluated current contracts to determine which met the criteria of a lease. The right-of-use (ROU) assets represent the Institute's right to use the underlying assets for the lease term, and the lease liabilities represent the Institute's obligation to make lease payments arising from these leases. The ROU assets and lease liabilities were calculated based on the present value of future lease payments over the lease terms at the time of implementation. The Institute has made an accounting policy election to utilize a risk-free rate in lieu of its incremental borrowing rate to discount future lease payments. The Institute has elected the practical expedient package to not reassess at adoption (i) expired contracts for whether they contain a lease, (ii) the lease classification of any existing leases, or (iii) initial indirect costs for existing leases.

The components of lease expense for the year ended June 30, 2021 consist of the following:

Finance lease cost:		
Amortization of right-of-use assets	$	518,080
Interest on lease liabilities		3,975
Operating lease cost		191,201
Total lease cost	$	713,256

Total cash paid for amounts included in the measurement of lease liabilities, which is recorded as operating cash flows from operating leases, is $191,201. Total cash paid for amounts included in the measurement of lease liabilities, which is recorded as financing cash flows from operating leases, is $736,772.

The following table displays the undiscounted cash flows due related to operating and finance leases, along with a reconciliation to the discounted amount recorded on the Statements of Financial Position:

		Operating lease	Finance lease
Year ending June 30:			
2022	$	68,568	740,747
2023		30,061	677,919
2024		17,091	593,795
2025		4,455	193,831
Total lease payments		120,175	2,206,292
Less present value discount		(256)	(22,620)
Present value of lease liabilities	$	119,919	2,183,672

The following table displays the weighted average remaining lease term and discount rates for the year ended June 30, 2021:

	Operating lease	Finance lease
Weighted-average remaining lease term	2 years	3 years
Weighted-average discount rate	0.21%	0.46%

(13) COVID-19

On March 11, 2020, the World Health Organization declared the COVID-19 outbreak a public health emergency. In response, various governmental agencies mandated stringent regulations and guidelines to help organizations promote the health and safety of their communities. In connection with this event and restrictions by state and local governments, the Institute's members, faculty, and staff were transitioned to remote operations, which in some cases disrupted planned programmatic activity.

The United States Congress passed the Coronavirus Aid, Relief, and Economic Security (CARES) Act on March 27, 2020. The Institute recognized Employee Retention Credits through June 30, 2021 under the CARES Act of approximately $463,150. Those credits were used to offset a portion of the cost of keeping faculty and staff on payroll during the mandated shutdown. The Institute has been able to continue its academic mission to date but uncertainty around the breadth and duration of other business disruptions related to the pandemic could potentially impact operations in the future.

(14) Subsequent Events

The Institute evaluated events subsequent to June 30, 2021 through October 29, 2021, the date on which the financial statements were issued, and determined there were no subsequent events required to be disclosed.

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