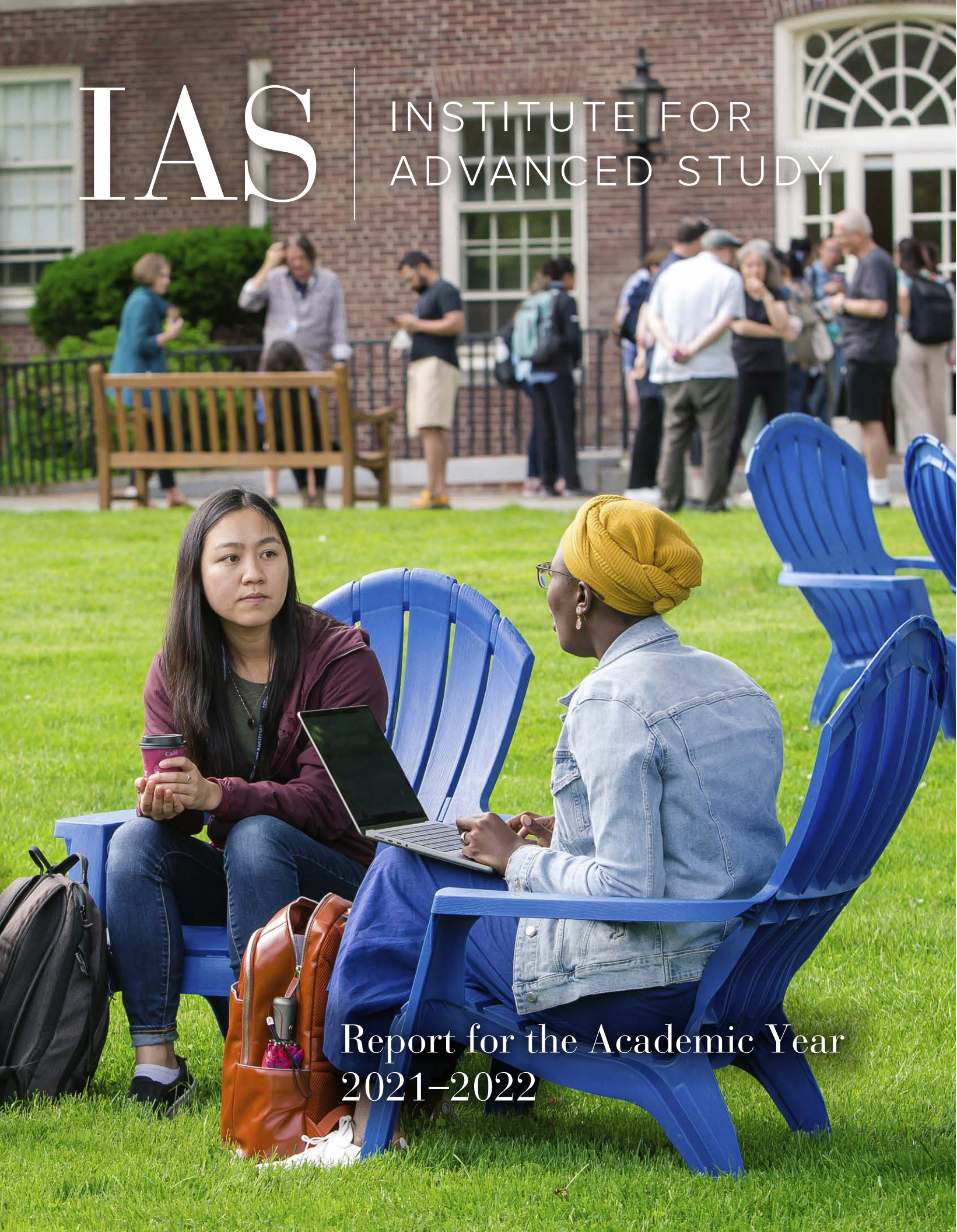

IAS | INSTITUTE FOR ADVANCED STUDY

Report for the Academic Year 2021–2022

Cover: Participants in the 2022 Women and Mathematics Program visited campus for a week in May to participate in a series of lectures, problem sessions, research seminars, special talks—and of course, teatime.

Opposite: This granite and steel sculpture by Elyn Zimmerman was dedicated in 2005 and celebrates the 75th anniversary of the Institute's certificate of incorporation. It was made possible through the generosity of former Trustee Robert B. Menschel.

COVER PHOTO: ANDREA KANE

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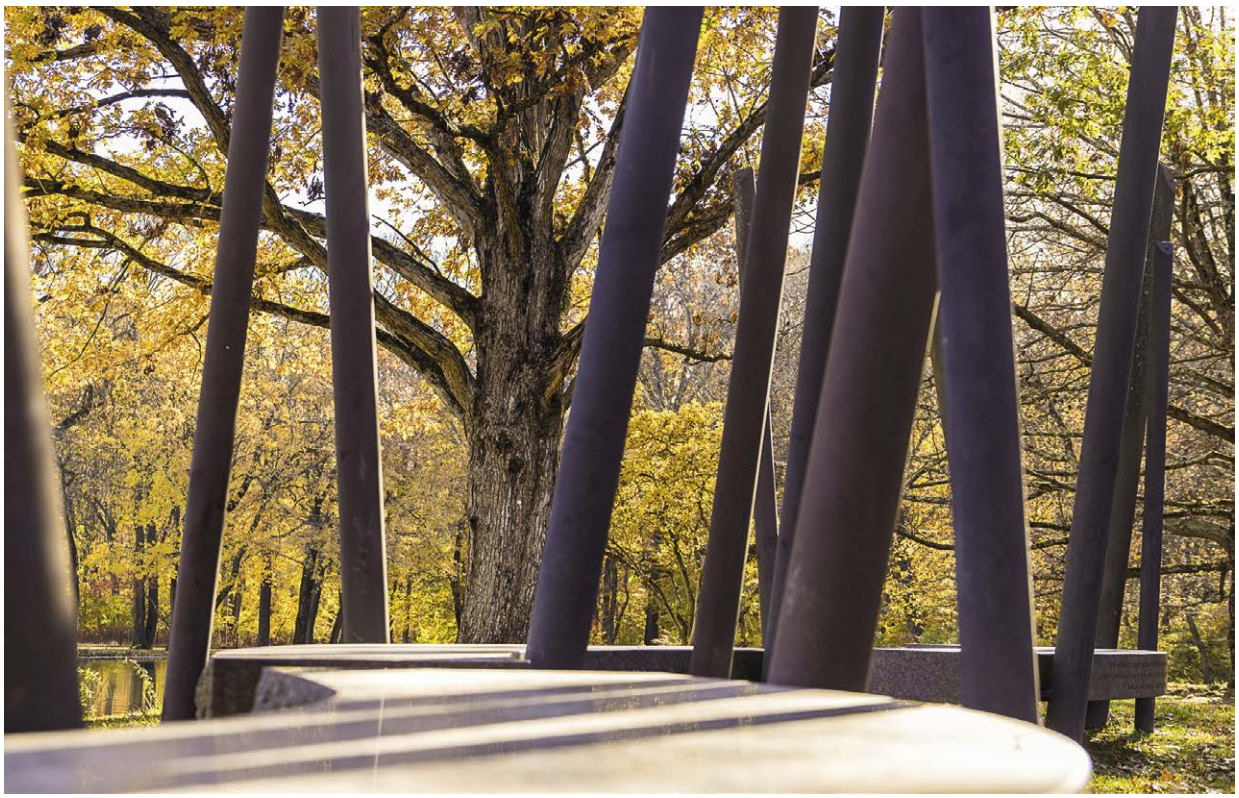

DAN KOMODA

Report of the Chair

ANDREA KANE

THE 2021–22 ACADEMIC YEAR was a time of change at the Institute. Robbert Dijkgraaf concluded his term as Director, serving from 2012 to 2022, and the Institute welcomed David Nirenberg as its tenth Director and Leon Levy Professor. After a period of remote work, scholars and Staff returned to campus as in-person activities resumed. Prior to their return, a project to reduce energy consumption had been undertaken, placing IAS on a path toward carbon neutrality.

With these changes, Robbert's last year concluded a remarkable tenure, during which the Institute was able to thrive academically, financially, and administratively. His lasting impact includes the appointment of 11 professors across the sciences and humanities, raising more than $200 million, and overseeing the Institute's endowment as it exceeded $1 billion for the first time. After serving the Institute with grace and agility for a decade, Robbert was sworn in as Minister of Education, Culture and Science of the Netherlands, by King Willem-Alexander in January 2022.

Under David's leadership, and building on new resources such as Rubenstein Commons, the Institute is well poised for the future. David has been intensely engaged in discussions with the entire Institute community about how to build on the Institute's illustrious past while cultivating new lines of thought and enriching the possibilities for collaborative interactions.

I applaud the eight-member director search committee for their foresight and efforts in selecting a leader who represents the core values of IAS and brings the energy and vision necessary to nourish the Institute's unique potential. The committee, chaired by Nancy Peretsman, included her fellow IAS Trustees Mark Heising, John Overdeck, Shirley Tilghman and IAS Professors Didier Fassin, Myles Jackson, Juan Maldacena, and Akshay Venkatesh—representing each of the IAS Schools.

In the early months of David's term, three endowed professorships were established: the Albers-Schönberg Professorship in the History of Science, the Gopal Prasad Professorship in the Schools of Mathematics and Natural Sciences, and the Frank C. and Florence S. Ogg Professorship in the School of Mathematics. Furthermore, a gala celebration was held on May 6, 2022, in honor of Shelby White, IAS Trustee Emerita, where she was presented with the IAS Bamberger Medal in recognition of the decades she has spent fostering truth and beauty at IAS.

The Institute has also seen changes to the Board of Trustees, as we welcomed to the Board Carl P. Feinberg, Founder and former CEO of Relational Architects International and a long-time supporter of the Institute since joining the Friends in 2002; Gigliola Staffilani, Abby Rockefeller Mauze Professor, MIT; and Wendell Weeks, Chairman and CEO, Corning Incorporated.

It is with immense gratitude that we recognize recently retired Board member Sir Martin J. Rees, who served as Academic Trustee for the School of Natural Sciences from 1998–2003 and as a Trustee since 2004, and through his own research helped guide and inspire succeeding generations of IAS Members.

Charles Simonyi
Chair of the Board

Report of the Director


ANDREA KANE

THE GLOBAL COLLECTIVE INTELLECT would be inestimably poorer without the discoveries and ideas the Institute has inspired in the years since its founding. Moreover, across those years, the Institute has consistently demonstrated that humanity benefits when it nourishes promise without regard to race, gender, or creed; when it supports the free movement of scholars and of ideas; and when it is committed not only to utility, but also to curiosity, discovery, and critique.

The world provides us with daily reminders that the work of the Institute is as vital today as it has ever been, and that the values upon which it was founded cannot be taken for granted. It was for me therefore a great joy to return to the Institute in February as the tenth Director and Leon Levy Professor, joining the Faculty, Board, Members, and Staff in the precious custody of this work and these values.

My immediate predecessor Robbert Dijkgraaf admirably navigated the Institute through numerous challenges. Among these was the pandemic, that in addition to its grave consequences for the world in general, threatened to constrain the Institute's role as the gathering point for an international community of scholars. Despite those challenges, in September Robbert welcomed to campus 271 scholars and scientists representing 114 academic institutions from 38 countries. Arriving after Robbert's January departure, it was my privilege to learn from the cohort's flourishing of interaction as Covid-19 protocols lifted, and to bid them farewell in June, after a year of discovery.

Covid-19 was not the only threat to the global pursuit of knowledge. The year was also marked by Russia's brutal invasion of Ukraine, by growing geopolitical tensions between China and the United States, and by heightened barriers to scientific exchange between nations.

The modern history of knowledge is testament to the importance of the Institute's ability to welcome scholars from across the world, even in times of global conflict. The Institute's early generations famously included European refugees from World War II such as Einstein, von Neumann, Panofsky, Kantorowicz, and many others. It also included Japanese scholars like Yukawa and domestic scholars facing persecution at home like Japanese-American Yagi, whose brother was released from an internment camp through the Institute's intervention. And it included Chinese refugees from the Sino-Japanese War, such as C.N. Yang, who arrived at the Institute in 1949, and in 1957 received a share of the first Nobel Prize awarded to Chinese-born physicists.

Preserving this openness to the free exchange of ideas will continue to be, as it has always been, one of the Institute's primary responsibilities. Another one of those ongoing responsibilities is the sustenance and renewal of a Faculty that has always led the world in its disciplines. Here too, the past academic year was significant.

At the beginning of the year Wendy Brown, a preeminent political theorist, joined the Faculty as UPS Foundation Professor in the School of Social Science. She brought with her a wealth of expertise in a wide array of topics including neoliberalism, feminism, authoritarianism, and the political economy of climate change. The year concluded with the retirement of Edward Witten and Yve-Alain Bois. These retirements present the Institute with its most basic challenge, one that it has faced repeatedly over its near-century of existence: the challenge of recruiting in each generation those with the potential to make foundational contributions to knowledge.

The Institute's past success in facing that challenge has been of enormous benefit to humanity. Its future successes promise the world similar gifts. I look forward to collaborating with you in discovering that future.

David Nirenberg
Director and Leon Levy Professor

ANDREA KANE

The Institute for Advanced Study

The Institute's mission, which has remained constant from the time of founding Director Abraham Flexner, is "to assemble a group of scientists and scholars who with their pupils and assistants may devote themselves to the task of pushing beyond the present limits of human knowledge and to training those who may 'carry on' in this sense."

THE INSTITUTE FOR ADVANCED STUDY (IAS) is one of the world's leading international centers for theoretical research and intellectual inquiry. Each year, IAS assembles more than 250 visiting researchers capable of generating—through their talent, proximity, collaboration, critique, and conversation—insights and discoveries that could not otherwise have been produced. The Institute's academic community is drawn from more than 100 institutions around the world and is composed of scholars from postdoctoral fellows at the beginning of their research careers to distinguished senior academics who continue to shape fields of inquiry. Research spans four Schools—Historical Studies, Mathematics, Natural Sciences, and Social Science—and is focused on curiosity-driven exploration and fundamental discovery.

The IAS campus provides the material conditions for discovery by furnishing exceptional minds with an environment free of external pressures and academic restraints. Enabled by the generosity of the Institute's founders and subsequent benefactors, IAS catalyzes the generation and transmission of knowledge. The Institute creates time and space for individual work as well as dialogue and partnership among its scholars through organized collaborative networks and serendipitous interactions.

Counted among the Institute's past and present Faculty and Members are thirty-five Nobel Laureates, forty-four of the sixty-two Fields Medalists, and twenty-two of the twenty-five Abel Prize Laureates, and many winners of the Wolf and MacArthur prizes. 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 scholars to deepen understanding across the sciences and humanities.

In the words of current IAS Director and Leon Levy Professor, historian and author David Nirenberg, "The Institute has also served the nation and the world through the constant performance of its founding values: that discriminations by gender and race are inimical to excellence, that scholars and ideas must move freely if fundamental knowledge is to flourish, and that when knowledge flourishes, humanity benefits. Both these tasks—discovery and the defense of these values—feel as urgent today as they were at the Institute's founding."

Participants in the 2022 Program for Women and Mathematics outside Wolfensohn Hall

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

Myles W. Jackson
Albers-Schönberg Professor in the History of Science

Sabine Schmidtke

Francesca Trivellato
Andrew W. Mellon Professor

PROFESSORS EMERITI

Glen W. Bowersock

Caroline Walker Bynum

Patrick J. Geary

Jonathan Israel

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 of 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. She was elected as a Fellow of the Medieval Academy of America in 2022.

Akbari is a founding member of NAISIP, the Native American and Indigenous Studies Initiative at Princeton (https://indigenous.princeton.edu/about). Her recent publications include "Medieval Indigeneity," in

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Member Karen Sonik's work focuses on themes of metamorphosis and identity.

A Cultural History of Race in the Medieval Age, 800–1350 (2021) and "Naming the Children of Jacob: The Shape of Negative Theology in the Benjamin Minor" in *Enlistment: Lists in Medieval and Early Modern Literature* (2022). As a member of the SSHRC-funded "Practices of Commentary" project (2020–25; https://globalcommentary.utoronto.ca/), she is co-editing a special issue of the open access journal *The Medieval Globe,* presenting the research group's findings.

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. This Mellon-funded project (2019–22) has been funded for a second phase, "Hidden Stories: New Approaches to the Local and Global" (2M USD, 2023–26; https://booksilkroads.library.utoronto.ca/). Publications include "Automated Transcription of Ge'ez Manuscripts," forthcoming in *Digital Humanities Quarterly* (with Samuel Grieggs, Jessica Lockhart, Alexandra Atiya, Gelila Tilahun, and Walter Scheirer).

The Medieval Studies seminar for 2021–22, held outdoors, focused on the topic of "Situatedness." The seminar series began with shared readings and was followed by presentations of work in progress.

Professor **Yve-Alain Bois** was on sabbatical leave during this academic term. In September 2021, the hefty second volume of his Catalogue Raisonné of Ellsworth's Kelly's Paintings, Reliefs and Sculpture appeared, covering the 1954–58 period (Cahiers d'art, Paris), and he devoted a good part of the academic year working on the third volume, which will cover the 1958–65 period. Another important part of his activity was devoted to editing an anthology of his essays, old and new, for a volume entitled *An Oblique Autobiography*, which would come out in December 2022 (No Place Press, New York and San Francisco). He also published the preface of a translation into French of selected writings by the British art critic David Sylvester ("Le critique passionné," in *L'art à bras le corps*, L'atelier contemporain, Strasbourg); a long memoir on Guy Brett, another British art critic, and the artist David Medalla ("Angels with Guns," in *October*, no 179, January 2022); and an essay on the texts on twentieth-century art written in the 1960s by a specialist of the Italian Renaissance, Robert Klein (in les *Cahiers du Musée National d'Art Moderne*, no. 158, winter 2021–22).

The main focus of Professor **Angelos Chaniotis**'s work remains the study of inscriptions and the information they provide for Greek social, cultural, and religious history. He continued working on the corpus of the inscriptions of Aphrodisias. He also co-directed together with Associate Professor Antonis Kotsonas (ISAW/NYU) the excavation of the city of Lyktos on Crete, where he is unearthing a building complex used for the imperial cult and for meetings of the council. 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 2021 to April 2022) took place in a hybrid form; the online option made it possible for former Members to attend. Subjects related to the cultural history, philosophy, and religion of ancient Greece and the Roman East, Greek and Roman art, ancient magic, the history of Rome, and Greek epigraphy were treated by current and past Members from Austria, Germany, Greece, Italy, Switzerland, Serbia, and the U.S. The annual workshop "Epigraphic Friday" took place online and lasted for two days (March 4–5, 2022). The lectures by 12 scholars from nine countries were attended by more than 90 scholars and graduate students from the U.S., Europe, and Israel. Chaniotis gave 17 lectures in Australia, Austria, Germany, Greece, Israel, Italy, Spain, and the U.S., most of them online, and taught online the course "Crete: Law – War – Profit" at the Northeast Normal University, Changchun (China). His lectures presented an overview of the history of Crete (seventh century B.C.E. to third century C.E.). He also presented the online course "Ancient Democracies" through the platform MATHESIS of Crete University Press.

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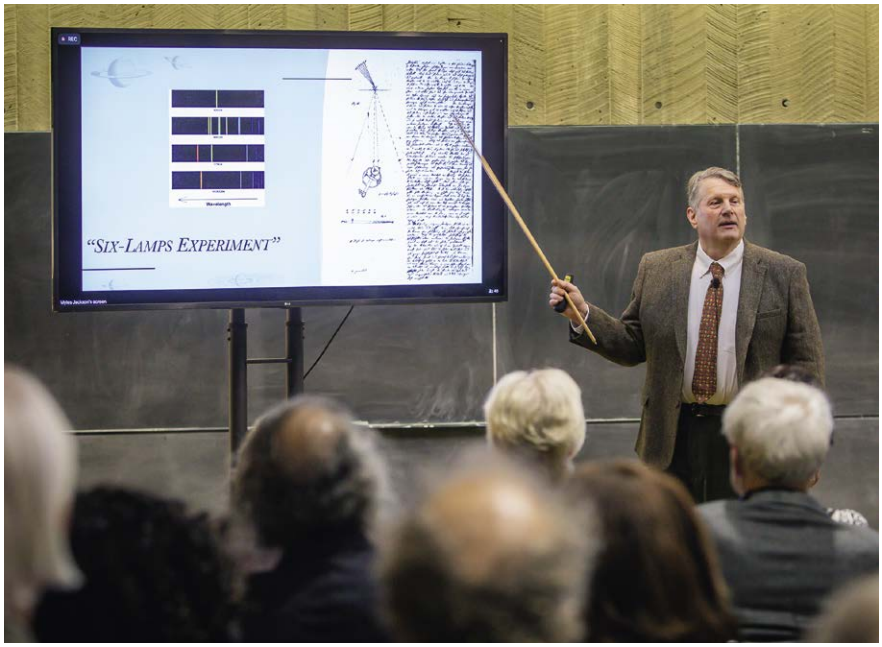
Professor Angelos Chaniotis greets the new class of scholars during Welcome Day.

Chaniotis continued his work as a member of the Council of Higher Education in Greece, responsible for the strategic planning and the evaluation of Greek universities. He was also involved in the international protests against the removal of antiquities found during the construction of a subway station in Thessaloniki. The documentary *Through the Window Glass*, which he co-produced and documents the life in a nursing home for the elderly in Athens during a lockdown in 2020, won numerous awards in 2021, including the Fischer Audience Award at the 23rd Thessaloniki Documentary Festival and the Best Documentary Awards at the Balkan Nordic Film Festival in Stockholm and the Docfest (the Greek Festival of Documentary Films) in Chalkis.

Nicola Di Cosmo, Henry Luce Foundation Professor in East Asian Studies, initiated and participated in several interdisciplinary research projects on climate change and its multiple causal and non-causal relations to environment and society in historical perspective. First, "Volcanoes, Climate and History," of which Di Cosmo is a member of the "core group" of conveners, is an international and interdisciplinary project funded by the Zentrum für Interdisziplinäre Forschung (ZiF), Univerisität Bielefeld. From November 2021 to October 2023, it will include five workshops that bring



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Myles Jackson gives his inaugural lecture as Albers-Schönberg Professor in the History of Science.

together climatologists, archaeologists, and historians to establish new conceptual and methodological approaches and intellectual pathways for research that bridges the knowledge gaps between scientific and humanistic disciplines of the past. The workshops held in 2021–22 were devoted to archaeological investigations and to paleoclimate proxy records. The chief purpose of these meetings is to learn about different disciplinary approaches to the past and set an agenda for interdisciplinary research across the humanities and the sciences to understand how past climatic changes relate to pre-modern societies, and thus build a better knowledge base to inform our present. A second initiative, *Climate, History and Environment on the "Great Wall" Region*, is funded by the Tang Research Foundation (TRF), and based at the IAS. Bringing together climate scientists and environmental historians, it seeks to investigate the environmental history of China through case studies, focusing in particular on the sensitive ecotone of the northern boundary of the East Asian summer monsoons. This is a region that was historically subject to deep and frequent climatic, political, and environmental changes. The workshop, held in June 2022, set an agenda for two specific case studies, which they plan to complete over the next two years, with yearly meetings at IAS. Also related to climate research, he was a co-author in a study of the volcanic eruption of Mt. Churchill (852/3 C.E.). He also completed the monograph (co-authored) *Venezia e I Mongoli: diplomazia e commercio sulle vie della seta* (Viella 2022, forthcoming). An English translation will follow. This book has been in preparation for several years, and it focuses especially on economic matters, including the Mongols' creation of a "silver standard" for medieval international trade. Di Cosmo continued his research on ancient China and presented several talks on the Chinese production of luxury products for markets outside China, discussing the political and military implications of trade with "barbarian" peoples. As a visiting scholar, Di Cosmo taught a new (and experimental) graduate course at Columbia University called "Climate and History: Methods and Concepts." Finally, a distinguished lecture series in pre-modern China was launched with the financial support of the TRF, named after its founder: the Roger E. Covey Distinguished Lecture in Pre-Modern China.

Albers-Schönberg Professor in the History of Science **Myles Jackson** finished the book manuscript tentatively entitled "Engineering Fidelities: Early German Radio, the Trautonium, and Electronic Music." It will either be published with Princeton University Press or the MIT Press. He is also working on a popular book on science and society over the past three centuries. Additionally, Jackson published an article entitled "Ownability, Ownership, Knowledge, and Genetic Information in the United States," in *Ownership of Knowledge: Beyond Intellectual Property* (forthcoming with The MIT Press, 2023), edited by Dagmar Schäfer, Marius Buning, and Annapurna Mamidipudi.

Jackson presented various aspects of his research at Hamilton College, the University of Krakow (Poland, via Zoom), and the Technical University of Munich. He also delivered the William and Myrtle Harris Distinguished Lecture in Science and Civilization at Caltech as well as the inaugural lecture for the Albers-Schönberg Professorship in the History of Science at IAS. He served as a visiting professor at the Institute for Advanced Study at the Technical University of Munich. With Professors Akshay Venkatesh, Helmut Hofer, Nathan Seiberg, and Didier Fassin, Jackson co-organized a series of discussions on "Artificial Intelligence and Machine Learning" with a view to increase dialogues among the four Schools at IAS. The theme for 2022–23 is "Evidence and Error." Finally, he was elected to the German National Academy of Engineering.

Jackson's Members worked on various topics, including a history of technology via material objects; dance and physiology in the Weimar Republic; biomedical research and ethics in Brazil; art, politics, science, and technology in Southeast Asia; and colonialism and early modern science in South America. He offered a colloquium series on the history of science every other week where members offered their works-in-progress in order to get feedback. They also had Members from musicology and the School of Social Science as well as a journalist who actively participated in the group. A number of the works presented in the colloquium series will appear as books in the near future.

In 2021–22 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, the "Science of Judaism" at the turn of the century, and the Muslim reception of the Bible.

The partnership with Hill Museum & Manuscript Library (HMML) at St. John's University, Collegeville, Minnesota to build up a repository to host 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. The final images from collections held by libraries in Rome (Dubbiosi, Nallino, Sarnelli) and Naples (Sarnelli) were dispatched to HMML's server during the summer of 2022. Moreover, in the framework of the NEH project, the history of the collections of Zaydi/Yemeni manuscripts in Europe were 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. A detailed study on the Griffini legacy was published by Sabine Schmidtke and Valentina Sagaria Rossi in *Shii Studies Review 6* (published in June 2022). During April 2022, Schmidtke inspected the archives of Cornelis van Arendonk (1881–1946) in Leiden and Oscar Löfgren (1898–1992) in Uppsala, two scholars, who also played an important role in Yemeni/Zaydi studies during the twentieth century. Additionally, the edited volume, "Yemeni manuscript cultures in peril" (co-edited with Hassan Ansari), was published during the early summer of 2022 (Gorgias Press); it includes two studies by the editors, the first discussing the fate of Yemeni manuscript traditions during the twentieth century and the second one revolving around the oeuvre and thought of one of the prominent scholars of Yemeni Zaydism of the thirteenth century, ʿAbd Allāh b. Zayd al-ʿAnsī. Moreover, an 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 published in *Shii Studies Review 6* (by Hassan Ansari, Ammar Jomha Falalieh Zadeh, 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 in 2023 by Mohr Siebeck). In parallel an edition of his correspondence (in Arabic, Hebrew, Hungarian, and German) is being prepared (with Dora Zsom). Schmidtke further began to study the legacy of two related figures, Eugen Mittwoch (1876–1942) and Israel Friedländer (1876–1920). While Mittwoch's legacy needs to be pieced together on the basis of what can be found in the archives of others, Friedländer's legacy is largely preserved at the JTS in New York. A study on the fate of Mittwoch's library is currently under consideration, and an annotated edition and study of Friedländer's correspondence with Ignaz Goldziher is presently in preparation (with Camilla Adang).

Within the area of the history of Near Eastern and Islamic studies, Schmidtke completed a monograph on Rudolf Strothmann (1877–1960), the founder of Shiʿi studies in Europe (to be published in the Transactions of the American Philosophical Society in 2023), as well as a study on the correspondence between Strothmann and Paul Kahle (1875–1964) (German Orientalism in Times of Turmoil, published Budapest: Eötvös Loránd University Chair for Arabic Studies, 2022). For this purpose, Schmidtke consulted the Fondo Paul Kahle in Turin in situ in April 2022. Together with two Italian colleagues, Valentina Sagaria Rossi and Roberto Tottoli, she is preparing a collective volume on the life and work of Paul Kahle. She further convened, in November 2021, with colleagues in Göttingen and Budapest, a conference "Ignaz Goldziher and his Correspondents" (https://www.ias.edu/hs/islamic-world/goldziher), and a proceedings volume is in preparation (to be published with Brill). Schmidtke further began preparations for a collaborative research project entitled "Scholarly Correspondences: The Case of 'Oriental Studies' During the Late Nineteenth and Early Twentieth Century."

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" (published by UCO Press, Cordoba, to be released in September 2022). In the field of Shiʿi Studies, Schmidtke also completed (with H. Ansari) the sixth volume of the peer-reviewed journal, *Shii Studies Review*, published by Brill, Leiden (www.brill.com/ssr). In it, Schmidtke, Ansari and Hamid Ataei Nazari published an *editio princeps* of a responsum by the eleventh-century Twelver Shiʿi theologian Abū Yaʿlā al-Jaʿfarī. With respect to the Muslim reception of the Bible, Schmidtke prepared a study on an Arabic translation of the Gospel in the library of the Twelver Shīʿī Scholar Raḍī al-Dīn ʿAlī b. Mūsā Ibn Ṭāwūs (d. 1266).

Over the course of the year, Schmidtke organized a number of online events. These included presentations of collaborative research projects and panels, some of which were convened in collaboration with Digital Scholarship Conversations @IAS. 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 United Kingdom, Austria, Germany, Iran, 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 IAS, as

well as occasional visitors.

In 2021–22 Andrew W. Mellon Professor **Francesca Trivellato** was delighted to return to convene the Members' seminar in person (with occasional hybrid sessions). Pre-circulated papers on topics ranging widely from Machiavelli to the politics of untouchability in East and South Asia generated lively and enriching conversations. She was able to spend May and June 2022 as William H. Bonsall Visiting Professor in the Humanities at Stanford University, where she enjoyed teaching a seminar on the history of credit, presenting a paper at the Law and History Center, and delivering the Harry Camp Memorial Lecture at the Humanities Center. In April 2022, Trivellato hosted the S.T. Lee Lecture (a SHS annual tradition until Covid-19). The speaker was Mariana Mazzucato, Professor of the Economics of Innovation and Public Value at University College London and Founding Director of the UCL Institute for Innovation and Public Purpose. During the day-and-a-half following the lecture, Trivellato convened a workshop on economic and environmental history jointly organized with Professor R. Bin Wong (UCLA).

In addition to completing a number of papers as well as an edited volume on Jewish history in early modern Europe, Trivellato began working on a new project (which may or may not become a book) on the meaning of equity and equality in Europe before the French Revolution. She addresses the topic by combining the history of ideas with granular-level analysis of specific labor and credit markets.

Her most recent monograph, *The Promise and Peril of Credit* (Princeton University Press, 2019), was awarded the 2021 Jordan Schnitzer Book Award in Medieval and Early Modern Jewish History and Culture by the Association for Jewish Studies. The book also appeared in Italian translation as *Ebrei e capitalismo: Storia di una leggenda dimenticata* (Laterza, 2021). A collection of her most significant essays on merchant networks and microhistory was issued in a Japanese paperback edition curated by Toshiaki Tamaki for the publishing house Chikuma Shobo.

Her publications include "1647: La leggenda delle origini ebraiche della finanza europea," in *Storia mondiale degli ebrei*, ed. Pierre Savy (Laterza, 2021); "The Medieval/Early Modern Divide along the Franco-Spanish Border," in *Constructing Iberian Identities, 1000–1700*, ed. Thomas Barton, Marie A. Kelleher, and Antonio Zaldívar (Brepols, 2022); "An Economic Historian Reads Salo W. Baron," in *Salo Baron: The Past and Future of Jewish Studies in America*, ed. Rebecca Kobrin (Columbia University Press, 2022); as well as a long review of a provocative book by Luciano Allegra, *La povertà degli ebrei: Voci dal ghetto* (Silvio Zamorani, 2021), in *Jewish History*, 36 (2022).

In 2021–22, Professor Emerita **Caroline Walker Bynum** continued to work on devotional objects in the period of the later Middle Ages and the Protestant Reformation in northern Europe and also to pursue various issues concerning the nature of comparison that she has addressed in several recent studies. Her article "Growing Up in the Shadow of Confederate Monuments" appeared in *Common Knowledge* 27 in the fall of 2021; it will appear in German translation in *Historische Anthropologie* in 2023. She published an essay titled "Objects and images" in the ethnographic journal *HAU* in fall 2021 as part of a symposium on Carlos Fausto's *Art Effects* and an interview with historians Almut Höfert and Xenia von Tippelskirch in the journal *L'Homme. Europäische Zeitschrift für Feministische Geschichtswissenschaft* in spring 2022. Her tongue-in-cheek essay "Who Does She Think She Is?" appeared in the online journal *Medieval Feminist Forum* in spring 2022. She served as a commentator for a symposium on relics held at Princeton University in the spring of 2022, organized by Professor Elizabeth Davis, wrote several book reviews and reports on manuscripts for journals, taught some classes on Zoom for various colleagues, and continued to mentor Columbia University graduate students (as well as the occasional Harvard and Princeton student) in history and art history. She is delighted to report that three of the graduate students she mentored over the past several years have now received their Ph.D.s and have tenure track jobs. She was recently elected vice president for the Humanities Division of the American Philosophical Society.

Professor Emeritus **Patrick Geary**'s European Research Council research project, HistoGenes, made significant progress in the past year. Through weekly Zoom meetings and a plenary meeting

Heinrich von Staden in conversation with an IAS Friend during an event in Simons Hall.

in Vienna in September the different research groups continue to coordinate their activities. The international, interdisciplinary team of historians, archaeologists, anthropologists, and geneticists have now sequenced over 4,000 individuals from the Carpathian basin between 400 and 900 C.E., completed the anthropological analysis of some 1,600, and has been completing fine-grained regional analyses of population structures and changes throughout the region.

In April, 2022 they published a paper showing rapid trans-Eurasian migration during the seventh-century in the journal *Cell* (https://doi.org/10.1016/j.cell.2022.03.007). A video on the project is available on its YouTube channel at https://www.youtube.com/watch?v=myla0_cCEWU.

In addition to a general lecture on directions of medieval history over the past forty years presented at the University of Göttingen, Geary also spoke on genetic history at the University of British Columbia, the German Historikertag, and at the Accademia delle Scienze of Torino, where he served as a visiting professor during the fall term, lecturing on ethnicity and nationalism at the invitation of Professor Laura Gaffuri.

Once more he chaired the MA exams at the Central European University in Vienna in June and was delighted to be able to return to his office at the Institute in May.

2021–22 MEMBERS AND VISITORS

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

Ken Alder
History of Science ✦ Northwestern University
Funding provided by the Andrew W. Mellon Foundation Fund

Andrew Amstutz
History of Science, History of South Asia ✦ University of Arkansas at Little Rock ✦ *f*
AMIAS Member

Hassan Farhang Ansari
Islamic Law and Theology ✦ Institute for Advanced Study ✦ *vp*
Funding provided by the Gerard B. Lambert Foundation

Robert James Antony
Chinese History ✦ Shandong University ✦ *v/f*
Funding provided by The Gladys Krieble Delmas Foundation

Ana Lucia Araujo
Atlantic Slavery, Memory, Material Culture ✦ Howard University ✦ *s*
Funding provided by The Gladys Krieble Delmas Foundation

Samuel Baker
Ancient Greek Philosophy ✦ University of South Alabama ✦ *f*
The Andrew W. Mellon Foundation Fellowship for Assistant Professors

Audrey Becker
Late Antiquity, Early Byzantine Empire ✦ Université de Lorraine ✦ *v/f*

Renate Blumenfeld-Kosinski
Medieval French Literature and Religious History ✦ University of Pittsburg ✦ *v/f*

Andrea Bohlman
Sound Studies, Musicology, Ethnomusicology ✦ The University of North Carolina at Chapel Hill
Edward T. Cone Member in Music Studies

Cédric Brélaz
Ancient Studies, Ancient History ✦ Université de Fribourg ✦ *s*
Funding provided by the Fund for Historical Studies

Cemil Bülbül
Ancient History

Pınar Bülbül
Anatolian History ✦ Kahramanmaraş Sütçü İmam Üniversitesi ✦ *v*

Delia Casadei
Music History, Sound Studies ✦ University of California, Berkeley ✦ *s*
The Andrew W. Mellon Foundation Fellowship for Assistant Professors

Celia Chazelle
Early Medieval History, History of Race ✦ The College of New Jersey
Funding provided by the Fund for Historical Studies

Peter Hewitt Christensen
History of Art and Architecture ✦ University of Rochester ✦ *s*
Funding provided by the Patrons' Endowment Fund

Rosanna Dent
History of Science, Modern Latin America ✦ New Jersey Institute of Technology and Rutgers University–Newark
Elizabeth and J. Richardson Dilworth Fellow

Abbey Ellis
Museum Studies and Classical Archaeology ✦ *v/s*

Christopher Athanasious Faraone
Classics, Ancient Religion, Medicine ✦ The University of Chicago ✦ *f*
William D. Loughlin Member

Douglas Flowe
Race, Carceral Studies, and Criminality ✦ Washington University in St. Louis
The Andrew W. Mellon Foundation Fellowship for Assistant Professors

Jérémie Foa
Early Modern History ✦ Aix-Marseille Université
Funding provided by the Florence Gould Foundation Fund

Patricia Gaborik
European Cultural History ✦ Università della Calabria ✦ *s*
George F. Kennan Member

Lucia Galli
Tibetan Studies ✦ Centre de Recherche sur les Civilisations de l'Asie Orientale, École Pratique des Hautes Études, Paris
Friends of the Institute for Advanced Study Member

Paul Galvez
Art History ✦ *v*

Nina Glibetic
Liturgical Studies ✦ University of Notre Dame ✦ *v*

Asaf Goldschmidt
History of Medicine in China ✦ Tel Aviv University
Founders' Circle Member, in recognition of Georg Albers-Schönberg and in memory of Ernst Albers-Schönberg

Karen B. Graubart
Latin American History ✦ University of Notre Dame ✦ *f*
Funding provided by the Fund for Historical Studies

Byron Ellsworth Hamann
Anthropology, History, Art History ✦ The Ohio State University
Felix Gilbert Member

Chunwen Hao
Chinese History ✦ Capital Normal University
Roger E. Covey Member in East Asian Studies

Kaja Harter-Uibopuu
Ancient Greek Law, Greek Epigraphy ✦ Universität Hamburg ✦ *v/s*

Matthew Hersch
History of Technology ✦ Harvard University ✦ *v*

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

Joshua Howard
Modern Chinese History ✦ University of Mississippi ✦ *v/s*

Ayesha A. Irani
Islam in South Asia ✦ University of Massachusetts Boston
Patricia Crone Member

Maya Jasanoff
History ✦ Harvard University ✦ *f*
George F. Kennan Member

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

Nathaniel Barrett Jones
Art History ✦ Washington University in St. Louis
Agnes Gund and Daniel Shapiro Member

Emily Kadens
Premodern European Legal History ✦ Northwestern University ✦ *s*
Funding provided by the Fund for Historical Studies

Grigory Kessel
Syriac Studies, Ancient Medicine, Manuscripts ✦ Austrian Academy of Sciences and The University of Manchester
Funding provided by the Herodotus Fund

Mansooreh Khalilizand
Islamic Philosophy ✦ University of Münster ✦ *v/s*

Diana Kim
Politics ✦ Georgetown University
Hans Kohn Member

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

Yukiko Koga
Anthropology of Post-Imperial Entanglements ✦ Yale University
Willis F. Doney Member

Whitney Laemmli
History of Science and Technology ✦ Carnegie Mellon University
The Andrew W. Mellon Foundation Fellowship for Assistant Professors

Peter G. Lake
Early Modern English History ✦ Vanderbilt University
Funding provided by the Andrew W. Mellon Foundation Fund

Feng Li
History and Archaeology of Early China ✦ Columbia University
Starr Foundation East Asian Studies Member

Ethan Lewis Menchinger
Ottoman History ✦ The University of Manchester ✦ *s*
Patricia Crone Member

Naphtali S. Meshel
Hebrew Bible ✦ Princeton University ✦ *v/s*

Shiva Mihan
Art of Early Modern Perso-Islamic Manuscripts ✦ Harvard Art Museums
Funding provided by the Herodotus Fund

Maureen Miller
Medieval History ✦ University of California, Berkeley ✦ *f*
Elizabeth and J. Richardson Dilworth Fellow

Takashi Miura
Japanese Religions ✦ The University of Arizona ✦ *s*
Starr Foundation East Asian Studies Member

Iris Montero-Sobrevilla
History of Science, Colonial Latin America ✦ Brown University ✦ *f*

Melissa Moreton
History of the Book, Global Middle Ages ✦ Institute for Advanced Study ✦ *ra*

Robert S. Nelson
Byzantine Art and Its Later Reception ✦ Yale University
Funding provided by the Fund for Historical Studies

Luther Obrock
Sanskrit, South Asian Literature and History ✦ University of Toronto Mississauga
Funding provided by the Herodotus Fund

Esen Ogus
Classical Archaeology and Art ✦ The College of New Jersey ✦ *ra*

Eleftheria Pappa
Mediterranean and Classical Archaeology
Funding provided by the Hetty Goldman Fund

Scott Anthony Pearce
Medieval East Asian History ✦ Western Washington University ✦ *f*

Gabriele Pedullà
Intellectual History, Political Thought ✦ Università di Roma Tre ✦ *v/s*

Jillian Porter
Russian Cultural History ✦ University of Colorado ✦ *f*
George F. Kennan Member

David Potter
Roman History ✦ The University of Michigan
Founders' Circle Member, in recognition of Deborah Lunder and Alan Ezekowitz

Gabriel Radle
Liturgical Studies; Byzantine Studies ✦ University of Notre Dame
George William Cottrell, Jr. Member

Ramnarayan Singh Rawat
South Asia, Liberalism, Race and Caste ✦ University of Delaware ✦ *f*
George F. Kennan Member

Ann Reynolds
Art History ✦ The University of Texas at Austin
Funding provided by the Ruth Stanton Foundation Fund

Valentina Sagaria Rossi
Zaydi Manuscript Tradition, Arabic Codicology ✦ Accademia Nazionale dei Lincei ✦ *ra*

Sayuri Guthrie Shimizu
History ✦ Rice University ✦ *f*
Martin L. and Sarah F. Leibowitz Member

Asheesh Kapur Siddique
Early America, Early Modern World ✦ University of Massachusetts
The Andrew W. Mellon Foundation Fellowship for Assistant Professors

Karen Sonik
Cultural History, History of Art ✦ Auburn University
Funding provided by the Hetty Goldman Fund

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

Thomas Maria Weber-Karyotakis
Archaeology of the Near East ✦ German-Jordanian University
Gerda Henkel Stiftung Member

Gavin Williams
Sound Studies, Musicology ✦ University of California, Berkeley ✦ *v/s*

Anna Patricia Wilson
Medieval Literature, Fan Studies ✦ Harvard University
Willis F. Doney Member

David Wilton
Linguistics, Medieval Literature ✦ *v*

Joseph Witztum
Quranic Studies ✦ The Hebrew University of Jerusalem
Funding provided by the Fund for Historical Studies

Talia Zajac
Medieval History ✦ John Rylands Research Institute and Library and the University of Manchester ✦ *v/s*

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
Frank C. and Florence S. Ogg Professor

Peter Sarnak
Gopal Prasad Professor

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 2021–22 ACADEMIC year, the IAS School of Mathematics conducted a special program on Variational Methods in Geometry. The program was led by Distinguished Visiting Professor László Székelyhidi Jr. and IBM von Neumann Professor **Camillo De Lellis**.

The "*h*-principle" (not to be confused with Boltzmann's "*H*-principle" in statistical physics) is a term coined by Gromov to identify situations in which a certain family of constraints on some objects, given typically as a system of partial differential equations and inequalities, turns out to be much less restrictive than expected. In a certain sense when the *h*-principle holds there is an abundance of solutions to the family of constraints and this abundance goes beyond what the intuition of the mathematical community historically suggested. An historical groundbreaking example is the C^1 isometric embedding theorem of Nash and Kuiper, proved in the fifties: while it was largely believed that there is only one way of embedding a round sphere in the flat 3-dimensional space so to preserve the length of any curve, it actually turns out that it is possible to do it in a variety of ways (as long as the embedded surface is not too "regular").

Gromov's original aim was to gather a host of surpringly flexible, but seemingly scattered, geometric examples in a single unifying framework. His work led to a theory which has far-reaching consequences and which has seen groundbreaking developments in the last decade. Meanwhile a family of apparently unrelated "softness" examples appeared in sectors of partial differential equations closer to mathematical physics than geometry. It was pointed out at the turn of the last century by Müller and Šverak that the latter could be interpreted as suitable versions of Gromov's *h*-principle. The last decade has witnessed a number of surprising *h*-principle type statements in theoretical fluid dynamics, which culminated in the proof of a long-standing conjecture put forward by the theoretical physicist Lars Onsager in 1949 in his celebrated paper about a statistical theory of fully developed turbulent flow.

The special program gathered together senior experts from both the geometric and analytical side of the *h*-principle, such as Yasha Eliashberg, Emmy Murphy, Kai Cieliebak, Tristan Buckmaster, Vladimir Šverak, Alexei Cheskidov, and Daniel

DAN KOMODA

Simonyi Hall, home of the School of Mathematics, was built in 1993 and dedicated in 2000 in recognition of Charles Simonyi's contributions to IAS.

ANDREA KANE

Visitor Julian Chaidez participates in a discussion during a visit from Google's DeepMind.

Faraco, together with a smaller group of senior mathematicians from other subjects eager to learn about the *h*-principle and its recent applications, and approximately twenty younger researchers (mostly at the postdoc level).

In September the School of Mathematics hosted the ceremony for the attribution of the Clay Research Award to Buckmaster, Isett, and Vicol for their recent contributions to the *h*-principle in fluid dynamics. Two weekly workshops were held in the fall and in the spring. The fall workshop gravitated more around the geometric side of the subject and was an occasion to celebrate Eliashberg's 75th birthday, while the spring workshop was dedicated to the analytical side. Both workshops saw the participation of several international speakers, and in spite of the pandemic quite a few talks were in-person.

During the "regular" weeks of the two semesters the participants gathered for three regular seminars. The Tuesday seminar was dedicated to 1-hour talks showcasing the research achievements of the participants. During the fall the Wednesday seminars were organized as monthly cycles of three to four 2-hour lectures on the basic tools of the trade and was conceived as a way of fostering exchanges between Members coming from diverse communities. Meanwhile the Thursday seminars were monthly cycles of 2-hour lectures dedicated to the understanding of recent breakthroughs and the study of important open questions. During the spring semester both the Wednesday and Thursday seminars were dedicated to reading seminars exploring the details of recent results: the Wednesdays were dedicated to geometric problems and the Thursdays to analytical problems.

Various participants in the special program coalesced naturally into smaller groups who tackled important advanced open problems in the field. Some took advantage of the possibility given by the presence of a large number of experts to delve into unsolved questions or to clarify recent claims of solutions of major problems in the literature. The one given below is a very small sample:

- Dallas Albritton and Elia Brué completed with their collaborator Maria Colombo a groundbreaking theorem on the ill-posedness of Leray-Hopf solutions of the Navier-Stokes equations with an external driving force, and their work was featured by *Quanta*.
- After a reading seminar which was a veritable tour de force, Yasha Eliashberg and Dishant Pancholi found an important gap in the works of Honda and Huang on contact convexity. They then devoted a substantial effort to fix the gap, finally crowned by success in the summer.
- Tristan Buckmaster and two postdocs at Princeton University used neural networks to propose a possible blow-up scenario for one of the most studied models of incompressible fluid dynamics; their work was also featured by *Quanta*.
- Camillo De Lellis, László Székelyhidi Jr., and Vladimir Šverak started in the fall a collaboration with Google DeepMind to explore the use of machine learning in blow-up problems in partial differential equations.
- Matthew Novack completed a work with Vlad Vicol which suggests an *h*-principle typle approach to multifractality in turbulent flows.

The activities in geometric analysis and partial differential equations at IAS, led by IBM von Neumann Professor **Camillo De Lellis**, have been very intensive in the 2021–22 academic year. De Lellis and Distinguished Visiting Professor László Székelyhidi Jr. were the organizers of the Special Year focused on the *h*-principle and its applications in analysis and geometry. The latter program involved more than 25 Members of the School of Mathematics and several external collaborators. Since a separate report on the various accomplishments and activities of the Special Year can be found in the School's introduction, this following paragraph will focus on a handful of research collaborations which were not part of the Special Program but were carried out at the School of Mathematics in the topics of geometric analysis and partial differential equations.

Elia Bruè continued his research on how the notion of "curvature" of a space can be optimally introduced with a minimal amount of structural assumptions on the underlying geometric object. Bjoern Bringmann completed a long program to prove the invariance of the Gibbs measure for the three-dimensional cubic nonlinear wave equation, which is also known as the hyperbolic Φ^4_3-model. The work of Bringmann—joint with Y. Deng, A. Nahmod, and H. Yue—fills an important gap in our understanding of stochastic and dispersive partial differential equations. The most difficult aspect of their proof is the probabilistic well-posedness of the cubic nonlinear wave equation, which combines sophisticated techniques from dispersive equations, harmonic analysis, and probability theory.

De Lellis, together with his Ph.D. students and some external collaborators, has spent part of the year investigating the nature of singularities for one of the most

common examples of minimal surfaces, called area-minimizing integral currents. In a joint project with his Ph.D. student Anna Skorobogatova he has tackled the "rectifiability problem" for the singular set, one of the major unsolved questions in the area. In a series of three forthcoming papers De Lellis and Skorobogatova are able to subdivide the singularities according to a suitable "degree of homogeneity." The subdivision enables them to split the "rectifiability question" into three separate subproblems and two of them can be solved combining recent techniques of Naber and Valtorta with the works of De Lellis and Spadaro on Almgren's regularity theory. The remaining subproblem connects the rectifiability of the singular set to another major unsolved question in the area: the "uniqueness of tangent cones at singular points." The final outcome of De Lellis and Skorobogatova's work is therefore an unexpected connection between two major unsolved problems in the area.

Helmut Hofer, Hermann Weyl Professor, led the research in symplectic geometry at IAS. The research group—consisting of the members Ipsita Datta, Agustin Moreno, and Shira Tanny, and the visitors Julian Chaidez and Rohil Prasad from Princeton University—profited from interactions with some of the Members participating in the special year, most notably Kai Cieliebak, Yasha Eliashberg, and Josh Sabloff. The group organized, with Princeton University, a "Joint Symplectic Geometry Seminar," and also the international "Symplectic Zoominar," jointly with Montreal, Paris, Princeton, and Tel Aviv. The research focused on Symplectic Dynamics and Symplectic Geometry. Agustin Moreno, together with Urs Frauenfelder (Augsburg, Germany), introduced general tools extracted from Floer theory for the study of periodic orbits and their bifurcations. In separate work with Dayung Koh (navigational engineer at JPL-NASA), these tools served as the mathematical groundwork behind guiding and organizing numerical work, designed to find trajectories on which to place a spacecraft in orbit around the Jupiter-Europa and the Saturn-Enceladus systems. In recent work, Chaidez, Datta, Prasad, and Tanny proved a conjecture by Kei Irie which can be viewed as an important first step to understand when the so-called smooth closing lemma holds, i.e. when a generic compact Hamiltonian energy surface contains its periodic orbits as a dense set. Their work gives the first high-dimensional examples. In a different direction, Moreno, together with Jonathan Bowden (Regensburg, Germany), Fabio Gironella (Berlin, Germany), and Zhengyi Zhou (past Member (2018–21) in the School of Mathematics), within the context of the classification of higher-dimensional contact manifolds, have produced contact structures on higher-dimensional spheres with "exotic" properties, i.e. they are tight and non-fillable. This builds on previous work of the first three authors, which appeared recently in Inventiones Mathematicae. A project of Tanny concerns the Floer chain complex of Hamiltonians supported on subsets of closed manifolds and investigates the "local behavior" of the associated Floer chain complex which depends in subtle ways on the topology of the symplectic space. Datta worked with Eliashberg and Sabloff on the development of algebraic structures and capacities which describe appropriately moduli spaces of holomorphic disks with corners and boundaries on Lagrangian tangles extending her previous work. Helmut Hofer and science journalist Siobhan Roberts have been working on a book about the late Andreas Floer and the development of Floer theory: "The Floer Jungle: Charting the Development of a Theory."

One of Frank C. and Florence S. Ogg Professor **Jacob Lurie**'s primary interests is algebraic geometry: the study of solutions to systems of polynomial equations

$$f_1(x_1, \cdots, x_n) = f_2(x_1, \cdots, x_n) = \cdots = f_m(x_1, \cdots, x_n) = 0.$$

When these equations have complex coefficients, the locus of complex solutions can be regarded as a topological space. In this case, the classical theory of algebraic topology provides a plethora of invariants which can be used to analyze the geometry of the solution space. When working over more general fields, the tools of classical topology are no longer available. However, some important invariants (such as cohomology) can be defined in purely algebraic ways, which make sense even for equations whose coefficients lie in finite fields. Here there are two primary approaches, both of which were introduced by Alexander Grothendieck and his students in the 1960s: the theory of étale cohomology (which is useful for studying p-torsion phenomena over fields where p does not vanish) and the theory of crystalline cohomology (which is useful for studying p-torsion phenomena over fields where p does vanish).

In arithmetic applications, one often encounters systems of polynomial equations having integer coefficients. In this

ANDREA KANE

Distinguished Visiting Professor László Székelyhidi Jr. poses a question during DeepMind's Fireside Chat on how machine learning is aiding mathematicians in discovering new conjectures and theorems.

ANDREA KANE

ANDREA KANE

The 2022 Program for Women and Mathematics, pictured here during a lecture by Kate Saenko, explored "The Mathematics of Machine Learning."

case, one can study their solutions both over fields of characteristic zero (where one can apply the theory of étale cohomology) and over fields of characteristic $p > 0$ (where one can apply the theory of crystalline cohomology). One can then ask how these cohomological invariants are related to one another. There has been a great deal of recent progress on this question, culminating in the introduction of a new invariant called *prismatic cohomology*. Over the past year, Jacob Lurie and Bhargav Bhatt have studied the coefficient objects for this cohomology theory, known as *prismatic F-gauges*. One of the principal results of this collaboration is an arithmetic duality theorem, which can be regarded as a "crystalline" refinement of local Tate duality. The proof of this result relies on a detailed analysis of a new object called the *Cartier-Witt stack* (discovered independently in work of Drinfeld), whose geometry governs the "spectral theory" of prismatic *F*-gauges.

Gaps in the spectra of Laplace/Hecke type operators associated with locally uniform geometries are central to many of the applications of automorphic forms. Their study has a long tradition at IAS. Some interesting advances in the last few years are by Dalimil Mazac (SNS), Sridip Pal (SNS) and Petr Kravchuk who apply bootstrap techniques from conformal field theory to determine the complete bass-note spectrum of hyperbolic orbifolds, and the breakthrough by past Member Michael Magee and William Hide who exhibit hyperbolic surfaces with arbitrary large genus and bass-note limiting at 1/4 (this being the optimally large such spectral gap). Gopal Prasad Professor **Peter Sarnak** together with Alicia Kollar and past Member Fan Wei have developed a detailed theory for prescribing gaps in the spectra of large cubic graphs.

In particular, an abrupt passage from being gap set rich to being rigid, as one imposes planar constraints on the graphs, is uncovered. This is decisive in various applications. The key spectral gaps that have applications in number theory and related dynamics center around arithmetically defined locally uniform geometries. For these, the holy grail is the Ramanujan Conjecture formulated by Professor Emeritus Robert Langlands, and in full generality and with subtle modifications by frequent Member James Arthur. While these remain out of reach, the more approachable "Density Conjecture" of Sarnak and Xiao Xue serves as a substitute in many applications. A number of seminar talks during the last year have centered around proofs of the density conjecture in various settings. These include the advances by past Members Shai Evra and Mathilde Gerbelli-Gauthier, and Rahul Dalal.

This year, Robert and Luisa Fernholz Professor **Akshay Venkatesh** continued his investigations with David Ben-Zvi and Yiannis Sakellaridis into duality of automorphic periods, as well as several related projects.

This project is related to ideas arising in the physics literature—namely, the study of "boundary conditions" for quantum field theories; it is remarkable to see them arise also in number theory.

As in previous years, Jacob Lurie and Venkatesh organized a learning seminar on a topic of broad interest. Their focus this year was Floer homology, a technique introduced in the 1980s by Andreas Floer; they sought to study it in a relatively simple setting where they could try to understand the (already formidable) technicalities. They were fortunate that some of the Members were already experts in this area, and could guide them through some of the most difficult arguments. They were delighted by the range of interests of the attendees of the seminar, representing fields from analytic number theory to partial differential equations.

During the past academic year, Herbert H. Maass Professor **Avi Wigderson** devoted a large chunk of time to the preparation of two substantial monographs. The first, with past Member Jeroen Zuiddam, is a modern survey of Strassen's theory of the asymptotic spectrum of tensors, including many recent developments. The second—with collaborators Peter Burgisser, Cole Franks, Ankit Garg, Rafael Oliveira, and Michael Walter—is a survey of a research project Wigderson was part of in the past six to seven years on connections between optimization, complexity, and invariant theory, leading to a theory of geodesic optimization over linear groups, with many applications. Wigderson was also involved in several research projects with current Members, which include the following: Fernando Jeronimo (and two University of Chicago students) on expander graphs; Pei Wu and Ronen Eldan, on the noise sensitivity of Boolean functions and voting schemes; Or Zamir, on batch computation over groups; and Vijay Bhattiprolu on properties of geometrically defined Boolean functions.

2021–22 MEMBERS AND VISITORS

f First Term ✦ *s* Second Term ✦ *v* Visitor ✦ *vp* Visiting Professor ✦ *dvp* Distinguished Visiting Professor ✦ *vri* Veblen Research Instructor ✦ *vnf* von Neumann Fellow

Bahar Acu
Symplectic Geometry, Contact Topology ✦ Institute for Advanced Study ✦ *f*
Minerva Research Foundation Member

Amol Aggarwal
Probability, Mathematical Physics ✦ Columbia University ✦ *vp/s*
Funding provided by the National Science Foundation

Dallas Albritton
Partial Differential Equations, Fluid Dynamics ✦ Institute for Advanced Study
Funding provided by the Simons Foundation

Lior Alon
Mathematical Physics ✦ Institute for Advanced Study
Funding provided by The Ambrose Monell Foundation

Francisco Andres Arana-Herrera
Teichmüller Theory and Dynamics on Moduli Spaces of Riemann Surfaces ✦ Institute for Advanced Study
Funding provided by the National Science Foundation

Emelie Kerstin Arvidsson
Arithmetic and Algebraic Geometry ✦ Institute for Advanced Study
Giorgio and Elena Petronio Fellow

Alexey Balitskiy
Geometry ✦ Institute for Advanced Study
Funding provided by the National Science Foundation

Aleksandr Berdnikov
Geometric Topology ✦ Institute for Advanced Study
Erik Ellentuck Fellow

Vijay Bhattiprolu
Approximation, Optimization, Convex Geometry ✦ Institute for Advanced Study
Founders' Circle Member, in recognition of Cynthia and Robert Hillas; funding provided by the National Science Foundation

Bjoern Bringmann
Partial Differential Equations ✦ Institute for Advanced Study
Funding provided by the National Science Foundation

Elia Bruè
Metric Geometry, Partial Differential Equations ✦ Institute for Advanced Study
Giorgio and Elena Petronio Fellow

Matija Bucic
Discrete Mathematics and Combinatorics ✦ Institute for Advanced Study and Princeton University ✦ *vri*

Tristan Buckmaster
Partial Differential Equations, Fluid Dynamics ✦ Princeton University

Clark W. Butler
Dynamical Systems ✦ Institute for Advanced Study and Princeton University ✦ *vri*
Funding provided by the Oswald Veblen Fund

Julian Chaidez
Contact and Symplectic Geometry ✦ Princeton University ✦ *v*

Lin Chen
Geometric Langlands Program ✦ Institute for Advanced Study
Funding provided by the Simons Foundation

William Yun Chen
Number Theory, Algebraic Geometry ✦ Institute for Advanced Study
Minerva Research Foundation Member

Alexey P. Cheskidov
Nonlinear Partial Differential Equations and Fluid Dynamics ✦ University of Illinois at Chicago
Funding provided by the Charles Simonyi Endowment

Kai Cieliebak
Symplectic Geometry ✦ Universität Augsburg

Diego Cordoba
Analysis and Partial Differential Equations ✦ Instituto de Ciencias Matemáticas, Madrid ✦ *s*
Funding provided by the Charles Simonyi Endowment

Leonardo Coregliano
Graph Limits, Extremal Combinatorics ✦ Institute for Advanced Study

Mimi Dai
Partial Differential Equations ✦ University of Illinois at Chicago ✦ *vnf*
Friends of the Institute for Advanced Study Member

Ipsita Datta
Symplectic Geometry ✦ Institute for Advanced Study
Funding provided by the National Science Foundation

Mark de Cataldo
Algebraic Geometry ✦ Stony Brook University, The State University of New York ✦ *f*

Cédric De Groote
Symplectic Geometry ✦ Institute for Advanced Study
Funding provided by The Ambrose Monell Foundation

Hongjie Dong
Partial Differential Equations ✦ Brown University
Funding provided by the Charles Simonyi Endowment

Theodore Dimitrios Drivas
Fluid Dynamics, Turbulence, Dynamical Systems ✦ Stony Brook University, The State University of New York ✦ *s*
Funding provided by the Charles Simonyi Endowment

Ronen Eldan
High-dimensional probability ✦ Weizmann Institute of Science ✦ *vnf*
Funding provided by the National Science Foundation

Yakov Eliashberg
Geometry, Topology ✦ Stanford University ✦ *f*

Daniel Faraco
Analysis, Applied Mathematics ✦ Universidad Autónoma de Madrid ✦ *s*
Bell System Fellow

Mathilde Gerbelli-Gauthier
Number Theory, Representation Theory ✦ Institute for Advanced Study
Funding provided by the Charles Simonyi Endowment

William Goldman
Differential Geometry, Topology, Dynamics ✦ University of Maryland

Mark Goresky
Geometry, Automorphic Forms ✦ Institute for Advanced Study ✦ *v*

Fernando Granha Jeronimo
Theoretical Computer Science ✦ Institute for Advanced Study
Funding provided by the National Science Foundation

André Guerra
Partial Differential Equations ✦ Institute for Advanced Study
Infosys Member

Michael Harrison
Differential Topology ✦ Institute for Advanced Study
Funding provided by the National Science Foundation

Manh Khang Huynh
Partial Differential Equations ✦ Institute for Advanced Study

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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

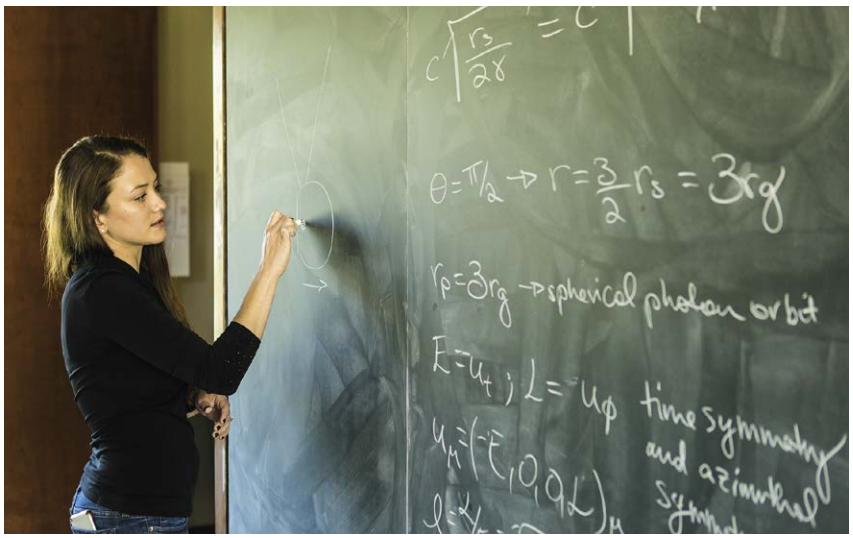
Peter Goddard

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.



DAN KOMODA

Member Lia Medeiros pictured in Bloomberg Hall

Astrophysics

Computational methods have emerged as essential tools for understanding the dynamics of many astrophysical systems, from the formation of stars and planets to accretion onto black holes. Professor **James Stone** has continued his work to develop and implement new algorithms that can be used to tackle increasingly complex problems. Working with Members Patrick Mullen, Elias Most, and George Wong, he has developed new methods for radiation transport and general relativistic magneto-hydrodynamics (MHD) to study rapid accretion onto black holes where radiation pressure plays an important role, in order to understand the dynamics of systems such as active galactic nuclei and X-ray binaries. He is also working with graduate students at

Princeton University and collaborators at Pennsylvania State University to implement numerical methods to solve Einstein's equations along with the dynamics of matter to study the mergers of black holes and compact objects such as neutron stars. A novel aspect of this work is the adoption of a new programming model that allows calculations to be run on any computer hardware currently available, from standard CPUs to advanced accelerators such as graphical processing units (GPUs). In addition, Stone has continued work with other members and students at the University on a number of problems in astrophysical MHD. This includes work with members Libby Tolman, Lev Arzamasskiy, and Siyao Xu to study 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.

During the past year, Richard Black Professor **Matias Zaldarriaga** continued his involvement in gravitational wave research. Together with former Members Barack Zackay and Tejaswi Venumadhav, as well as Javier Roulet, Seth Olsen, and Jonathan Mushkin, Zaldarriaga applied novel analysis techniques to the public data from the LIGO/Virgo observatory and reported the detection of ten new binary black hole (BBH) mergers in the publicly released data from the first half of the third observing run (O3a) of advanced LIGO and advanced Virgo. Among the ten new events, astrophysically interesting new sources were reported, including sources with confidently large effective spin parameters in both the positive and negative directions, high-mass black holes that are difficult to form in stellar collapse models due to (pulsational) pair instability, and low-mass mergers that bridge the gap between neutron stars and the lightest observed black holes.

Zaldarriaga continues to be interested in topics related to cosmology. Together with Marko Simonović, Mikhail Ivanov, Giovanni Cabass, and Oliver Philcox, Zaldarriaga presented new constraints on the very early universe, the epoch of inflation, derived from measurements of the location of galaxies obtained by the BOSS survey. The techniques developed provide a new avenue by which upcoming surveys of galaxies will be able to constrain the first instants in the history of our universe.

A primary interest of Professor Emeritus **Scott Tremaine** is the study of the history and structure of the Milky Way, our home galaxy, which has been revolutionized by the European Space Agency's Gaia spacecraft, launched in 2013. Gaia measures the positions and motions of the Milky Way's stars in vast numbers, with unprecedented accuracy. Its current catalog contains over a billion stars, and can measure changes in their positions on the sky as small as the width of a human hair in Los Angeles as seen from New York. The results from Gaia have confirmed that traditional models of the Milky Way, which were mostly based on the assumption that it was in an axisymmetric, time-independent, equilibrium state, were oversimplified. In fact, the galaxy exhibits significant transitory deviations from equilibrium, probably caused by infalling satellite galaxies, substructure in its dark-matter halo, irregular star formation, transitory disk instabilities, and so forth. One of the most striking of the Gaia discoveries is the so-called Gaia snail, a spiral feature in the phase-space distribution of stars in the solar neighborhood. Tremaine is collaborating with Jo Bovy and Neige Frankel (University of Toronto) to analyze the properties and investigate the origin of the Gaia snail. Conventional models attribute the snail to the gravitational disturbance caused by a passage of the Sagittarius dwarf galaxy through the disk of the Milky Way about 300 million years ago, but another possibility is that the snail encodes the response of the disk to a large number of smaller disturbances, probably caused by substructure in the dark matter halo. The Gaia snail is a testbed for future analyses of the archaeology of the Milky Way.

LEE SANDBERG

Member Nadia Zakamska's research interests range from extrasolar planets to extragalactic astronomy.

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 length and time scales and different organizational levels of biological systems. In 2021–22, 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 dynamical systems theory for phenotypical evolution. In addition, Leibler has also been developing a new line of research connected with complex terrestrial ecosystems. Together with

DAN KOMODA

Members in the School of Natural Sciences outside Fuld Hall

Members Nicolas Lenner, Sirio Belga Fedeli 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. Universal relation holds when items presented for memorization are randomly assembled and hence do not convey any meaning. Together with his colleagues Mikhail Katkov, Tankut Can, and Antoine Georgiou, Tsodyks is trying to extend the memory research to the domain of meaningful material, such as narratives. To quantitatively access memory for narratives, they developed an AI-assisted analysis of memory by evaluating meaningful pieces of narratives, called 'clauses', and finding out which of them were recalled, even in a modified form. This analysis was shown to successfully mimic the human analysis and can be scaled up to large amounts of data with multiple narratives of increasing length, which can also be generated by AI. Experiments will now be performed to find the modifications in the relation between the number of clauses in memory and the number of clauses recalled by participants.

During the past year, Professor Emeritus **Arnold J. Levine** has been leading a collaborative study, with funding from the Mark Foundation for Cancer Research, to explore the responses of the adaptive and the innate immune system in the formation of breast tumors in Li-Fraumeni Syndrome (LFS) patients (who have inherited *Tp53* mutations). The penetrance of these tumors is very high, with an unusually early age of onset. Using multiplex immunohistochemistry to quantitate the levels and activity of TILs, CD-3, CD-4, CD-8, and CD-20 (B-cells), the collaboration is comparatively analyzing tissue sections from ER+/PR+, *Tp53* wild type, TN breast cancers with spontaneous mutant *Tp53* genes (controls) and tissue from LFS breast cancer patients from various stages of diagnosis and treatment. Spontaneous breast cancers that are ER+/PR+ hormone responsive (HRBC), commonly with no *Tp53* mutations, do not attract tumor infiltrating lymphocytes (TILs) and do not respond to checkpoint therapy. Triple negative breast cancers (TNBC) commonly have *Tp53* mutations, which strongly correlate with TILs in the tumor and can respond to checkpoint immunotherapy.

Tissue and serum samples under study are also being tested for the expression of LINE-1 ORF-1 proteins, and the presence or absence of these proteins is being correlated to patient outcomes (responses to therapies employed and overall survival). The LINE-1 (long interspersed nuclear element-1) retrotransposon is a set of 100,000 LINE-1 elements (20% of the DNA sequences) found throughout the human genome. About 130 out of 4,000 full-length elements of these sequences encode for two proteins, an RNA binding protein (ORF-1) and a reverse transcriptase and endonuclease (ORF-2). These proteins copy the RNA transcribed from the

chromosomal DNA copies, making RNA to DNA copies, and then integrate those DNA copies into new sites in the human genome. Throughout the life of a human, these chromosomal DNA copies of LINE-1 are transcriptionally silent, and are found in heterochromatin. In some cancers, particularly with mutations in the *Tp53* gene, the LINE elements are transcribed into RNA, which is translated into ORF-1 and 2 proteins. These proteins produce DNA breaks and insertions of LINE-1 DNA into the genomes of these cancer cells.

Results from these studies will provide the first picture of the immune response to LFS breast cancers and will quantitatively compare these results to TNBC and HRBC as examples of an immune-responsive and non-responsive breast tumor. Depending upon the results, this could lead to both diagnostic and therapeutic clinical trials in the future.

Theoretical Physics

Over the past year, Professor **Nima Arkani-Hamed** has largely completed a long-term project, initiated at the beginning of the pandemic, on a new understanding of the basic scattering processes for elementary particles from a point of view where the principles of spacetime and quantum mechanics are not taken as primary but are seen to arise from more primitive mathematical ideas. This was first seen ten years ago in the story of the "amplituhedron" describing the quantum scattering amplitudes for the maximally supersymmetric gauge theories, but has now been extended to describe a much more general class of theories. Along the way, this has exposed unexpected new connections between particles and strings. Instead of starting from strings and reducing to particles at long-distances, here the fundamental starting points are particles, but thought of from a new point of view where all possible building blocks of scattering processes are naturally unified into a single polyhedron, which captures the rules of spacetime and quantum mechanics in its facet structure. This polyhedron is then seen to naturally have a smoother, "curvy" cousin, that gives the generalization from particles to strings. The ideas underlying this structure turn out to have a fascinating, fundamentally combinatorial interpretation in terms of a certain counting problem associated to triangulations of surfaces, that is most naturally interpreted in the language of categories of quiver representations.

Arkani-Hamed has also started to think more systematically about scattering amplitudes in string theory, with the aim of better understanding the physical consistency with unitarity and causality constraints, as well as obtaining a much clearer understanding of the high-energy behavior as string states morph into black holes in transplanckian collisions. Four-particle tree-level scattering amplitudes in string theory are magically consistent with quantum-mechanical unitarity, reflected in the non-trivial fact that the residues of the amplitudes on poles corresponding to massive particles have a certain positivity property. While this fact follows (rather indirectly) in textbooks from the so-called "no-ghost theorem," the simplicity of the statement and its fundamental importance for the physical consistency of string theory begs for a more direct and elementary understanding. Arkani-Hamed and collaborators found a new expression for these residues of string amplitudes, given by surprisingly simple and intriguing contour integral formulae, which allowed a direct proof the needed positivity statement in many cases. Another famous fact about string amplitudes is that they fall off exponentially quickly at high energies. This is usually shown by direct computation for four particle scattering, and crucially makes use of the fact that the momenta of the particles take physical "Lorentzian" values; outside the Lorentzian region the amplitudes actually instead grow exponentially with energy. Arkani-Hamed and collaborators have understood the reason for the exponential softness in the Lorentzian region for all string scattering processes, opening the door to more systematic exploration of the still not-well-understood properties of string scattering at ultra-high energies.

If a local picture of spacetime processes is to be replaced by other principles in our description of physics, one of the biggest challenges will be in understanding short-distance/high-energy divergences and the renormalization group, where the conventional best understanding, given by Wilson, is maximally "local," involving gradually zooming from short to long distances to describe physics using an appropriate effective description scale-by-scale. The structure of long-distance singularities also involves a gradual "showering" of particles gradually giving off radiation after suffering a high-energy/short-distance collision. How can we understand this ubiquitous UV and IR physics from a point of view not explicitly referring to a spacetime picture? Arkani-Hamed and collaborators undertook a systematic understanding of these questions in so called Schwinger parametric representation associated with any Feynman graph, and surprisingly found a unified understanding of the leading UV and IR divergences associated with the graph, associated with a new description of some beautiful "Feynman Polytopes" associated with the graph. Via a simple analysis using "tropical geometry," these divergences are seen to be completely determined by the facet structure of the polytopes, which turn out to have a beautiful concrete description, leading to an especially powerful way of computing leading divergences, which were carried out for infinite classes of examples.

When a black hole is small enough, the classical gravity description is no longer valid. In string theory, it had been conjectured that small enough black holes might turn into highly excited oscillating strings. This proposal was investigated by Carl P. Feinberg Professor **Juan Maldacena** together with Princeton student Yiming Chen and Edward Witten. They noticed that the simplest version of the proposal implied that certain two-dimensional conformal field theories should be continuously connected. They showed that this is not possible for the type II string theory but it was likely true in the case of the heterotic string theory.

With Princeton students Henry Lin, Liza Rosenberg, and Jieru Shan, Maldacena studied aspects of the dynamics of certain extremal black holes in supersymmetric theories. These are charged black holes which become completely

stable at very low temperatures. They have shown how to perform gravity computations in this limit by taking into account the dominant quantum corrections. These could be useful for gaining a better understanding of the average spacetime-properties of the states that give rise to the large black hole entropy.

Professor **Nathan Seiberg** continued his explorations of quantum field theory. It has been widely believed that the long-distance, low-energy behavior of every microscopic (local) system is captured by a continuum quantum field theory. However, certain recently discovered, exotic systems seem to violate this lore. On one hand, the low-energy limit of these lattice models cannot be described by a standard continuum field theory. On the other hand, their naïve continuum theory is quite subtle and it is not clear what it means. These discoveries motivated Seiberg (together with former Member Shu-Heng Shao, former student Ho Tat Lam, and student Pranay Gorantla) to understand better the relation between lattice models and continuum field theory.

Gorantla, Lam, Shao, and Seiberg discovered new lattice systems that are closer to the continuum models. They are easier to analyze, and they enjoy all the global symmetries 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 makes it easier to derive new results.

Armed with these new lattice models, these authors reanalyzed some of the exotic and challenging systems. They derived a number of surprising results, and many of them are at the root of the subtle relation between the lattice and the continuum. In particular, they clarified the appearance of UV/IR mixing. This is the statement that certain low-energy phenomena are extremely sensitive to short-distance details. This fact contradicts the starting assumption for the use of the renormalization group and the standard lattice/continuum relation.

This UV/IR mixing has different manifestations in different models and seems to be the main reason these exotic models are so interesting. This understanding inspired Gorantla, Lam, Shao, and Seiberg to find many new exotic systems and to analyze them.

DAN KOMODA

From left to right, Carl P. Feinberg Professor Juan Maldacena, Junior Visiting Professor Geoff Penington, and Distinguished Visiting Professor Subir Sachdev during the event "Spacetime, Quantum Entanglement and Black Holes"

In a somewhat distinct line of research, Seiberg and Meng Cheng explored the appearance of anomalies in lattice systems. Anomalies are an important tool in studying the symmetries of a system. They allow one to make robust predictions about the behavior of complicated models. Anomalies are studied mostly in the context of continuum theories. However, certain results about lattice models, and in particular, the celebrated Lieb-Schultz-Mattis theorem and its generalizations, appear to be related to such anomalies. Cheng and Seiberg clarified in what sense the lattice models have anomalies and how the Lieb-Schultz-Mattis theorem can be thought of as an 't Hooft anomaly matching condition. This understanding unifies a number of distinct results in various lattice models into a single framework—anomalies, as understood in the context of continuum field theory.

During the academic year 2021–22, Charles Simonyi Professor **Edward Witten** proposed a description of the quantum mechanics of a black hole in terms of Type II von Neumann algebras. Such algebras, which previously have had only limited applications in physics, describe a situation in which quantum mechanical microstates do not exist, but quantum mechanical density matrices and entropies can be defined. Witten's construction gave a new interpretation of the important question of why entropy is better defined in the presence of gravity than it is in ordinary quantum field theory without gravity. With V. Chandrasekaran, R. Longo, and G. Penington, Witten constructed a Type II algebra that describes the experience of an observer in a cosmological model known as de Sitter space. De Sitter entropy, which has been mysterious, can be interpreted as the entropy of a state of the Type II algebra. This gives a new understanding of the sense in which "empty de Sitter space" is a state of maximum entropy.

With IAS colleague Juan Maldacena and graduate student Yiming Chen, Witten developed a better understanding of the transition between strings and black holes.

Also in the last academic year, Witten wrote a review article explaining why quantum field theory in curved spacetime makes sense, and what happens to the algebra of observables in the thermodynamic limit.

2021–22 MEMBERS AND VISITORS

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

Joshua Winn
Astrophysics ✦ Princeton University

George Nathaniel Wong
Astrophysics ✦ Institute for Advanced Study and Princeton University
Funding provided by Schmidt Futures

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*
Funding provided by the Simons Foundation

Nadia Zakamska
Astrophysics ✦ Johns Hopkins University
J. Robert Oppenheimer Visiting Professor; additional funding provided by the Bershadsky Fund

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 2021–22, the theme was "Political Mobilizations and Social Movements." In total, twenty-five Members and ten Visitors participated in the activities of the School.

FACULTY

Wendy Brown
UPS Foundation Professor

Didier Fassin
James D. Wolfensohn Professor

Alondra Nelson
Harold F. Linder Professor

PROFESSORS EMERITI

Joan Wallach Scott

Michael Walzer

THE PAST DECADE HAS SEEN A great upsurge of political mobilizations and social movements around the world. From Hong Kong to Santiago, from Beirut to Algiers, from Tahrir Square to Gezi Park, from the Indignados in Spain to the yellow vests in France, these mobilizations have shaken state power, provoking reforms and sometimes brutal repressions. Many social movements in liberal democracies are animated by the Left's frustration with government inaction; such is the case, for example, in the United States with Occupy, Black Lives Matter, #MeToo, Extinction Rebellion, and March For Our Lives. Others embody a parallel frustration from the Right, with mobilizations on behalf of fundamentalist, nationalist, xenophobic, racist, sexist, and/or anti-feminist programs that push the boundaries of secular liberal democratic states.

Too often, Left and Right mobilizations, and social movements in various parts of the world, are studied quite independently of one another. In the School of Social Science's 2021–22 theme seminar, "Political Mobilizations and Social Movements," we sought to think about these movements and mobilizations comparatively, from different angles and social science disciplines, and in terms of the specificity of current global powers and trends. Convened by Wendy Brown, UPS Foundation Professor, and Didier Fassin, James D. Wolfensohn Professor, the scholars we brought together included sociologists, anthropologists, political theorists, historians, and comparative political scientists. Respectively, they studied or theorized social movements and political mobilizations in Latin America, Africa, the Near and Middle East, South Asia, Europe and the United States.

The specific topics considered over the course of the year included the place of violence in social movements and state responses to them; the role of social media and other contemporary technologies in social movements; different ways that social movements address and/or reject the state; the relation of new mobilizations to populism and to liberal democratic politics; ways that movements connect with each other

Member Tanisha C. Ford presents "What Gives?: Money and the Black Freedom Movement" at the weekly Social Science Seminar.

ANDREA KANE

ANDREA KANE

UPS Foundation Professor Wendy Brown speaks during a seminar in the Dilworth Room.

across national and continental borders, including questions of solidarity and difference; the importance of financialization and neoliberalism in shaping many new social movements; challenges for ethnographers studying social movements; and complexities of social movements in and related to universities. Many scholars brought field work and empirical studies to these conversations, so that we often found ourselves comparing, for example, right wing mobilizations in the U.S., Europe and India; feminist mobilizations in Argentina, Ecuador, Turkey and Iraq; and mobilizations against racist policing in Nigeria and the U.S.

Wendy Brown, UPS Foundation Professor, spent her first year at the Institute co-facilitating the theme seminar Political Mobilizations and Social Movements, completing one book project and starting another. Her completed book, *Nihilistic Times: Thinking With Max Weber* (Harvard University Press, forthcoming), draws on Weber's century-old lectures on the vocations for scholarship and politics in order to reflect on our contemporary predicaments in both spheres. Interpreting Weber's discussions of the challenges for the scholar and the politician as importantly framed by what he understood as growing historical conditions of nihilism, she treats from a similar perspective today's hyper-politicization of knowledge and battles over truth in the academic sphere and partisanship without depth in the political one. Both a new reading of Weber and of our contemporary condition, the book reveals the value of thinking with canonical and even conservative thinkers for critically apprehending the present.

Brown's new work is on political freedom in the Anthropocene. Address of the climate crisis is often regarded as incompatible with democracy, whether because of the urgent and global character of the crisis, because individual liberty appears incompatible with the regulation the crisis requires, or because climate change has been so politicized in highly polarized democracies. The result is that the political freedom that is democracy's promise is neglected in climate change scholarship. Brown's purpose with this book is to rethink political freedom from the perspective of the Anthropocene, where we can no longer treat "nature" as external to us, let alone that which we master, conquer or ignore in democratic life.

In 2021–22, Brown gave lectures, mostly virtually, on these projects at several U.S. venues and in Greece, Turkey, Chile, and Argentina. She also gave interviews for the Mitchell Center at Penn, RT TV, *Dissent*, *Salon*, BBC Radio Scotland, the *New York Times*, *La Vanguardia de Argentina* (Argentinian newspaper), and Canalnet (Argentinian television). She published an op-ed on the overturning of *Roe v. Wade* in the *Washington Post*.

Brown also contributed essays to two volumes on her own work—*Power, Neoliberalism and the Reinvention of Politics: The Political Theory of Wendy Brown* and *Classics Revisited: States of Injury*—in the journal *Polity*. She participated in a published dialogue on law and political economy in *South Atlantic Quarterly*, and on governmentality with Nikolas Rose and Partha Chatterjee for *The Handbook on Governmentality*. She was elected to the American Academy of Arts and Sciences in spring 2022.

The eight lectures delivered by James D. Wolfensohn Professor **Didier Fassin** at the Collège de France as part of his Annual Chair on Public Health have been turned into a book published in French as *Les Mondes de la santé publique: Excursions anthropologiques* at Le Seuil, which is currently under press in its English version at Polity Press. It examines major questions around public health today. *Policing the City: An Ethno-Graphic,* at Other Press, translates a classical ethnography of policing conducted in the Paris region into a graphic study, which allows for a reflection on innovative genres allowing for a broader public to have access to the social sciences.

The edited volume *La Société qui vient*, at Le Seuil, assembles sixty-six authors, who draw a tentative picture of contemporary society, through a reflection on current situations and future challenges around a series of themes, from the environment to neoliberalism, from democracy to populism, from inequality to non-humans, from the commons to occupy movements. Two other collective volumes were published this year. *Crisis under Critique: How People Assess, Transform and Respond to Critical Situations*, at Columbia University Press, is the outcome of the special year on Crisis and Critique, led with Axel Honneth. *Pandemic Exposures: Economy and Society in the Time of Coronavirus*, at Hau Books, gathers contributions from Members who worked on the theme Economy and Society, coordinated with Marion Fourcade.

The Page-Barbour Lectures were delivered at the University of Virginia on the theme "Crisis. Elements of a Critique" and followed by a workshop with doctoral students. Invited lectures were given at La Sorbonne, the London School of Economics, Humboldt University, the Universities of Bern, Neuchâtel and Granada. A special lecture was

delivered for the honorary degree received at the University of Liège. A graduate seminar, "Borders," was held at the École des hautes études en sciences sociales in Paris. Various encounters took place with high school students in Lille and Marseille, where there was also a public performance that was part of the Festival of Writings of the Real.

The ethnography of the border between Italy and France, in the Alps, was carried out for the fourth year, alongside visiting scholar Anne-Claire Defossez. Two stays of several weeks in the winter and the summer have been focused on the interactions between exiles, volunteers and the police. It is part of the project on crisis funded by the NOMIS Foundation.

Alondra Nelson, Harold F. Linder Professor, continues to be on public service leave from the Institute for Advanced Study for the duration of her time at the White House, where she is both Deputy Assistant to the President for Science and Technology Policy and performing the duties of the Director of the White House Office of Science and Technology Policy (OSTP). Nelson was appointed to this second role by President Joe Biden on February 17, 2022, having served as Deputy Director for Science and Society in the OSTP since January 15, 2022.

Nelson's work in OSTP has included directing efforts to protect the integrity of science in the federal government, broaden participation in STEM fields, strengthen the U.S. research infrastructure, and ensure that all Americans have equitable access to the benefits of new and emerging technologies and scientific innovation. She has played a key role in overseeing the implementation of the president's early directives on "Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking" and on "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government." Nelson leads OSTP's six policy divisions in their work to advance critical administration priorities including groundbreaking clean energy investments; a people's bill of rights for automated technologies; a national strategy for STEM equity; appointment of the nation's chief technology officer; data-driven guidance for implementing the Bipartisan Infrastructure Law; a transformative, life-saving Community Connected Health initiative; and programs to ensure the U.S. remains a magnet for the world's top innovators and scientists.

In her academic capacity Nelson was elected a Fellow of the American Association for the Advancement of Science in fall 2021 and received an honorary doctor of science degree from Rutgers University in spring 2022.

It was another year of Zoom conferences, enabling travel to places Professor Emerita **Joan Scott** would have preferred to visit. She gave keynote lectures at a gender conference in Mexico, at a national history association conference in Peru, and at a nation-wide historians' conference in Brazil. At Duke University, Scott presented a paper on academic freedom and led a discussion with faculty and graduate students on her work on gender. She conducted a workshop on her writings on gender and history at the University of Bielefeld (Germany) and gave a lecture at the University of Memphis on the Republican backlash against gender studies in the U.S. and in authoritarian regimes (Hungary, Poland, Russia, Turkey). In those places, she argued, the pattern seems to be the same: the backlash seeks to deny any teaching that the roles, indeed the very definitions, of man and woman are not permanent biological determinations, but changing social categories. As authoritarian rulers offer their distinctive masculine virtues to legitimize their power, they do so by reasserting "traditional" patriarchal norms about the weakness and inferiority of women, whose natural or God-given destiny, they insist, is to produce children in the service of family, race, and nation.

The University of Liège (Belgium) presented Scott with an honorary degree. As part of the Zoom ceremony, she gave a lecture and greeted the advanced students who were receiving their Ph.D.s.

Scott served her final term on the Committee on Academic Freedom and Tenure of the American Association of University Professors. It's an assignment she will miss because it gave her an important overview of the nationwide conditions of university and college life in the U.S. In her many years on the committee, she saw things worsen overall: increasingly faculty are "contingent"

ANDREA KANE

ANDREA KANE

Left: While at IAS, Member Aslı Iğsız researched fascism and its contemporary reincarnations. *Right:* Member Robyn Marasco spent her time at IAS working on a book about politics, critical theory, and the family.

workers rather than tenured, the protections of academic freedom extend to fewer of them as a result; the increased interventions in the operations of university life by politicians, trustees, and philanthropists have weakened faculty autonomy and faculty governance; student debt has taken the place of state and federal support for higher education; and the values of humanistic education have been undermined by an emphasis on vocational training as the aim of higher education.

In addition to her writing (essays published and in progress on the gender backlash, the political uses of history, and academic freedom), Scott continues to mentor young faculty and graduate students. During this past year, she worked with Ph.D. students at the New School University and at the Graduate Center of The City University of New York (where she has an "adjunct" appointment). At the Institute, she worked closely with a Member to get his manuscript into publishable form. Scott is the lead editor of the journal, *History of the Present: a Journal of Critical History*. In that capacity, she also works with authors (many of them young scholars) on their articles. She finds this productive and rewarding—a way of continuing to engage with new generations as they begin their careers.

Professor Emeritus **Michael Walzer** is fully retired now and not much engaged with Members in the School of Social Science—except for a few whose interests are close to his. His own work is mostly shaped by his past. Walzer gave the keynote lecture for a three-day international (Zoom) conference focused on his 1994 book *Thick and Thin: Moral Argument at Home and Abroad*. The conference papers will be published sometime soon. He wrote an essay, "Dirty Hands Revisited," for a journal issue marking 40 years since the publication of his article, "Political Action: the Problem of Dirty Hands." And he has participated in the planning of a volume of essays devoted to his *Spheres of Justice* (1984), scheduled for publication in 2024.

For the rest of the academic year, Walzer has been writing occasional articles on war and nationalism. He gave a lecture on "Moral Capacity" to the philosophers at Hebrew University in Jerusalem. His book on the adjective "liberal," originally scheduled for publication in 2022 will be out instead in January 2023 (from Yale University Press). He remarked, "I think of that as my last book, but who knows?"

2021–22 MEMBERS AND VISITORS

f First Term ✦ *s* Second Term ✦ *v* Visitor

Daniel Agbiboa
Political Sociology ✦ Harvard University
AMIAS Member

Anthony Alessandrini
Cultural Politics, Decolonization Studies ✦ Kingsborough Community College, The City University of New York

Zahra Ali
Sociology ✦ Rutgers University–Newark

Minou Arjomand
Theater and Performance Studies ✦ The University of Texas at Austin ✦ *v*

Magali Bessone
Political Philosophy, Critical Theory of Race ✦ Université Paris 1
Funding provided by the Florence Gould Foundation Fund

Debaditya Bhattacharya
Histories of Higher Education ✦ Kazi Nazrul University, Asansol, India

Keisha N. Blain
History ✦ University of Pittsburgh
Friends of the Institute for Advanced Study Member

Julien Brachet
Geography ✦ Université Paris 1 ✦ *v*

William Callison
Political Theory ✦ Lafayette College
Richard B. Fisher Member

Angela B. Cornell
Labor Law, Human Rights ✦ Cornell Law School ✦ *v*

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

Marielle Debos
Political Science ✦ Université Paris Nanterre
Richard B. Fisher Member

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

Tanisha C. Ford
Black Women, Philanthropy, Social Justice Movements ✦ The Graduate Center, The City University of New York
Roger W. Ferguson, Jr. and Annette L. Nazareth Member

Jill Frank
Political Science, Classics ✦ Cornell University

Lawrence B. Glickman
American History ✦ Cornell University ✦ *v/f*

Aslı Iğsız
History of the Present, Cultural Politics ✦ New York University

Biko Koenig
Politics ✦ Franklin & Marshall College
Ralph E. and Doris M. Hansmann Member

Katherine Lemons
Anthropology ✦ McGill University ✦ *v*

Zachariah Mampilly
Political Science ✦ Marxe School of Public and International Affairs, The City University of New York

Robyn Marasco
Political Theory ✦ Hunter College, The City University of New York

Emily Merchant
History of Science ✦ University of California, Davis

Jorge Núñez
Anthropology ✦ Kaleidos – Center for Ethnography, Universidad de Cuenca ✦ *v*

Cecilia Palmeiro
Cultural Studies, Gender Studies ✦ New York University Buenos Aires and Universidad Nacional de Tres de Febrero

Kenneth M. Roberts
Government, Political Science ✦ Cornell University

Elizabeth Saleh
Anthropology ✦ American University of Beirut

Judith Scheele
Social Anthropology ✦ École de Hautes Études en Sciences Sociales, Marseille
Wolfensohn Family Member

Andrea Sempértegui
Sociology and Anthropology ✦ *v*

Matthew Shafer
Political Theory ✦ Andrea Mitchell Center for the Study of Democracy, University of Pennsylvania

Harel Shapira
Sociology ✦ The University of Texas at Austin

Alicia Steinmetz
Political Theory ✦ Stanford University ✦ *v*

Maka Suarez
Anthropology ✦ University of Oslo

Sonja van Wichelen
Sociology, Anthropology ✦ The University of Sydney ✦ *f*

Deborah R. Vargas
Sociology of Culture, Feminist and Queer Studies ✦ Rutgers University–New Brunswick

Yves Winter
Political Theory ✦ McGill University

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 2021–22 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

Professor **Piet Hut**, head of the Institute's Program in Interdisciplinary Studies, continued his 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.

Members from various Schools and from the Program in Interdisciplinary Studies collaborate in a Zoom conference.

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.

During the second term, Hut started a new initiative, focused on the totality of the global problems that are likely to form global cascading failures at or before the middle of the century. In comparison to the increasing focus that is currently given to such problems like climate change, species loss, pollution, soil loss, scarcity of drinking water, lack of circular recycling, as well as the role of wars and novel diseases, the interactions between all these problems have received comparatively less attention. The war in Ukraine has shown already how one war in one place can lead to unexpected price rises for energy and food worldwide, affecting especially low-income countries, with the risk of starting secondary wars and refugee problems elsewhere. In short, the interplay between very diverse global problems can lead to cascades of crises that can only be studied in a truly global study of global problems. In modeling terms: most analyses have so far focused on problems that, although global in geographic terms, are still treated locally in the global space of global space. In order to analyze System Earth as a complex system in a truly "globally global way," including the way that geospheres, biosphere, and anthroposphere (or noosphere) are all deeply interwoven, Hut started a new project, tentatively called "The Challenge," with a group of Visitors to the Program in Interdisciplinary Studies, to be led by him together with Visitors Will Cavendish, Eric Smith, and Tim Lenton.

2021–22 VISITORS

Stephen Burlingham
Art and Science

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

Will Cavendish
Science Communication

Jacob Gates Foster
Computational Social Science, Collective Intelligence ✦ University of California, Los Angeles

Eiko Ikegami
Historical Sociology ✦ The New School

Alexander A. Kaurov
Astrophysics, Sociology, and Science Communication ✦ Institute for Advanced Study

Jun Makino
Astrophysics, Computational Science ✦ Kobe University

Phillip Ording
Mathematics ✦ Sarah Lawrence College

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

D. Eric Smith
Origin of Life ✦ Georgia Institute of Technology and Tokyo Institute of Technology

Edward Tenner
Science, Technology, and Culture ✦ Lemelson Center, Smithsonian Institution

Edwin L. Turner
Astrophysics ✦ Princeton University

Mark Van Atten
Philosophy of Logic and Mathematics, Phenomenology, Idealistic Philosophy ✦ Archives Husserl de Paris, Centre National de la Recherche Scientifique

Harald Wiltsche
Philosophy of Science ✦ Linköping University

ARTIST-IN-RESIDENCE PROGRAM

ANDREA KANE

David Lang during After Hours Conversations in 2019

In academic year 2021–22, Pulitzer Prize-winning composer **David Lang** continued his second three-year term as IAS Artist-in-Residence. Lang presented the 2021–22 Edward T. Cone Concert Series, which hosted *Music and Memory* by Rolf Schulte, a chain of solo violin music about memory, including pieces from Elliot Carver, Igor Stravinsky; *Revelation: Music in Pure Intonation* by Michael Harrison, a unique performance which sought to return tuning to its natural roots, where musical intervals reflected their origins in perfect mathematical proportions; and *The Passinge Mesures* by harpsichordist Mahan Esfahani, a concert of both new and old works that included the virtuosic compositions of John Bull and William Byrd. The series also featured *Fanm d'Ayiti (Women of Haiti),* Nathalie Joachim's exploration of her immediate family, heritage, and artistic roots, along with the Spektral Quartet; and *Beowulf* by medieval music scholar Benjamin Bagby, who performed the entire tale, from start to finish, singing and speaking in the intones and howls of Old English, accompanied by the medieval harp. To learn more about the Artist-in-Residence program, visit www.ias.edu/air

2021–22 DIRECTOR'S VISITORS

f First Term ✦ *s* Second Term

Yonatan Binyam
History of Religion ✦ *ra*

Curtis Callan
Theoretical Physics, Biology ✦
Princeton University

David Gyllenhaal
History, Religion ✦ *ra*

Anna Laqua
Literary Studies, History of Theater

Lorenza Pescia De Lellis
Italian Studies, History of Romance Philology ✦ Institute for Advanced. Study

Siobhan Roberts
Independent Scholar ✦ *f*

Jillian Stinchcomb
Religious Studies, Biblical Studies, Jewish Studies ✦ *ra*

Edmond Shlomo Zuckier
Rabbinic Literature, Philosophy of Religion ✦ *ra*

DIGITAL SCHOLARSHIP @IAS

Digital projects continued to be at the forefront of the Institute's scholarship. This past academic year included the following 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. Moreover, 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 2,000 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, and Aaron Hershkowitz as Project Manager, successfully completed the second year of its NEH grant, furthering metadata collection efforts and fabricating an automated 3D scanning rig to future-proof project outputs. The project team has also begun exploring the application of machine learning technology to its image library, and has applied for a new NEH grant to further support that work. For more see https://www.ias.edu/krateros

- **Hidden Stories: New Approaches to the Local and Global History of the Book (2023–26).** This second phase of the Mellon-funded project "The Book and the Silk Roads" (https://booksilkroads.library.utoronto.ca/) widens the focus beyond Eurasia and Africa into the Americas, to illuminate book history through a range of research methods drawn from the sciences and humanities. Hidden Stories connects over 130 collaborators working across more than 60 institutions around the world. The four-year project brings together interdisciplinary and scientific research, cultural heritage preservation, community relationship-building, and the development of knowledge-sharing tools, protocols, and best practices. Launched with a workshop in October 2022 on birchbark as a writing substrate in South Asia and North America, the Hidden Stories project page is here: 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 in early 2023. See: https://globalcommentary.utoronto.ca/

- **Lyktos Archaeological Project:** Since 2021 Angelos Chaniotis has co-directed an archaeological excavation in the island of Crete, Greece. The excavation, a joint project with Professor Antonis Kotsonas (NYU), in the city of Lyktos (according to Hesiod the birthplace of Zeus), explores the early phase of the city (9th–5th century B.C.E.), a public building dedicated to the cult of the emperor (2nd–4th century C.E.), and Byzantine basilica (8th/9th century). To assist documenting the ongoing project a database was developed by Georgios Tsolakis (University of Chicago) which currently includes the notebooks of the excavation, list of finds, and photos of the excavation as well as the finds. Following a migration completed earlier this year, this database and all related digital materials now have a permanent home being hosted by IAS.

ABBEY ELLIS

Visitor Abbey Ellis of the Krateros Project unraveling a paper squeeze

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 (see: https://albert.ias.edu), as well as in the formation of the Institute's current policy regarding open access.

Outreach

PROGRAM FOR WOMEN AND MATHEMATICS

ANDREA KANE

2022 WAM organizers and participants pose outside Fuld Hall

The 28th Women and Mathematics program, "The Mathematics of Machine Learning," was held in person from May 21–27, 2022. The program had four sponsors: the National Science Foundation, Lisa Simonyi, Princeton University, and the Institute for Advanced Study. It was organized by Dusa McDuff (Barnard College), Michelle Huguenin (IAS), and Linda Ness (retired from Rutgers DIMACS). The 2022 program included 4 committee members and 37 participants (13 undergraduates, 11 graduates, 4 postdocs, and 9 faculty). Participants engaged in curricular activities, including the following:

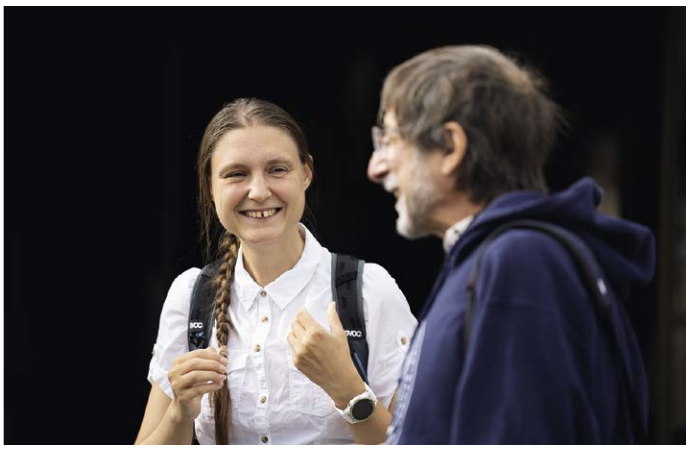
- Terng Lecture Series, "Introduction to Interpretable Machine Learning," by Cynthia Rudin of Duke University;
- Uhlenbeck Lecture Series, "Foundations for Learning in the Age of Big Data," by Maria Florina Balcan of Carnegie Mellon University;
- Colloquium, "Learning Generalizable Visual Representations," by Kate Saenko of Boston University;
- Special Talk, "Interpreting Deep Neural Networks towards Trustworthiness," by Bin Yu of University of California, Berkeley;
- Public Lecture, "Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead," by Cynthia Rudin;
- Stochastic Gradient Descent: where optimization meets machine learning. Rachel Ward, University of Texas, Austin
- Several Young Researchers Seminars;
- Daily Problem Sessions, by two Teaching Assistants, Lesia Semenova (an advanced graduate student from Duke University) and Ellen Vitercik (a postdoctoral researcher from University of California, Berkeley), where participants were able to review course notes and work on problems.

In conjunction with the Princeton Public Library, Margaret Readdy organized an outreach program entitled, "Math Carnival with the Institute for Advanced Study." WAM participants Princess Allotey, Sarah Brown, Nischita Kaza, Amber Lee, Anna Ma, Mansi Sood, and Ria Stevens facilitated math activities for over 75 children and adolescents.

Thanks to a generous grant from Lisa Simonyi, the WAM Ambassador Program concluded its 5th year of funding a series of mini-grants designed to build support and outreach networks across the country. Funded activities for 2021–22 included Florida Atlantic University's 4th Annual Florida Women in Mathematics Day, and their Association for Women in Mathematics Graduate Student Chapter mentoring initiative, "Dare To BEE"; and University of California, Riverside's Women in MathArt Conference.

IAS/PARK CITY MATHEMATICS INSTITUTE

DAVE TITENSOR



DAVE TITENSOR

Left: A moose in Park City, Utah *Right:* Maryna Viazovska and Rafe Mazzeo share a conversation.

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 45 undergraduate students participate in a program consisting of a parallel lecture course pertaining to the research 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 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 35 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 2022, PCMI returned to its in-person sessions after taking place virtually in 2021. The PCMI Graduate Summer School consisted of 11 mini-courses, each accompanied by a problem session, on the topic "Number Theory Informed by Computation." Specifically, it included courses on algorithmic number theory, post-quantum cryptography, geometry of numbers, and arithmetic statistics; more advanced topics included computation of zeta functions and computational arithmetic geometry. Its undergraduate counterpart took on the same topic with a daily lecture series given by Christelle Vincent (University of Vermont), in addition to a morning session involving an experimental mathematics component with open-ended problems and computational work. Vincent's lecture was titled "Introduction to mathematical cryptography," offering a short primer on the history of cryptography, its possible future, and some societal issues related to cryptography. The Undergraduate Faculty Program featured lecturer Sinai Robins (University of Sao Paulo, Brazil), and focused on the geometry of numbers from a Fourier analytic perspective. The Teacher Leadership Program activities centered around two main daily activities: the first a session where teachers worked in small groups on a collection of mathematical problems, to remind them of the joys and challenges of learning new mathematics, and the second, a structured discussion about "Reflecting on Practice." In the afternoons, the teachers broke into small groups to work on further activities related to mathematics and education.

SUMMER PROGRAM IN SOCIAL SCIENCE

After two years of interruption due to the Covid-19 pandemic, the third cohort of the Summer Program in Social Science took place in March 2022. It gathered 20 scholars—10 women and 10 men—from Argentina, Uruguay, Brazil, Chile, Colombia, Ecuador, Côte d'Ivoire, Kenya, Nigeria, South Africa, Egypt, Iraq, Kuwait, and the Palestinian Territories. A multidisciplinary group, it comprises anthropology, sociology, history, psychology, demography, law, political science, urban planning, environmental archeology, religion studies, media studies, and environmental politics. The two fellows who could not attend in person participated online.

The program draws together early-career scholars from the Global South. Its goals are to 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. It is funded by the Mellon Foundation. For each cohort, the first session is at the Institute, and the second is at the University of the Witwatersrand in Johannesburg for scholars from Africa and the Middle East, and at the Universidad Nacional in Bogotá for scholars from Latin America.

The program is coordinated by Didier Fassin, James D. Wolfensohn Professor.

ANDREA KANE

ANDREA KANE

ANDREA KANE

Participants in the spring 2022 session of the Summer Program in Social Science during a seminar held in the White-Levy Room.

RECORD OF EVENTS

School of Historical Studies

ANCIENT STUDIES

October 5
Ancient Studies Seminar ✦ *Περὶ ὄνου ψωλῆς: performing obscenity in the Roman East* ✦ **Angelos Chaniotis**, Professor, School of Historical Studies

October 12
Ancient Studies Seminar ✦ *The new lead tablet from Tongres: curse tablet or house amulet?* ✦ **Christopher Faraone**, University of Chicago; Member, School of Historical Studies

October 26
Ancient Studies Seminar ✦ *Crime and punishment in Epidaurus: the case of the ivory carver Pasiteles* ✦ **Sebastian Prignitz** and **Gerhard Thür**, Academy of Vienna

November 9
Ancient Studies Seminar ✦ *Dance as history in the Roman provinces* ✦ **Felipe Rojas**, Brown University

November 16
Ancient Studies Seminar ✦ *Aristotelian Revision and Editorial Error in Nicomachean Ethics VI 2* ✦ **Samuel Baker**, University of South Alabama; Member, School of Historical Studies

December 7
Ancient Studies Seminar ✦ *Two early Hellenistic honorary decrees from Dion* ✦ **Manolis Voutiras**, University of Thessaloniki

February 1
Ancient Studies Seminar ✦ *Horror Saltus: camouflaging religious change (mid-2nd to early 6th century C.E.)* ✦ **Angelos Chaniotis**, Professor, School of Historical Studies

February 5
Ancient Studies Seminar ✦ *A look at Socrates' divine sign* ✦ **Marijana Ricl**, University of Belgrade

February 22
Ancient Studies Seminar ✦ *Tokens of dust, potions of lamp oil: extended agency of images from the Roman Imperial statue to the magical icon* ✦ **Esen Ogus**, Research Associate, School of Historical Studies

March 1
Ancient Studies Seminar ✦ *Caesar in the* Bellum Gallicum ✦ **David Potter**, University of Michigan; Member, School of Historical Studies

March 4
Long Epigraphic Friday, Day 1 ✦ *News from Kallias (IG I³ 52)* ✦ **Sebastian Prignitz**, Akademy of Vienna ✦ *A new edition of the later Tribute lists (IG I³ 281–290)* ✦ **Helmut Lotz**, Academy of Vienna ✦ *New Athenian inscriptions from early travellers* ✦ **Robert K. Pitt**, College Year in Athens ✦ *Dating problems in Lyttos (Crete): new and old inscriptions* ✦ **Georgios Tsolakis**, Institute for the Study of the Ancient World, New York University ✦ *An inscription from Hyllarima* ✦ **Marco Zangheri**, University of Rome, La Sapienza ✦ *The liability of the architect Perillos from juristic and archaeological perspective ('Stele of the Punishment' from Epidaurus, lines 51–55)* ✦ **Sebastian Prignitz** and **Gerhard Thür**, Academy of Vienna ✦ Μακαρῖξαι*: social ritual and honours at Mesambria* ✦ **John Ma**, Columbia University ✦ *From an epitaph to a dedication to Herakles: A new reading of SEG XXX 593 (Serres, Eastern Macedonia)* ✦ **Cédric Brélaz**, University of Fribourg; Member, School of Historical Studies

March 5
Long Epigraphic Friday, Day 2 ✦ *A woman who became Hekate: an inscription from Mesambria* ✦ **Dobrinka Chiekova**, The College of New Jersey ✦ *On a few non-Halikarnassian 'Halikarnassian' inscriptions* ✦ **Mat Carbon**, Queen's University, Kingston ✦ *A new opisthographic stele from Smyrna (?) with a Greek and a Roman inscription* ✦ **Marijana Ricl**, University of Belgrade ✦ *An epigraphical potpourri: An aretalogy of Theos Hypsistos from Daskyleion and miracles from Epidauros amd Lydia* ✦ **Angelos Chaniotis**, Professor, School of Historical Studies

March 8
Ancient Studies Seminar ✦ *Epigraphy, iconography, and multilingualism in 5th and 4th century B.C.E. South Italy* ✦ **Sara Kaczko**, University of Rome, La Sapienza

March 15
Ancient Studies Seminar ✦ *Fiction (and reality) of demokratia in Greek cities under Roman imperial rule* ✦ **Cédric Brélaz**, University of Fribourg; Member, School of Historical Studies

March 22
Ancient Studies Seminar ✦ *Pliny the Elder's painters and painting's nature* ✦ **Michael Koortbojian**, Princeton University

March 29
Ancient Studies Seminar ✦ *Prosopographical puzzles: The families of the Emperors Valerian and Gallienus* ✦ **Hartwin Brandt**, University of Bamberg

April 5
Ancient Studies Seminar ✦ *The so-called phlyax vases and their users: images of mocking the divine for whose eyes?* ✦ **Eleftheria Pappa**, Member, School of Historical Studies

EARLY MODERN EUROPE

October 12
Early Modern Europe Seminar ✦ *The Living Line: Origins and Afterlives of the Soviet Queue* ✦ **Jillian Porter**, University of Colorado; Member, School of Historical Studies

October 19
Early Modern Europe Seminar ✦ *The Contentious Archive* ✦ **Asheesh Kapur Siddique**, University of Massachusetts; Member, School of Historical Studies

October 26
Early Modern Europe Seminar ✦ *Bhajans of Liberties: Songs as a Method of Critical Dialogue* ✦ **Ramnarayan Singh Rawat**, University of Delaware; Member, School of Historical Studies

November 2
Early Modern Europe Seminar ✦ *'Untouchability' and Transnational Politics in Twentieth-Century Korea* ✦ **Diana Kim**, Georgetown University; Member, School of Historical Studies

November 9
Early Modern Europe Seminar ✦ *Religious Republics in Seville, 1248–1502* ✦ **Karen Graubart**, University of Notre Dame; Member, School of Historical Studies

November 16
Early Modern Europe Seminar ✦ *Investigating the Executioners of the Saint Bartholomew's Day Massacre (France, 1572)* ✦ **Jérémie Foa**, Aix-Marseille Université; Member, School of Historical Studies

November 23
Early Modern Europe Seminar ✦ *On Laudianism: Piety, Polemic, and Politics during the Personal Rule of Charles I* ✦ **Peter G. Lake**, Vanderbilt University; Member, School of Historical Studies

March 1
Early Modern Europe Seminar ✦ *The Auspicious Rise of the Seka: Reimagining the Islamic Conquest of Bengal* ✦ **Ayesha A. Irani**, University of Massachusetts Boston; Member, School of Historical Studies

March 8
Early Modern Europe Seminar ✦ *An Eighteenth-Century Gift in the Era of the Atlantic Slave Trade* ✦ **Ana Lucia Araujo**, Howard University; Member, School of Historical Studies

March 15
Early Modern Europe Seminar ✦ *The Credit Nexus* ✦ **Francesca Trivellato**, Andrew W. Mellon Professor, School of Historical Studies

March 22
Early Modern Europe Seminar ✦ *Mussolini's Cesare: Roman History as Italy's Present and Future* ✦ **Patricia Gaborik**, Università della Calabria; Member, School of Historical Studies

April 5
Early Modern Europe Seminar ✦ *Niccolò Machiavelli* ✦ **Gabriele Pedullà**, Università di Roma Tre; Visitor, School of Historical Studies

April 12
Early Modern Europe Seminar ✦ *The Experience of the Archive: Knowledge and the Making of the Early Modern British Empire* ✦ **Asheesh Kapur Siddique**, University of Massachusetts; Member, School of Historical Studies

April 19
Early Modern Europe Seminar ✦ *Cheaters in a Moral Economy: Commercial Deceit in England, ca. 1200–1640* ✦ **Emily Kadens**, Northwestern University; Member, School of Historical Studies

April 26
Early Modern Europe Seminar ✦ *Swami Achutanand: Mofussil Activist and Cosmopolitan Intellectual* ✦ **Ramnarayan Singh Rawat**, University of Delaware; Member, School of Historical Studies

EAST ASIAN STUDIES

October 4
East Asian Seminar ✦ *Post-imperial Reckoning: Law, Redress, Reconciliation* ✦ **Yukiko Koga**, Yale University; Member, School of Historical Studies

October 18
East Asian Seminar ✦ *Caste discrimination ("untouchability") and transnational politics in 20th century Korea* ✦ **Diana Kim**, Georgetown University; Member, School of Historical Studies

November 8
East Asian Seminar ✦ *The Xianbei in their Historical Setting* ✦ **Scott Pearce**, Western Washington University; Member, School of Historical Studies

November 15
East Asian Seminar ✦ *Japan, the United States and the Enclosure of the North Pacific* ✦ **Sayuri Guthrie Shimizu**, Rice University; Member, School of Historical Studies

November 22
East Asian Seminar ✦ *The Human Frontier: Overseas Chinese and the Making of Modern China* ✦ **Adele Carrai**, NYU Shanghai

December 6
East Asian Seminar ✦ *How Buddhism Spread in Ancient Japan: Provincial Temple Construction and Social Networks, 650–850 C.E.* ✦ **Bryan Lowe**, Princeton University

December 13
East Asian Seminar ✦ *The Afterlife of a Painting: Qingming Shanghe, 12th to 16th Century* ✦ **Cheng-hua Wang**, Princeton University

January 24
East Asian Seminar ✦ *From Conflict to Mutual Compatibility: The Relationship between Traditional Sheyi (社邑) and Buddhism in Medieval China* ✦ **Hao Chunwen**, Capital Normal University, Beijing, China; Member, School of Historical Studies

January 31
East Asian Seminar ✦ *Sino-Soviet Friendship and the Uyghur National Project* ✦ **Joshua Freeman**, Princeton University

February 14
East Asian Seminar ✦ *Business Associationism and State Protectionism: The Case of the Kalimpong Tibetan Traders' Association* ✦ **Lucia Galli**, École pratique des hautes études; Member, School of Historical Studies

February 28
East Asian Seminar ✦ *The Technology of Government and Institutions: Comparative Perspectives on the Development of Royal and Imperial Administrations in Early China* ✦ **Li Feng**, Columbia University; Member, School of Historical Studies

March 7
East Asian Seminar ✦ *Sending the Alien Monks Back to the Marchlands: A Forgotten Nationalization of Buddhism in Tang China* ✦ **Antonello Palumbo**, Yale University

April 4
East Asian Seminar ✦ *The Clinical Encounter and Medical Case Records in Chinese Medicine, 1100–1350* ✦ **Asaf Goldschmidt**, Tel Aviv University; Member, School of Historical Studies

April 11
East Asian Seminar ✦ *Memorializing Protests in Early Modern Japan* ✦ **Miura Takashi**, University of Arizona; Member, School of Historical Studies

April 29
Roger E. Covey Distinguished Lecture in Pre-Modern China ✦ *The Philosopher and the Khan: the Diary of the Daoist Changchun's Journey to the West* ✦ **Stephen West**, Emeritus Foundation Professor of Chinese, Arizona State University

June 2–4
Workshop ✦ *Climate, History and Environment on the "Great Wall" Region* ✦ Participants: **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, School of Historical Studies; **I-I Lin**, National Taiwan University; **Edward Cook**, Lamont-Doherty Earth Observatory, Columbia Climate School; **Elena Xoplaki**, Justus-Liebig-University Giessen; **Bin Wang**, University of Hawaii; **Gabriel Vecchi**, High Meadow Environmental Institute, Princeton University; **David Bello**, Washington and Lee University; **David Graff**, Kansas State University; **Yuan Chen**, Duke University; **Ruth Mostern**, University of Pittsburgh; **Yan Gao**, Duke University; **Meng Zhang**, Vanderbilt University

MEDIEVAL STUDIES

September 30
Medieval Studies Seminar ✦ *Situatedness and Land* (Barker, "Territory as Analytic") ✦ **Suzanne Conklin Akbari**, Professor, School of Historical Studies

October 14
Medieval Studies Seminar ✦ *Disciplinary Situatedness* (Achi and Chaganti, "Redrawing the Borders of Medieval African Art" and Kaldellis, "Byzantium Was Not Medieval") ✦ **Gabriel Radle**, Member, School of Historical Studies

November 4–5
Munsee Language Symposium ✦ *LUNAAPAHKIING, HULUNIIXSUWAAKAN, LUNAAPEEWAK (Munsee Land, Munsee Language, Munsee People)* ✦ **Karen Mosko** and **Ian McCallum**, Munsee-Delaware Nation in Ontario

November 11
Medieval Studies Seminar ✦ *Situatedness and Race* (Ahmed, "Declarations of Whiteness" and Vernon, *The Black Middle Ages*) ✦ **Celia Chazelle** and **Anna Wilson**, Members, School of Historical Studies

November 18
Medieval Studies Seminar ✦ *Institutional Situatedness* (Stern, "History of the Institute for Advanced Study, 1930–1950" and Porter, "The Founding of the Institute for Advanced Study, 1930–1933") ✦ **Caitlin Rizzo**, Shelby White and Leon Levy Archives Center

December 9
Medieval Studies Seminar ✦ *Abbot Balsamon's Book: The Origins of Administrative Registers at Cava dei Tirreni* ✦ **Maureen Miller**, Member, School of Historical Studies

January 20
Medieval Studies Seminar ✦ *Sanskrit and Persian in the Court Culture of Kashmir* ✦ **Luther Obrock**, Member, School of Historical Studies

January 27
Medieval Studies Seminar ✦ *Gregory's Angels, Pale Custance, and the Fragility of Whiteness* ✦ **Celia Chazelle**, Member, School of Historical Studies

February 1
Munsee Delaware Story Evening ✦ *NEEKAAWA KIHTAACHIIMUWAK WULAAKWUNUWII (This Evening They Tell Stories)* ✦ **Karen Mosko** and **Ian McCallum**, Munsee-Delaware Nation in Ontario

February 10
Medieval Studies Seminar ✦ *Parasocial Relationships: Petrarch, Cicero, and the Textual Self in Real Person Fanfiction* ✦ **Anna Wilson**, Member, School of Historical Studies

February 17
Medieval Studies Seminar ✦ *Life-cycle Rituals for Children and Adolescents in Byzantium* ✦ **Gabriel Radle**, Member, School of Historical Studies

March 3
Medieval Studies Seminar ✦ *The Auspicious Rise of the Seka: Reimagining the Islamic Conquest of Bengal* ✦ **Ayesha Irani**, Member, School of Historical Studies

March 17
Medieval Studies Seminar ✦ *Anna Yaroslavna (d. 1075/1079)* ✦ **Talia Zajac**, Visitor, School of Historical Studies

April 14
Medieval Studies Seminar ✦ *Saint Colette de Corbie (1381–1447)* ✦ **Renate Blumenfeld-Kosinski**, University of Pittsburgh

NEAR/MIDDLE EASTERN AND ISLAMIC STUDIES

September 2–3
Near Eastern Studies Workshop ✦ *Colophons in Middle Eastern Manuscripts* ✦ Conveners: **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press

September 16
The Author's Voice ✦ *Sasanian Iran: A Personal View* ✦ **Michael R. Jackson Bonner**, Canadian writer, political adviser and independent historian of Iran ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press; in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

November 5–6
International Symposium ✦ *Prince Baysunghur, Before & After: Timurid Manuscripts in Context* ✦ Inaugural symposium of the Persian Manuscripts Association hosted by Near Eastern Studies at the Institute for Advanced Study, celebrating the 600th anniversary of the first manuscript produced at the royal library-atelier of the Timurid Prince Baysunghur (1399–1433) in Herat

November 10
Near Eastern Studies and Digital Scholarship @IAS joint lecture ✦ *The Study of Pre-modern Hebrew Philosophical and Scientific Terminology as a new Chapter in the Intellectual History of Europe and the Islamicate World: PESHAT in Context* ✦ Speakers: **Giuseppe Veltri**, University of Hamburg; **Reimund Leicht**, Hebrew University of Jerusalem; **Michael Engel**, University of Hamburg; **Florian Dunklau**, University of Hamburg

November 12–13
Conference ✦ *Ignaz Goldziher and his Correspondents: Islamic and Jewish Studies around the Turn of the Twentieth Century* ✦ Conveners: **Sabine Schmidtke**, Professor, School of Historical Studies; **Sebastian Günther**, Georg-August-Universität Göttingen; **Kinga Dévényi**, Corvinus University of Budapest; The Oriental Collection of the Library of the Hungarian Academy of Sciences; **Hans-Jürgen Becker**, Georg-August-Universität Göttingen

December 9
The Author's Voice ✦ *Ash'arism Encounters Avicennism: Sayf Al-Dīn Al-Āmidī (d. 631/1233) on Creation* ✦ **Laura Hassan**, Associate Faculty Member, Faculty of Oriental Studies, University of Oxford ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press; in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

January 12
Near Eastern Studies Seminar ✦ *Al-Suddī and his sources for rewriting the Quran* ✦ **Joseph Witztum**, The Hebrew University of Jerusalem; Member, School of Historical Studies

February 9
Near Eastern Studies Seminar ✦ *Unorthodox Patronage: Persian manuscript production in 15th-century Iran* ✦ **Shiva Mihan**, Member, School of Historical Studies

February 16
Near Eastern Studies Lecture ✦ *From Compilation to Indexing: Tracing the Practice of Early Modern Orientalist Scholarship* ✦ **Paul Babinski**, University of Copenhagen

February 23
Near Eastern Studies Lecture ✦ *An Ottoman Fiscal Codex and Financial Tales of 134 Women and Men* ✦ **Ali Yaycıoğlu**, Stanford University

March 9
Near Eastern Studies Seminar ✦ *The Auspicious Rise of the Seka: Revisiting the Islamic Conquest of Bengal* ✦ **Ayesha A. Irani**, University of Massachusetts Boston; Member, School of Historical Studies

March 10
The Author's Voice ✦ *Angels Hastening: The Karbalā' Dreams* ✦ **Christopher Clohessy**, Pontifical Institute for Arabic and Islamic Studies (PISAI); Pontifical Beda College, Rome ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press; in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

March 16
Near Eastern Studies Seminar ✦ *Reconstructing al-Suddī* ✦ **Joseph Witztum**, The Hebrew University of Jerusalem; Member, School of Historical Studies

March 23
Near Eastern Studies Lecture ✦ *Setting out from Mecca in 1481: About the possibly oldest extant Arabic travelogue from the Mashreq* ✦ **Björn Bentlage**, Orientalisches Institut, Martin-Luther-Universität Halle-Wittenberg

March 29–April 1
Conference ✦ *Power, Religion and Wisdom: Orthodoxy and Heterodoxy in al-Andalus and Beyond* ✦ Convened by **Godefroid de Callataÿ**, Université catholique de Louvain; sponsored by **Sabine Schmidtke**, Professor, School of Historical Studies

March 30
Near Eastern Studies Seminar ✦ *Conversion, Revolution, and State Formation in the Mountains of the Medieval Islamic World*

April 1
Near Eastern Studies, Digital Scholarship Conversations @IAS and Beth Mardutho: The Syriac Institute joint event ✦ *Simtho: Hands-on Workshop in Syriac Corpus Search*

April 27
Near Eastern Studies and Digital Scholarship Conversations @IAS joint lecture ✦ *The Preservation of Documentary Heritage in the MENASA Region: The Role of the QNL* ✦ **Stephane Ipert**, Director of Distinctive Collections, Qatar National Library (QNL)

June 23
The Author's Voice ✦ *The symbolic language of Ethiopian crosses: Explorations through form and ritual* ✦ **Maria Evangelatou**, University of California Santa Cruz ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press; in cooperation with **Angelos Chaniotis** Professor, School of Historical Studies

School of Mathematics

September 15

Joint IAS/Princeton University Number Theory Seminar ✦ *A Uniform Bogomolov Type of Theorem for Curves Over Global Fields* ✦ **Xinyi Yuan**, Beijing International Center for Mathematical Research

September 20

Computer Science/Discrete Mathematics Seminar I ✦ *Expander Random Walks: A Fourier-Analytic Approach* ✦ **Gil Cohen**, Tel Aviv University

September 21

Computer Science/Discrete Mathematics Seminar II ✦ *Linear Spaces of Matrices* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

Short Talks by Postdoctoral Members ✦ *An Iterative Approach to Higher-Dimensional Contact Manifolds* ✦ **Bahar Acu**, Member, School of Mathematics ✦ *A Boundary Layer Model of Erosion* ✦ **Dallas Albritton**, Member, School of Mathematics ✦ *On the Spectrum and Eigenfunctions of Generic Metric Graphs* ✦ **Lior Alon**, Member, School of Mathematics ✦ *Effective Counting Estimates for Filling Closed Geodesics on Hyperbolic Surfaces* ✦ **Francisco Andres Arana Herrera**, Member, School of Mathematics ✦ *The Minimal Model Program, Singularities and Vanishing Theorems, in Positive Characteristic* ✦ **Emelie Kerstin Arvidsson**, Member, School of Mathematics ✦ *Urysohn Width* ✦ **Alexey Balitskiy**, Member, School of Mathematics

September 22

Short Talks by Postdoctoral Members ✦ *Metric Aspects in Homotopy Theory* ✦ **Aleksandr Berdnikov**, Member, School of Mathematics ✦ *Grothendieck's Inequality, Algorithmic Aspects and Generalizations* ✦ **Vijay Bhattiprolu**, Member, School of Mathematics ✦ *Invariant Measures for Nonlinear Dispersive Equations* ✦ **Bjoern Bringmann**, Member, School of Mathematics ✦ *Optimal Transport and Spaces with Ricci Curvature Bounded Below* ✦ **Elia Bruè**, Member, School of Mathematics ✦ *Trace Theorems for Metric Spaces* ✦ **Clark W. Butler**, Member, School of Mathematics ✦ *Representations of Affine Lie Algebras vs Quantum Groups: Fusion, Factorization and $\mathbb{E}_2$ Structures* ✦ **Lin Chen**, Member, School of Mathematics

September 23

Short Talks by Postdoctoral Members ✦ *A Glimpse of Continuous Combinatorics via Natural Quasirandomness* ✦ **Leonardo Coregliano**, Member, School of Mathematics ✦ *Lagrangian Cobordisms Between Enriched Knot Diagrams* ✦ **Ipsita Datta**, Member, School of Mathematics ✦ *Contact Orderability* ✦ **Cedric De Groote**, Member, School of Mathematics ✦ *On The Frontiers of Binary Codes* ✦ **Fernando Granha Jeronimo**, Member, School of Mathematics ✦ *Prescribing the Jacobian of Homeomorphisms* ✦ **Andre Guerra**, Member, School of Mathematics ✦ *Nonparallel Immersions, Skew Fibrations, and Borsuk-Ulam Type Results* ✦ **Michael Harrison**, Member, School of Mathematics

September 27

Computer Science/Discrete Mathematics Seminar I ✦ *Superpolynomial Lower Bounds Against Low-Depth Algebraic Circuits I: An Overview* ✦ **Srikanth Srinivasan**, Aarhus University

Short Talks by Postdoctoral Members ✦ *An Unexpected Small Divisors Instability in General Relativity* ✦ **Christoph Kehle**, Member, School of Mathematics ✦ *Equivariant and Motivic Stable Homotopy Theory* ✦ **Hana Jia Kong**, Member, School of Mathematics ✦ *Well-Posedness for Hyperbolic Systems of Conservation Laws* ✦ **Sam G. Krupa**, Member, School of Mathematics ✦ *Conjecture on the Optimal Dimension for the Singular Set of Wild Ideal Fluids* ✦ **Manh Khang Huynh**, Member, School of Mathematics ✦ *Euler Flows with Local Energy Dissipation* ✦ **Hyunju Kwon**, Member, School of Mathematics ✦ *Orbit Closures of Unipotent Flows for Hyperbolic Manifold with Fuchsian Ends* ✦ **Minju Lee**, Member, School of Mathematics ✦ *Endoscopy for Affine Hecke Categories* ✦ **Yau Wing Li**, Member, School of Mathematics

September 28

Computer Science/Discrete Mathematics Seminar II ✦ *Superpolynomial Lower Bounds Against Low-Depth Algebraic Circuits II: A More Detailed Approach* ✦ **Sebastien Tavenas**, Université Savoie Mont Blanc Chambéry ✦ *Uniqueness Threshold for the Navier-Stokes Equations* ✦ **Xiaoyutao Luo**, Member, School of Mathematics ✦ *Instabilities in Fluid Mechanics and Convex Integration* ✦ **Francisco Mengual**, Member, School of Mathematics ✦ *A (very) Brief Look into the Restricted 3-Body Problem* ✦ **Agustin Moreno**, Member, School of Mathematics ✦ *When Invariants are Equivalent* ✦ **Jean Pierre Mutanguha**, Member, School of Mathematics ✦ *Non-conservative, Intermittent Weak Solutions of the 3D Euler Equations* ✦ **Matthew Novack**, Member, School of Mathematics ✦ *Directed Laplacian Matrices* ✦ **John Peebles**, Member, School of Mathematics ✦ *Projective Hypoellipticity, Fisher Information and Positive Lyapunov Exponents for High-Dimensional Stochastic Differential Equations* ✦ **Samuel Punshon Smith**, Member, School of Mathematics

September 29

Short Talks by Postdoctoral Members ✦ *Bounded Generation, a Diophantine Approximation Approach* ✦ **Jinbo Ren**, Member, School of Mathematics ✦ *The Poisson Bracket Invariant: Elementary and Hard Approaches* ✦ **Shira Tanny**, Member, School of Mathematics ✦ *Graphs, Principal Minors, and Eigenvalue Problems* ✦ **John C. Urschel**, Member, School of Mathematics ✦ *Black Cats, White Cats, and Shrodinger's Cats—Classical and Quantum Computation via Query Complexity* ✦ **Pei Wu**, Member, School of Mathematics ✦ *Deterministic and Stochastic Aspects of Two-Dimensional Fluid* ✦ **Bian Wu**, Member, School of Mathematics ✦ *Tight Space Complexity of the Coin Problem* ✦ **Or Zamir**, Member, School of Mathematics

September 30

Clay Research Conference—an Online Event ✦ *Convex Integration and Synthetic Turbulence* ✦ **László Székelyhidi**, Distinguished Visiting Professor, School of Mathematics ✦ *Gauge Theory and the Analytic Approach to Geometric Langlands* ✦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciencess ✦ *The Work of Buckmaster, Isett and Vicol and Presentation of the Clay Research Award to Tristan Buckmaster, Philip Isett and Vlad Vicol* ✦ **Camillo De Lellis**, IBM von Neumann Professor, School of Mathematics and **Thomas Clay**

Joint IAS/Princeton University Number Theory Seminar ✦ *Sums in Progressions over $\mathbb{F}_q[T]$, the Symmetric Group, and Geometry* ✦ **Will Sawin**, Columbia University

October 1

Hermann Weyl Lectures ✦ *On Singularity Formation for Energy Super Critical Problems* ✦ **Pierre Raphaël**, University of Cambridge

October 4

Computer Science/Discrete Mathematics Seminar I ✦ *Verifying the Unseen: Interactive Proofs for Label-Invariant Distribution Properties* ✦ **Guy Rothblum**, Weizmann Institute of Science

Hermann Weyl Lectures ✦ *Type I, Type II and Front Singularities* ✦ **Pierre Raphaël**, University of Cambridge

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *On Stabilized Symplectic Embeddings and Higher Symplectic Capacities* ✦ **Kyler Siegel**, Member, School of Mathematics

October 5

Computer Science/Discrete Mathematics Seminar II ✦ *Recent Progress in Query Complexity I & II* ✦ **Pei Wu**, Member, School of Mathematics

Hermann Weyl Lectures ✦ *Blow Up for the Energy Super Critical Defocusing NLS* ✦ **Pierre Raphaël**, University of Cambridge

October 6

Arithmetic Groups ✦ *First Order Rigidity of High-Rank Arithmetic Groups* ✦ **Alexander Lubotzky**, Hebrew University of Jerusalem; Visiting Professor, School of Mathematics

Lectures in Analysis and Geometry ✦ *Basic Notions and User's Guide for Fluid Mechanics* ✦ **László Székelyhidi**, University of Leipzig; Distinguished Visiting Professor, School of Mathematics

October 7

Discussions in Analysis and Geometry ✦ *Basic Notions and Users' Guide for the Special Year, Part II* ✦ **Kai Cieliebak**, University of Augsburg; Member, School of Mathematics

Joint IAS/Princeton University Number Theory Seminar ✦ *Bounds for Standard L-functions* ✦ **Paul Nelson**, von Neumann Fellow; School of Mathematics

October 8

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20-minute Research Talks* ✦ **Jean-Philippe Chassé**, Université de Montréal; **Leo Digiosia**, Rice University; **Rima Chatterjee**, University of Cologne

October 11

Computer Science/Discrete Mathematics Seminar I ✦ *The Complexity of Gradient Descent: CLS = PPAD ∩ PLS* ✦ **Alexandros Hollender**, University of Oxford

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Tropical Lagrangian Sections and Looijenga Pairs* ✦ **Andrew Hanlon**, Stony Brook University

Members' Colloquium ✦ *What is the h-Principle*? ✦ **Camillo De Lellis**, IBM von Neumann Professor, School of Mathematics

October 12

Computer Science/Discrete Mathematics Seminar II ✦ *Recent Progress in Query Complexity I & II* ✦ **Pei Wu**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *Shades of h-Principle in Foliation Theory* ✦ **Gael Meigniez**, Aix-Marseille University; Member, School of Mathematics

October 13

Arithmetic Groups ✦ *First-Order Rigidity, Bi-Interpretability, and Congruence Subgroups* ✦ **Nir Avni**, Northwestern University

Lectures in Analysis and Geometry ✦ *The h-Principle and Weak Solutions* ✦ **László Székelyhidi**, University of Leipzig; Distinguished Visiting Professor, School of Mathematics

Mathematical Conversations ✦ *Tangent Cones and Their Uniqueness, Maybe a Meeting Ground for Hard Analysis and Algebraic Geometry* ✦ **Camillo De Lellis**, IBM von Neumann Professor; School of Mathematics

October 14

Discussions in Analysis and Geometry ✦ *Reading Seminar on Papers of Honda-Huang and Breem-Christopher, Exploring the Notion of Convexity in High Dimensional Contact Geometry*

Joint IAS/Princeton University Number Theory Seminar ✦ *Modularity and Heights of CM Cycles on Kuga-Sato Varieties* ✦ **Congling Qiu**, Yale University

October 15

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Results on Abundance of Global Surfaces of Section* ✦ **Umberto Hryniewicz**, RWTH Aachen University

October 18

Computer Science/Discrete Mathematics Seminar I ✦ *Sharp Matrix Concentration Inequalities* ✦ **Ramon Van Handel**, Princeton University

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Contractibility of the Space of Tight Contact Structures on* $\mathbb{R}^3$ ✦ **Yakov Eliashberg**, Stanford University; Member, School of Mathematics

Members' Colloquium ✦ *Higher Order Fourier Analysis and Solving Equations in Dense Sets* ✦ **Sarah Peluse**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

October 19

Computer Science/Discrete Mathematics Seminar II ✦ *An Introduction to Determinantal Point Processes* ✦ **John C. Urschel**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *The Shock Development Problem* ✦ **Tristan Buckmaster**, Princeton University; Member, School of Mathematics

October 20

Arithmetic Groups ✦ *Groups with Bounded Generation: Properties and Examples* ✦ **Andrei S. Rapinchuk**, University of Virginia

Lectures in Analysis and Geometry ✦ *Overview of the h-Principle* ✦ **Yakov Eliashberg**, Stanford University; Member, School of Mathematics

Mathematical Conversations ✦ *The Unreasonable Effectiveness of Convexity in Symplectic Geometry* ✦ **Shira Tanny**, Member, School of Mathematics

October 21

Discussions in Analysis and Geometry ✦ *Reading Seminar on Papers of Honda-Huang and Breem-Christopher, Exploring the Notion of Convexity in High Dimensional Contact Geometry*

October 22

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Big Fiber Theorems and Ideal-valued Measures in Symplectic Topology* ✦ **Yaniv Ganor**, Technion – Israel Institute of Technology

October 25

Computer Science/Discrete Mathematics Seminar I ✦ *Locally Testable Codes with Constant Rate, Distance, and Locality, Part I* ✦ **Irit Dinur**, Weizmann Institute of Science

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Mirror Symmetry from the SYZ base* ✦ **Benjamin Gammage**, Harvard University

Members' Colloquium ✦ *A (slightly less) Brief Look into the Restricted 3-body Problem* ✦ **Agustin Moreno**, Member, School of Mathematics

October 26

Computer Science/Discrete Mathematics Seminar II ✦ *Locally Testable Codes with Constant Rate, Distance, and Locality, Part II* ✦ **Irit Dinur**, Weizmann Institute of Science

Seminar in Analysis and Geometry ✦ *On Embeddings of Manifolds* ✦ **Dishant Mayurbhai Pancholi**, Chennai Mathematical Institute; von Neumann Fellow, School of Mathematics

Special Seminar ✦ *Existence of an Unbounded Nodal Hypersurface for Smooth Gaussian Fields in Dimension* $d > 2$ ✦ **Hugo Duminil Copin**, Institut des Hautes Études Scientifiques

October 27

Lectures in Analysis and Geometry ✦ *The h-Principle in Fluid Mechanics* ✦ **László Székelyhidi**, University of Leipzig; Distinguished Visiting Professor, School of Mathematics

Mathematical Conversations ✦ *Gaussian Elimination with Complete Pivoting: Searching for a Needle in a Haystack* ✦ **John C. Urschel**, Member, School of Mathematics

October 28

Discussions in Analysis and Geometry ✦ *Reading Seminar on Papers of Honda-Huang and Breem-Christopher, Exploring the Notion of Convexity in High Dimensional Contact Geometry*

Joint IAS/Princeton University Number Theory Seminar ✦ *Reducible Fibers and Monodromy of Polynomial Maps* ✦ **Danny Neftin**, Technion – Israel Institute of Technology; Member, School of Mathematics

October 29

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Detecting Non-Trivial Elements in the Spaces of Legendrian Knots via Algebraic K-theory* ✦ **Yakov Eliashberg**, Stanford University; Member, School of Mathematics

November 1

Computer Science/Discrete Mathematics Seminar I ✦ *Parallel Repetition for the GHZ Game: A Simpler Proof* ✦ **Uma Girish**, Princeton University

Workshop on the *h*-Principle and Beyond ✦ *Looking at Euler Flows Through a Contact Mirror: Universality, Turing Completeness and Undecidability* ✦ **Eva Miranda**, Universitat Politècnica de Catalunya

November 1

Workshop on the *h*-Principle and Beyond ✦ *Overtwisted = Tight in 3 Dimensions* ✦ **Francisco Presas Mata**, Instituto de Ciencias Matemáticas

Workshop on the *h*-Principle and Beyond ✦ *Local Flexibility for Open Partial Differential Relations* ✦ **Bernhard Hanke**, University of Augsburg

Workshop on the *h*-Principle and Beyond ✦ *Mather-Thurston's Theory, Non-Abelian Poincare Duality and Diffeomorphism Groups* ✦ **Sam Nariman**, Purdue University

November 2

Computer Science/Discrete Mathematics Seminar II ✦ *Introduction to Continuous Combinatorics I: The Semidefinite Method of Flag Algebras* ✦ **Leonardo Coregliano**, Member, School of Mathematics

November 2

Workshop on the *h*-Principle and Beyond ✦ *The Many Facets of Complexity of Beltrami Fields in Euclidean Space* ✦ **Daniel Peralta Salas**, Instituto de Ciencias Matemáticas

November 2

Workshop on the *h*-Principle and Beyond ✦ *Holonomic Approximation through Convex Integration* ✦ **Melanie Theilliere**, University of Luxemborg

Workshop on the *h*-Principle and Beyond ✦ *Lefschetz Fibrations on the Milnor Fibers of Cusp Singularities and Applications* ✦ **Yoshihiko Mitsumatsu**, Chuo University

Workshop on the *h*-Principle and Beyond ✦ *Chaos in the Incompressible Euler Equation on Manifolds of High Dimension* ✦ **Francisco Torres De Lizaur**, University of Toronto

November 3

Arithmetic Groups ✦ *Non-virtually Abelian Anisotropic Linear Groups are not Boundedly Generated* ✦ **Jinbo Ren**, Member, School of Mathematics

Workshop on the *h*-Principle and Beyond ✦ *The Flexibility of Caustics and its Applications* ✦ **Daniel Alvarez Gavela**, Massachusetts Institute of Technology

Workshop on the *h*-Principle and Beyond ✦ *Hamiltonian Geometry Behind Compressible Fluids* ✦ **Boris Khesin**, University of Toronto

Workshop on the *h*-Principle and Beyond ✦ *A Controlled Mather Thurston Theorem* ✦ **Mike Freedman**, Microsoft

November 4

Joint IAS/Princeton University Number Theory Seminar ✦ *Monogenic Fields with Odd Class Number* ✦ **Artane Jeremie Siad**, Princeton University; Visitor, School of Mathematics

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *A (Slightly Deeper) Look into the Restricted 3-body Problem* ✦ **Agustin Moreno**, Member, School of Mathematics

Workshop on the *h*-Principle and Beyond ✦ *Regularity of the Limit Set of Embedded Poincaré Disks* ✦ **Vincent Borelli**, University of Lyon

Workshop on the *h*-Principle and Beyond ✦ *A Topological View on the Monge-Ampere Equation Without Convexity Assumptions* ✦ **Jonas Hirsch**, University of Leipzig

Workshop on the *h*-Principle and Beyond ✦ *Ampleness up to Avoidance* ✦ **Alvaro Del Pino Gomez**, University of Utrecht

Workshop on the *h*-Principle and Beyond ✦ *Flexibility in C^0 Symplectic Geometry* ✦ **Lev Buhovsky**, Tel Aviv University

November 5

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20-minute Research Talks* ✦ **Rohil Prasad**, Princeton University; **Alex Pieloch**, Columbia University; **Chi Hong Chow**, Chinese University of Hong Kong

Workshop on the *h*-Principle and Beyond ✦ *A h-Principle for Locally Conformal Symplectic Structures* ✦ **Melanie Bertelson**, University of Brussels

Workshop on the *h*-Principle and Beyond ✦ *Flexibilization as Localization* ✦ **Oleg Lazarev**, University of Massachusetts

Workshop on the *h*-Principle and Beyond ✦ *On Some Geometry-Grounded Problems Involving PDEs, Dynamics, and Discretization* ✦ **Dmitri Burago**, Pennsylvania State University

November 8

Computer Science/Discrete Mathematics Seminar I ✦ *The Kakeya Set Conjecture over Z mod N for General N* ✦ **Manik Dhar**, Princeton University

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Lagrangian Cobordisms and Enriched Knot Diagrams* ✦ **Ipsita Datta**, Member, School of Mathematics

Members' Colloquium ✦ *Which Manifolds are Symplectic?* ✦ **Yakov Eliashberg**, Stanford University; Member, School of Mathematics

November 9

Computer Science/Discrete Mathematics Seminar II ✦ *Introduction to Continuous Combinatorics II: Semantic Limits* ✦ **Leonardo Coregliano**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *3D Navier-Stokes Equations: The Dynamics of a Blow-Up* ✦ **Alexey P. Cheskidov**, University of Illinois, Chicago; Member, School of Mathematics

November 10

Arithmetic Groups ✦ *The Congruence Subgroup Property for SL(2,Z)* ✦ **William Yun Chen**, Member, School of Mathematics

Character Varieties, Dynamics and Arithmetic ✦ *Dynamics on Character Varieties* ✦ **William Goldman**, University of Maryland; Member, School of Mathematics

Lectures in Analysis and Geometry ✦ *h-Principle in Symplectic Topology* ✦ **Emmy Murphy**, Princeton University; Visitor, School of Mathematics

Mathematical Conversations ✦ *Stochastic Characteristics: Ellipticity and Hypoellipticity from Finite to Infinite Dimensions* ✦ **Jonathan Mattingly**, Duke University; Member, School of Mathematics

Special Seminar ✦ *Random Forests and Hyperbolic Symmetry* ✦ **Roland Bauerschmidt**, University of Cambridge

November 11

Discussions in Analysis and Geometry ✦ *Reading Seminar on the Papers of Tao on Universality of the Euler Equations* ✦ **Cedric De Groote**, Member, School of Mathematics

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *The Unbounded Denominators Conjecture* ✦ **Yunqing Tang**, Princeton University

November 15

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *ECH of Prequantization Bundles* ✦ **Jo Nelson**, Rice University

Members' Colloquium ✦ *Growth of Cohomology in Towers of Manifolds: A Topological Application of the Langlands Program* ✦ **Mathilde Gerbelli Gauthier**, Member, School of Mathematics

November 16

Seminar in Analysis and Geometry ✦ *Building Linear Homotopies in Metric Topology with Scalable Spaces* ✦ **Aleksandr Berdnikov**, Member, School of Mathematics

November 17

Arithmetic Groups ✦ *Algebraicity/Holonomicity Theorems* ✦ **Frank Calegari**, University of Toronto; University of Chicago

Character Varieties, Dynamics and Arithmetic ✦ *Dynamics on Character Varieties* ✦ **William Goldman**, University of Maryland; Member, School of Mathematics

Lectures in Analysis and Geometry ✦ *Stationary Solutions of the Euler Equations and Reeb Vector Fields* ✦ **Kai Cieliebak**, University of Augsburg; Member, School of Mathematics

Mathematical Conversations ✦ *Noether's Theorem in the Calculus of Variations and Hyperbolic Manifolds* ✦ **Karen Uhlenbeck**, The University of Texas at Austin; Distinguished Visiting Professor, School of Mathematics

November 18

Discussions in Analysis and Geometry ✦ *Reading Seminar on the Papers of Tao on Universality of the Euler Equations* ✦ **Francisco Mengual**, Member, School of Mathematics

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Conditional Approaches to Sums of Cubes* ✦ **Victor Wang**, Princeton University

November 19

Blackwell Tapia Conference 2021—IAS Satellite Location

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Exact Orbifold Fillings of Contact Manifolds* ✦ **Fabio Gironella**, Humboldt University of Berlin

November 20

Blackwell Tapia Conference 2021—IAS Satellite Location

November 22

Computer Science/Discrete Mathematics Seminar I ✦ *On Approximability of CSPs on Satisfiable Instances* ✦ **Subhash Khot**, New York University

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Legendrian Torus and Cable Links* ✦ **Lisa Traynor**, Bryn Mawr College

Members' Colloquium ✦ *Mathematical Foundations for Human-Level Intelligence (Part 1): Cooperative Communication as Belief Transport* ✦ **Patrick Shafto**, Rutgers University; Member, School of Mathematics

November 23

Computer Science/Discrete Mathematics Seminar II ✦ *Exact Algorithms for Graph Coloring* ✦ **Or Zamir**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *On Arnold's Formula for the Second Variation of Energy on Orbits of 2d Vorticities* ✦ **Vladimír Sverák**, University of Minnesota; Member, School of Mathematics

November 26

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Complex Cobordism and Hamiltonian Fibrations* ✦ **Mohammed Abouzaid**, Columbia University

November 29

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Morse-Bott Theory on Singular Analytic Spaces and Applications to the Topology of Symplectic Four-Manifolds* ✦ **Paul Feehan**, Rutgers University

Members' Colloquium ✦ *Fluid Equations: Regularity and Kolmogorov's Turbulence Theory* ✦ **Mimi Dai**, University of Illinois, Chicago; von Neumann Fellow, School of Mathematics

November 30

Seminar in Analysis and Geometry ✦ *h-Principle without Pre-conditions for Ridgy Lagrangians Transverse to a Distribution* ✦ **Yakov Eliashberg**, Stanford University; Member, School of Mathematics

December 1

Arithmetic Groups ✦ *Applications to Modular Forms and Noncongruence Arithmetic Groups* ✦ **Frank Calegari**, Princeton University; University of Chicago

Character Varieties, Dynamics and Arithmetic ✦ *Integral Points on Character Varieties* ✦ **Junho Peter Whang**, Seoul National University

Joint IAS/Princeton University Number Theory Seminar ✦ *Abelian Varieties Not Isogenous to Jacobians* ✦ **Jacob Tsimerman**, University of Toronto

Lectures in Analysis and Geometry ✦ *Rigidity and Flexibility of Isometric Embeddings in C1a I* ✦ **Camillo De Lellis**, IBM von Neumann Professor, School of Mathematics

Mathematical Conversations ✦ *A Magnetic Interpretation of the Nodal Count on Graphs* ✦ **Lior Alon**, Member, School of Mathematics

December 2

Discussions in Analysis and Geometry ✦ *Reading Seminar on Tao's Blow-up Paper for an Averaged Navier-Stokes System* ✦ **Vladimír Sverák**, University of Minnesota; Member, School of Mathematics

Floer Learning Seminar

December 6

Computer Science/Discrete Mathematics Seminar I ✦ *List Decoding with Double Samplers* ✦ **Inbal Livni Navon**, Weizmann Institute of Science

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Producing Algebraic Curves in Projective Families via Floer Theory* ✦ **Alex Pieloch**, Columbia University

Members' Colloquium ✦ *Old and New Results on the Spread of the Spectrum of a Graph* ✦ **John C. Urschel**, Member, School of Mathematics

December 7

Computer Science/Discrete Mathematics Seminar II ✦ *An Introduction to Binary Code Bounds* ✦ **Fernando Granha Jeronimo**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *The Landscape Law and Wave Localization* ✦ **Svitlana Mayboroda**, University of Minnesota; von Neumann Fellow, School of Mathematics

Special Seminar ✦ *Stable Vortex Sheets and Irreversibility of Turbulence* ✦ **Alexander Migdal**, New York University

December 8

Arithmetic Groups ✦ *Commutators in SL2 and Markoff Surfaces* ✦ **Peter Sarnak**, Professor, School of Mathematics

Character Varieties, Dynamics and Arithmetic ✦ *Effective Mapping Class Group Dynamics* ✦ **Francisco Andres Arana Herrera**, Member, School of Mathematics

Lectures in Analysis and Geometry ✦ *Rigidity and Flexibility of Isometric Embeddings in C1a II* ✦ **Camillo De Lellis**, IBM von Neumann Professor; School of Mathematics

Mathematical Conversations ✦ *Can One Hear the Winding Number?* ✦ **László Székelyhidi**, University of Leipzig; Distinguished Visiting Professor, School of Mathematics

December 9

Discussions in Analysis and Geometry ✦ *The Ruelle Invariant and Convexity I* ✦ **Julian Chaidez**, Princeton University; Visitor, School of Mathematics

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *The Second Moment of the Size of the 2-Selmer Group of Elliptic Curves* ✦ **Ashvin Swaminathan**, Princeton University

December 10

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *GIT Quotients and Symplectic Data Analysis* ✦ **Urs Frauenfelder**, Augsburg University

December 13

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Localization and Flexibilization in Symplectic Geometry* ✦ **Oleg Lazarev**, University of Massachusetts Boston

Members' Colloquium ✦ *A New Random Model for the Euler and Navier-Stokes Equations and Related Equations* ✦ **Jonathan Mattingly**, Duke University; Member, School of Mathematics

December 14

Computer Science/Discrete Mathematics Seminar II ✦ *An Introduction to Lifted Expander Graphs* ✦ **Fernando Granha Jeronimo**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *Floer Homology of Hamiltonians Supported on Subsets* ✦ **Shira Tanny**, Member, School of Mathematics

December 15

Arithmetic Groups ✦ *Commutators in SL2 and Markoff Surfaces* ✦ **Chen Meiri**, Technion – Israel Institute of Technology

Character Varieties, Dynamics and Arithmetic ✦ *The Dynamics of Aut(Fn) Actions on Group Presentations and Representations* ✦ **Alexander Lubotzky**, Hebrew University of Jerusalem; Visiting Professor, School of Mathematics

Lectures in Analysis and Geometry ✦ *The Ruelle Invariant and Convexity II* ✦ **Julian Chaidez**, Princeton University; Visitor, School of Mathematics

Special Lecture ✦ *Can You Hear the Will of the People in the Vote? The Mathematics and Policy of Quantifying Gerrymandering* ✦ **Jonathan Mattingly**, Duke University; Member, School of Mathematics

December 16

Floer Learning Seminar

December 17

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20-minute Research Talks* ✦ **Wenyuan Li**, Northwestern University; **Jakob Hedicke**, Ruhr-Universität Bochum; **Johan Asplund**, Uppsala University

January 13

Floer Learning Seminar

January 14

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Quantitative Legendrian Geometry* ✦ **Michael Sullivan**, University of Massachusetts, Amherst

January 18

Computer Science/Discrete Mathematics Seminar II ✦ *Norm Minimization, Invariant Theory, and the Jacobian Conjecture* ✦ **William Cole Franks**, Massachusetts Institute of Technology

Seminar in Analysis and Geometry ✦ *Non-uniqueness of Leray Solutions of the Forced Navier-Stokes Equations* ✦ **Dallas Albritton**, Member, School of Mathematics

January 19

Lectures in Analysis and Geometry ✦ *Informal Meeting to Discuss the Topics*

January 20

Discussions in Analysis and Geometry ✦ *Instability and Non-uniqueness in Fluid Dynamics—Part I: Unstable Vortex* ✦ **Elia Bruè**, Member, School of Mathematics

Floer Learning Seminar

January 21

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Beyond Semitoric* ✦ **Susan Tolman**, University of Illinois Urbana–Champaign

January 24

Computer Science/Discrete Mathematics Seminar I ✦ *Reproducibility in Learning* ✦ **Jessica Sorrell**, University of California San Diego

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Symplectomorphisms Mirror to Birational Transformations of the Complex Plane* ✦ **Abigail Ward**, Massachusetts Institute of Technology

Members' Colloquium ✦ *Cubic Surfaces and Non-Euclidean Geometry* ✦ **William Goldman**, University of Maryland; Member, School of Mathematics

January 25

Computer Science/Discrete Mathematics Seminar II ✦ *Bounds for Subsets of $\mathbb{F}_p^n \times \mathbb{F}_p^n$ without L-shaped Configurations* ✦ **Sarah Peluse**, Institute for Advanced Study and Princeton University; Veblen Research Instructor, School of Mathematics

Seminar in Analysis and Geometry ✦ *Honda-Huang's Work on Contact Convexity Revisited* ✦ **Dishant Mayurbhai Pancholi**, Chennai Mathematical Institute; von Neumann Fellow, School of Mathematics

January 26

Arithmetic Groups ✦ *Grothendieck Pairs and Profinite Rigidity* ✦ **Martin Bridson**, Oxford University

Mathematical Conversations ✦ *From Stein to Weinstein and Back* ✦ **Kai Cieliebak**, University of Augsburg; Member, School of Mathematics

January 27

Floer Learning Seminar

January 27

Topics in Analysis ✦ *Instability and Non-uniqueness in Fluid Dynamics—Part II: Unstable Vortex Ring* ✦ **Dallas Albritton**, Member, School of Mathematics

January 28

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20-minute Research Talks* ✦ **Dustin Connery Grigg**, Université de Montréal; **Pazit Haim-Kislev**, Tel Aviv University; **Thibaut Mazuir**, University of Paris

February 1

Computer Science/Discrete Mathematics Seminar II ✦ *Bounds for Subsets of $\mathbb{F}_p^n \times \mathbb{F}_p^n$ without L-shaped Configurations* ✦ **Sarah Peluse**, Veblen Research Instructor, School of Mathematics

Seminar in Analysis and Geometry ✦ *Euler Flows with Local Energy Dissipation* ✦ **Hyunju Kwon**, Member, School of Mathematics

Short Talks by Postdoctoral Members ✦ *How to Build a Fluid Clock* ✦ **Theodore Dimitrios Drivas**, Member, School of Mathematics

Short Talks by Postdoctoral Members ✦ *On the Birch and Swinnerton-Dyer Conjecture over Quadratic Fields: The Reducible Case* ✦ **Emmanuel Lecouturier**, Member, School of Mathematics

February 2

Arithmetic Groups ✦ *Profinite Completions and Representation Rigidity* ✦ **Ryan Spitler**, Rice University

Mathematical Conversations ✦ *The Vision of the Sets According to Brownian Travelers* ✦ **Svitlana Mayboroda**, University of Minnesota

Topics in Geometry ✦ *Quantitative Heegaard Floer Cohomology and the Calabi Invariant [CGHMSS] Part I: Background on C^0 Symplectic Geometry* ✦ **Kai Cieliebak**, University of Augsburg; Member, School of Mathematics

February 3

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Motivic Action on Coherent Cohomology of Hilbert Modular Varieties* ✦ **Aleksander Horawa**, University of Michigan

Topics in Analysis ✦ *Instability and Non-uniqueness in Fluid Dynamics—Part III: Non-uniqueness of Leray Solutions* ✦ **Elia Bruè**, Member, School of Mathematics

February 7

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Poincare Duality for Loop Spaces* ✦ **Kai Cieliebak**, Augsburg University; Member, School of Mathematics

Members' Colloquium ✦ *PDEs vs. Geometry: Analytic Characterizations of Geometric Properties of Sets* ✦ **Svitlana Mayboroda**, University of Minnesota

February 8

Seminar in Analysis and Geometry ✦ *Totally Nonparallel Immersions* ✦ **Michael Harrison**, Member, School of Mathematics

February 9

Arithmetic Groups ✦ *From PSL_2 Representation Rigidity to Profinite Rigidity* ✦ **Ben McReynolds**, Rice University; Purdue University

Mathematical Conversations ✦ *Random Hyperbolic Surfaces* ✦ **Francisco Andres Arana Herrera**, Member, School of Mathematics

Topics in Geometry ✦ *Quantitative Heegaard Floer Cohomology and the Calabi Invariant [CGHMSS] Part I: Background on C^0 Symplectic Geometry* ✦ **Kai Cieliebak**, Member, School of Mathematics

February 10

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Local ($\ell = p$) Galois Deformation Rings* ✦ **Ashwin Iyengar**, Johns Hopkins University

Topics in Analysis ✦ *Instability and Non-uniqueness in Fluid Dynamics—Part IV: Sharpness of the Yudovich Class* ✦ **Dallas Albritton**, Member, School of Mathematics

February 11

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *On Symplectic Capacities and Their Blind Spots* ✦ **Ely Kerman**, University of Illinois, Urbana-Champaign

February 14

Computer Science/Discrete Mathematics Seminar I ✦ *Random Algebraic Varieties and Their Applications to Hardness of Approximation* ✦ **Bhargav Narayanan**, Rutgers University

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Computing Disk Potentials via Multi-directional sft* ✦ **Chris Woodward**, Rutgers University

Members' Colloquium ✦ *Morrey's Conjecture* ✦ **László Székelyhidi**, University of Leipzig; Distinguished Visiting Professor, School of Mathematics

February 15

Computer Science/Discrete Mathematics Seminar II ✦ *Derandomization and its Connections Throughout Complexity Theory* ✦ **Roei Tell**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *$H^{1/2-}$ Weak Solutions of the 3D Euler Equations* ✦ **Matthew Novack**, Member, School of Mathematics

February 16

Arithmetic Groups ✦ *Anosov Groups: Local Mixing, Counting, and Equidistribution* ✦ **Minju Lee**, Member, School of Mathematics

Mathematical Conversations ✦ *The Strong Cosmic Censorship Conjecture in General Relativity* ✦ **Christoph Kehle**, Member, School of Mathematics

Topics in Geometry ✦ *Quantitative Heegaard Floer Cohomology and the Calabi Invariant [CGHMSS] Part II: Reduction to the Spectral Invariant* ✦ **Cedric De Groote**, Member, School of Mathematics

February 17

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *A Wiles-Diamond Numerical Criterion in Higher Dimensions* ✦ **Chandrashekhar Khare**, University of California, Los Angeles

February 18

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Reynaud Models from Relative Floer Theory* ✦ **Umut Varolgunes**, Boğaziçi University

February 21

Computer Science/Discrete Mathematics Seminar I ✦ *PAC Learnability of Partial Concept Classes* ✦ **Noga Alon**, Princeton University

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Generic Equidistribution of Periodic Orbits for Area-Preserving Surface Diffeomorphisms* ✦ **Rohil Prasad**, Princeton University

February 22

Computer Science/Discrete Mathematics Seminar II ✦ *Derandomization and its Connections Throughout Complexity Theory* ✦ **Liije Chen**, Massachusetts Institute of Technology

Seminar in Analysis and Geometry ✦ *On the Lagrangian Cobordism Relation on Legendrian Links* ✦ **Joshua Sabloff**, Member, School of Mathematics

February 23

Arithmetic Groups ✦ *Effective Equidistribution of Some One-Parameter Unipotent Flows with Polynomial Rates I & II* ✦ **Elon Lindenstrauss**, Hebrew University

Mathematical Conversations ✦ *Lego in Finite Groups, Hurwitz Spaces, and Markoff Triples* ✦ **William Yun Chen**, Member, School of Mathematics

Mathematical Physics Seminar ✦ *Log-Sobolev Inequality for Near Critical Ising and Continuum φ^4 Measures* ✦ **Roland Bauerschmidt**, University of Cambridge

Topics in Geometry ✦ *Quantitative Heegaard Floer cohomology and the Calabi Invariant [CGHMSS] Part III: Background on Heegaard-Floer* ✦ **Ipsita Datta**, Member, School of Mathematics

February 24

Floer Learning Seminar

Topics in Analysis ✦ *$H^{1/2-}$ Solutions of the 3D Euler Equations—Part 1: Constructing Velocity Increments and Placement Lemmas* ✦ **Sam G. Krupa**, Member, School of Mathematics

February 25

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Topological Entropy of Hamiltonian Diffeomorphisms: A Persistence Homology and Floer Theory Perspective* ✦ **Erman Cineli**, University of California Santa Cruz

February 28

Computer Science/Discrete Mathematics Seminar I ✦ *Refuting Smoothed k-SAT Formulas and a Proof of Feige's Conjecture* ✦ **Pravesh Kothari**, Carnegie Mellon University

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Symplectic Geometry of Surface Group Representations* ✦ **William Goldman**, Member, School of Mathematics

Members' Colloquium ✦ *A Gentle Approach to Crystalline Cohomology* ✦ **Jacob Lurie**, Professor, School of Mathematics

March 1

Computer Science/Discrete Mathematics Seminar II ✦ *Non-Black-Box Derandomization* ✦ **Roei Tell**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *Weak Solutions to MHD Equations* ✦ **Daniel Faraco**, Member, School of Mathematics

March 2

Arithmetic Groups ✦ *Effective Equidistribution of Some One-Parameter Unipotent Flows with Polynomial Rates I & II* ✦ **Amir Mohammadi**, University of California San Diego; Pennsylvania State University

Mathematical Conversations ✦ *Crooked Geometry: Crystallography in the Geometry of (2+1)-Special Relativity* ✦ **William Goldman**, Member, School of Mathematics

Mathematical Physics Seminar ✦ *Bounds on Maass Spectra from Holomorphic Forms* ✦ **Dalimil Mazac**, Member, School of Natural Sciences

Topics in Geometry ✦ *Quantitative Heegaard Floer Cohomology and the Calabi Invariant [CGHMSS] Part IV: Existence of the Spectral Invariant* ✦ **Agustin Moreno**, Member, School of Mathematics

March 3
Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *A Density Conjecture About Unit Fractions* ✦ **Thomas Bloom**, Oxford University

Topics in Analysis ✦ *$H^{1/2}$ Solutions of the 3D Euler Equations—Part 2: Low Frequency Error Terms and the Secondary Iteration* ✦ **Vikram Giri**, Princeton University

March 4
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Invariant Submanifolds for Conformal Dynamics* ✦ **Marie Claude Arnaud**, Université d'Avignon

March 7
Computer Science/Discrete Mathematics Seminar I ✦ *The Minimum Formula Size Problem is (ETH) Hard* ✦ **Rahul Ilango**, Massachusetts Institute of Technology

Members' Colloquium ✦ *The Orbit Method, Microlocal Analysis and Applications to L-functions* ✦ **Paul Nelson**, von Neumann Fellow, School of Mathematics

March 8
Computer Science/Discrete Mathematics Seminar II ✦ *Hardness of Easy Problems and Fine-Grained Complexity* ✦ **Or Zamir**, Member, School of Mathematics

March 9
Arithmetic Groups ✦ *Review of Vanishing for Bounded Cohomology, in Preparation for Stability* ✦ **Nicolas Monod**, École Polytechnique Fédérale de Lausanne

Mathematical Physics Seminar ✦ *An Introduction to Grassmann Integrals with Applications to Statistical Mechanics* ✦ **Vieri Mastropietro**, Member, School of Mathematics

Topics in Geometry ✦ *Quantitative Heegaard Floer Cohomology and the Calabi Invariant [CGHMSS] Part V: The Calabi Morphism* ✦ **Joshua Sabloff**, Member, School of Mathematics

March 10
Floer Learning Seminar

Topics in Analysis ✦ *$H^{1/2}$ Solutions of the 3D Euler Equations—Part 3: Transport Errors, Pointwise Estimates, and Future Directions* ✦ **Matthew Novack**, Member, School of Mathematics

March 14
Computer Science/Discrete Mathematics Seminar I ✦ *Multi-group Learning via Outcome Indistinguishability* ✦ **Gal Yona**, Weizmann Institute of Science

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *The Quasimorphism Question* ✦ **Daniel Anthony Cristofaro Gardiner**, University of Maryland

Marston Morse Lectures ✦ *Spectral Statistics of Random Matrices and Random Graphs* ✦ **Horng-Tzer Yau**, Harvard University

March 15
Computer Science/Discrete Mathematics Seminar II ✦ *Localization Schemes: A Framework for Proving Mixing Bounds for Markov Chains* ✦ **Ronen Eldan**, von Neumann Fellow, School of Mathematics

March 16
Arithmetic Groups ✦ *Asymptotic Bounded Cohomology and Uniform Stability of High-Rank Lattices* ✦ **Bharatram Rangarajan**, Hebrew University

Marston Morse Lectures ✦ *Matrix Brownian Motions and Random Spectral Dynamics* ✦ **Horng-Tzer Yau**, Harvard University

March 17
Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Arithmetic Statistics and Graded Lie Algebras* ✦ **Jef Laga**, University of Cambridge

Marston Morse Lectures ✦ *Quantum Diffusions and Random Band Matrices* ✦ **Horng-Tzer Yau**, Harvard University

March 18
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Dimers, Networks, and Integrable Systems* ✦ **Anton Izosimov**, The University of Arizona

March 21
Computer Science/Discrete Mathematics Seminar I ✦ *Online Bipartite Matching and Adwords* ✦ **Vijay V. Vazirani**, University of California Irvine

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Representations are Sheaves' for Legendrian 2-Weaves* ✦ **Kevin Sackel**, Stony Brook University

Members' Colloquium ✦ *On the Unpredictability of Fluid Motions* ✦ **Dallas Albritton**, Member, School of Mathematics

March 22
Computer Science/Discrete Mathematics Seminar II ✦ *Localization Schemes: A Framework for Proving Mixing Bounds for Markov Chains* ✦ **Ronen Eldan**, von Neumann Fellow, School of Mathematics

Seminar in Analysis and Geometry ✦ *Level Sets of Weakly Lipschitz Functions* ✦ **Bobby Wilson**, University of Washington

March 23
Arithmetic Groups ✦ *Canonical Forms for Free Group Automorphisms* ✦ **Jean Pierre Mutanguha**, Member, School of Mathematics

Mathematical Conversations ✦ *The Weyl Groupoid* ✦ **Shifra Reif**, Member, School of Mathematics

Topics in Geometry ✦ *Alternative Constructions of Weak Solutions of the Euler Equations* ✦ **Alexander Shnirelman**, Member, School of Mathematics

March 24
Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *On the BSD Conjecture for Certain Families of Abelian Varieties with Rational Torsion* ✦ **Emmanuel Lecouturier**, Member, School of Mathematics

Topics in Analysis ✦ *Alternative Constructions of Weak Solutions of the Euler Equations—Hybrid Discussion* ✦ **Alexander Shnirelman**, Member, School of Mathematics

March 25
Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20-min Research Talks* ✦ **Benoît Joly**, Ruhr-Universität Bochum; **Marco Castronovo**, Columbia University; **Agniva Roy**, Georgia Institute of Technology

March 28
Computer Science/Discrete Mathematics Seminar I ✦ *Linear Cover Time is Exponentially Unlikely* ✦ **Quentin Dubroff**, Rutgers University

DeepMind Workshop ✦ *Knot Theory and Machine Learning* ✦ **Andras Juhasz**, University of Oxford

DeepMind Workshop ✦ *Combinatorial Invariance: A Case Study of Pure Math / Machine Learning Interaction* ✦ **Geordie Williamson**, The University of Sydney

March 29
DeepMind Workshop ✦ *What is Machine Learning Good For?* ✦ **Alex Davies**, University of Cambridge

DeepMind Workshop ✦ *AlphaZero and Matrix Multiplication* ✦ **Alhussein Fawzi**, EPFL

Computer Science/Discrete Mathematics Seminar II ✦ *The Absorption Method, and An Application to An Old Ramsey Problem* ✦ **Matija Bucic**, Veblen Research Instructor, School of Mathematics

March 30
Arithmetic Groups ✦ *Growth of Bianchi Modular Forms* ✦ **Weibo Fu**, Princeton University

DeepMind Workshop ✦ *The Signature and Natural Slope of Hyperbolic Knots* ✦ **Marc Lackenby**, University of Oxford

Mathematical Conversations ✦ *Statistical Properties of the Character Table of the Symmetric Group* ✦ **Sarah Peluse**, Veblen Research Instructor, School of Mathematics

Mathematical Physics Seminar ✦ *Large Genus Asymptotics in Flat Surfaces and Hyperbolic Geodesics* ✦ **Amol Aggarwal**, Visiting Professor, School of Mathematics

March 31

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Some Progress on Categorical Local Langlands* ✦ **Linus Hamann**, Princeton University

April 1

DeepMind Workshop ✦ *Fireside Chat* ✦ **Andras Juhasz**, University of Oxford; University of Cambridge; The University of Sydney

April 4

Computer Science/Discrete Mathematics Seminar I ✦ *Many Nodal Domains in Random Regular Graphs* ✦ **Nikhil Srivastava**, University of California, Berkeley

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Rank Inequalities for the Heegaard Floer Homology of Branched Covers* ✦ **Kristen Hendricks**, Rutgers University

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Singularity Formation in Incompressible Fluids* ✦ **Tarek Elgindi**, Duke University

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *From the Monge Transportation Problem to Einstein's Gravitation through Euler's Hydrodynamics* ✦ **Yann Brenier**, CNRS–Laboratoire de Mathematiques d'Orsay, Universite Paris–Saclay

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *A Detailed Characterization of the Hypersurface of Pre-shocks for the Euler Equations* ✦ **Steve Shkoller**, University of California, Davis

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Local Dissipation of Energy for Continuous Incompressible Euler Flows* ✦ **Philip Isett**, The University of Texas at Austin

April 5

Computer Science/Discrete Mathematics Seminar II ✦ *A Magnetic Interpretation of the Nodal Count on Graphs* ✦ **Lior Alon**, Member, School of Mathematics

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Small Scale Formations in the Incompressible Porous Media Equation* ✦ **Yao Yao**, National University of Singapore

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Properties of Mixing BV Vector Fields* ✦ **Stefano Bianchini**, SISSA

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Pressure and Intermittency* ✦ **Peter Constantin**, Princeton University

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *D'Alembert Principle and Weak Solutions of the Euler Equations* ✦ **Alexander Shnirelman**, Concordia University

April 6

Special Number Theory Seminar ✦ *On the Distribution of the Hodge Locus* ✦ **Emmanuel Ullmo**, Institut des Hautes Études Scientifiques

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Generic Global Existence for the Modified SQG Equation* ✦ **Javier Gomez Serrano**, Brown University; University of Barcelona

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *On the Sticky Particle Solutions to the Pressureless Euler System in General Dimension* ✦ **Sara Daneri**, Gran Sasso Institute

April 7

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *The Average Size of 3-Torsion in Class Groups of 2-Extensions* ✦ **Robert Lemke Oliver**, Tufts University

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *The Quartic Integrability and Long Time Existence of Steep Water Waves in 2D* ✦ **Sijue Wu**, University of Michigan

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Self-similar Gravitational Collapse* ✦ **Juhi Jang**, University of Southern California

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Non-Newtonian Fluids and Convex Integration* ✦ **Stefano Modena**, TU Darmstadt

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *On the Competition Between Advection and Vortex Stretching* ✦ **Jiajie Chen**, California Institute of Technology

April 8

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Lagrangians, Symplectomorphisms and Zeroes of Moment Maps* ✦ **Yann Rollin**, Nantes University

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *Non-uniqueness of Leray Solutions of the Forced Navier-Stokes Equations* ✦ **Maria Colombo**, EPFL

Workshop on Recent Developments in Incompressible Fluid Dynamics ✦ *An Intermittent Onsager Theorem* ✦ **Vlad Vicol**, New York University

April 11

Computer Science/Discrete Mathematics Seminar I ✦ *The Long Arm of Theoretical Computer Science: A Case Study in Blockchains/Web3* ✦ **Tim Roughgarden**, Columbia University

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Integral Gromov-Witten Invariants and Complex Derived Orbifold Bordism* ✦ **Shaoyun Bai**, Princeton University

April 12

Computer Science/Discrete Mathematics Seminar II ✦ *Multi-Group Fairness, Loss Minimization and Indistinguishability* ✦ **Parikshit Gopalan**, VMware Research

April 13

Arithmetic Groups ✦ *Arithmetic and Dynamics on Varieties of Markoff Type* ✦ **Alexander Gamburd**, The City University of New York

Mathematical Conversations ✦ *How Dark Matter Could Be Measured in the Solar System* ✦ **Edward Belbruno**, Yeshiva University; Princeton University

Mathematical Physics Seminar ✦ *Invariant Gibbs Measures for the Cubic Nonlinear Wave Equation* ✦ **Bjoern Bringmann**, Member, School of Mathematics

April 14

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Non-Vanishing of Twists of* **GL**(4) *L-functions* ✦ **Liyang Yang**, Princeton University

April 15

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Singular Plane Curves and Stable Nonsqueezing Phenomena* ✦ **Kyler Siegel**, University of Southern California

April 18

Computer Science/Discrete Mathematics Seminar I ✦ *Set Chasing, with an Application to Online Shortest Path* ✦ **Sebastien Bubeck**, Microsoft Research Lab–Redmond

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Non-Orientable Lagrangian Fillings of Legendrian Knots* ✦ **Joshua Sabloff**, Member, School of Mathematics

April 19

Computer Science/Discrete Mathematics Seminar II ✦ *A Tutorial on Gaussian Elimination* ✦ **John C. Urschel** ✦ Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *Singularity Formation for Reduced Models of Fluid Equations* ✦ **Mimi Dai**, von Neumann Fellow, School of Mathematics

April 20

Mathematical Physics Seminar ✦ *Towards Morse Theory of Dispersion Relations* ✦ **Gregory Berkolaiko**, Texas A&M University

April 21

Floer Learning Seminar

Joint IAS/Princeton University Number Theory ✦ *Seminar Galois Groups of Random Integer Polynomials* ✦ **Manjul Bhargava**, Princeton University

Topics in Analysis ✦ *Positive Lyapunov Exponents and Mixing in Stochastic Fluid Flow. Part I* ✦ **Samuel Punshon Smith**, Member, School of Mathematics

April 22

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *From Floer to Hochschild via Matrix Factorisations* ✦ **Jack Smith**, University of Cambridge

April 26

Seminar in Analysis and Geometry ✦ *Global Well-Posedness for the 2D One-Phase Muskat Problem* ✦ **Hongjie Dong**, Brown University

April 27

Mathematical Conversations ✦ *The Sharp Liouville Theorem for Conformal Maps* ✦ **Andre Guerra**, Member, School of Mathematics

April 28

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Modular Forms of Half-Integral Weight on Exceptional Groups* ✦ **Spencer Leslie**, Duke University

Topics in Analysis ✦ *Positive Lyapunov Exponents and Mixing in Stochastic Fluid Flow. Part II* ✦ **Elia Bruè**, Member, School of Mathematics

April 29

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Knots, Minimal Surfaces and J-holomorphic Curves* ✦ **Joel Fine**, Université Libre de Bruxelles

May 2

Joint IAS/Princeton University Symplectic Geometry Seminar ✦ *Inner and Outer Billiards in Symplectic Spaces* ✦ **Sergei Tabachnikov**, Pennsylvania State University

May 3

Seminar in Analysis and Geometry ✦ *Metrics of Constant Chern Scalar Curvature* ✦ **Xi Sisi Shen**, Columbia University

May 4

Mathematical Conversations ✦ *What Persuades Us to Accept a Proof as Correct, and Can Computer Learning Help Us in That?* ✦ **Andrew Granville**, Université de Montréal

Mathematical Physics Seminar ✦ *Modular Bootstrap, Segal's Axioms and Resolution of Liouville Conformal Field Theory* ✦ **Rémi Rhodes**, Université Aix-Marseille; **Vincent Vargas**, École Normale Supérieure

May 5

Joint IAS/Princeton University Number Theory Seminar ✦ *Applications of the Subspace Theorem in Group Theory* ✦ **Jinbo Ren**, Member, School of Mathematics

Topics in Analysis ✦ *Positive Lyapunov Exponents and Mixing in Stochastic Fluid Flow. Part III* ✦ **Samuel Punshon-Smith**, Member, School of Mathematics

May 6

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Tate Homology and Powered Flybys* ✦ **Kevin Ruck**, Augsburg University

May 9

Computer Science/Discrete Mathematics Seminar I ✦ *Polynomial Bounds on Parallel Repetition for all 3-Player Games with Binary Inputs* ✦ **Kunal Mittal**, Princeton University

May 10

Computer Science/Discrete Mathematics Seminar II ✦ *Association Schemes and Codes I: The Delsarte Linear Program* ✦ **Leonardo Coregliano**, Member, School of Mathematics

Seminar in Analysis and Geometry ✦ *Remarks on the Long-Time Dynamics of 2D Euler* ✦ **Theodore Dimitrios Drivas**, Member, School of Mathematics

May 12

Floer Learning Seminar

The Celebration of Women in Mathematics ✦ *Bounds for Subsets of $\mathbb{F}_p^n \times \mathbb{F}_p^m$ Without L-Shaped Configurations* ✦ **Sarah Peluse**, Veblen Research Instructor, School of Mathematics

May 16

Computer Science/Discrete Mathematics Seminar I ✦ *Thresholds* ✦ **Jinyoung Park**, Stanford University

Members' Colloquium ✦ *Thresholds* ✦ **Jinyoung Park**, Stanford University

May 17

Computer Science/Discrete Mathematics Seminar II ✦ *Association Schemes and Codes II: Completeness of the Hierarchy of High-Order Hamming Schemes* ✦ **Leonardo Coregliano**, Member, School of Mathematics

May 19

Floer Learning Seminar

Joint IAS/Princeton University Number Theory Seminar ✦ *Branching Laws: Homological Aspects* ✦ **Dipendra Prasad**, Indian Institute of Technology

May 20

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Gamma-Support, Gamma-Coisotropic Subsets and Application* ✦ **Claude Viterbo**, Université de Paris–Sud

May 22

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Terng Lecture Course Preview* ✦ **Lesia Semenova**, Duke University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Uhlenbeck Lecture Course Preview* ✦ **Ellen Vitercik**, University of California, Berkeley

May 23

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Terng Lecture: Introduction to Interpretable Machine Learning* ✦ **Cynthia Rudin**, Duke University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Uhlenbeck Lecture: Foundations for Learning in the Age of Big Data* ✦ **Maria Florina Balcan**, Carnegie Mellon University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Colloquium: Learning Generalizable Visual Representations* ✦ **Kate Saenko**, Boston University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Review Sessions*

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Young Researcher Seminar*

May 24

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Terng Lecture: Introduction to Interpretable Machine Learning* ✦ **Cynthia Rudin**, Duke University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Uhlenbeck Lecture: Foundations for Learning in the Age of Big Data* ✦ **Maria Florina Balcan**, Carnegie Mellon University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Interpreting Deep Neural Networks towards Trustworthiness* ✦ **Bin Yu**, University of California, Berkeley

Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Review Sessions*

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Stop Explaining Black Box Machine Learning Models for High Stakes Decisions and Use Interpretable Models Instead* ✦ **Cynthia Rudin**, Duke University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Young Researcher Seminar*

May 26

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Terng Lecture: Introduction to Interpretable Machine Learning* ✦ **Cynthia Rudin**, Duke University

May 26

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Uhlenbeck Lecture: Foundations for Learning in the Age of Big Data* ✦ **Maria Florina Balcan**, Carnegie Mellon University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Stochastic Gradient Descent: Where Optimization Meets Machine Learning* ✦ **Rachel Ward**, The University of Texas at Austin

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Review Sessions*

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Young Researcher Seminar*

Floer Learning Seminar

May 27

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Terng Lecture: Introduction to Interpretable Machine Learning* ✦ **Cynthia Rudin**, Duke University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Uhlenbeck Lecture: Foundations for Learning in the Age of Big Data* ✦ **Maria Florina Balcan**, Carnegie Mellon University

2022 Program for Women and Mathematics: The Mathematics of Machine Learning ✦ *Young Researcher Seminar*

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Three 20-minute Research Talks* ✦ **Daniel Rudolf**, Ruhr-Universität Bochum; **Miguel Pereira**, Augsburg University; **Maksim Stokić**, Tel Aviv University

June 3

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Integer-valued Gromov-Witten Type Invariants* ✦ **Guangbo Xu**, Texas A&M University

June 17

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *Locality and Deformations in Relative Symplectic Cohomology* ✦ **Yoel Groman**, The Hebrew University of Jerusalem

June 21

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Opening Remarks* ✦ **Jon Keating**, Institute for Advanced Study

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Statistical Mechanics Arising from Random Matrix Theory* ✦ **Thomas Spencer**, Professor Emeritus, School of Mathematics

50 Years of Number Theory and Random Matrix Theory Conference ✦ *The Distribution of Values of Zeta and L-functions* ✦ **Kannan Soundararajan**, Stanford University

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Large Sieve Inequalities for Families of L-functions* ✦ **Matt Young**, Texas A&M University

June 22

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Number Theoretic Aspects of Multiplicative Chaos* ✦ **Adam Harper**, University of Warwick

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Gaussian Multiplicative Chaos: Applications and Recent Developments* ✦ **Nina Holden**, ETH Zurich

50 Years of Number Theory and Random Matrix Theory Conference ✦ *A Few Results and Conjectures on Some Product-Ratio Correlation Functions of Characteristic Polynomials of Beta-Hermite Ensembles* ✦ **Yan Fyodorov**, King's College London

50 Years of Number Theory and Random Matrix Theory Conference ✦ *The Fyodorov-Hiary-Keating Conjecture* ✦ **Louis Pierre Arguin**, The City University of New York

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Large Deviation Estimates for Selberg's Central Limit Theorem, Applications, and Numerics* ✦ **Emma Bailey**, The City University of New York

June 23

50 Years of Number Theory and Random Matrix Theory Conference ✦ *RMT Statistics in Number Theory and in Quantum Chaos* ✦ **Zeev Rudnick**, Tel Aviv University

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Half-Isolated Zeros and Zero-Density Estimates* ✦ **Kyle Pratt**, University of Oxford

50 Years of Number Theory and Random Matrix Theory Conference ✦ *The Recipe for Moments of L-Functions and Characteristic Polynomials of Random Matrices* ✦ **Sieg Baluyot**, American Institute of Mathematics

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Negative Moments of the Riemann Zeta Function* ✦ **Alexandra Florea**, University of California, Irvine

June 24

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Moments and Bounds for L-Functions of Large Degree* ✦ **Paul Nelson**, Member, School of Mathematics

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Sums of Certain Arithmetic Functions over $\mathbb{F}_q[T]$ and Non-Unitary Distributions* ✦ **Matilde Lalin**, Université de Montréal

50 Years of Number Theory and Random Matrix Theory Conference ✦ *Moments of Large Families of Dirichlet L-Functions* ✦ **Vorrapan Chandee**, Kansas State University

Joint IAS/Princeton/Montreal/Paris/Tel Aviv Symplectic Geometry Zoominar ✦ *The Ruelle Invariant and Convexity in Higher Dimensions* ✦ **Julian Chaidez**, Member, School of Mathematics

School of Natural Sciences

ASTROPHYSICS

July 19

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *The clustering of galaxies in the completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: Primordial non-Gaussianity in Fourier Space* ✦ **Giovanni Cabass**, Member, School of Natural Sciences

August 30
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Deep learning insights into cosmological structure formation* ✦ **Luisa Lucie-Smith**, Max-Planck-Institut für Astrophysik

September 7
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Cosmic magnetism from a computational perspective* ✦ **Romain Teyssier**, Princeton University

September 9
Institute for Advanced Study Astrophysics Seminar ✦ *Fundamental Physics of Dark Matter from Dwarf Galaxy Surveys* ✦ **Yao-Yuan Mao**, Rutgers University–New Brunswick

September 13
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Using a Neural Network Classifier to Select Galaxies with the Most Accurate Photometric Redshifts* ✦ **Adam Broussard**, Rutgers University–New Brunswick

September 14
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Soft Astronomy* ✦ **Alice Quillen**, University of Rochester

September 16
Institute for Advanced Study Astrophysics Seminar ✦ *Stellar spin-orbit misalignment* ✦ **Joshua Winn**, Princeton University

September 20
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Updated cosmological constraints on Macroscopic Dark Matter* ✦ **Luca Caloni**, Università degli Studi di Ferrara

September 21
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *New views on the Milky Way* ✦ **Amina Helmi**, University of Groningen

September 23
Institute for Advanced Study Astrophysics Seminar ✦ *Fundamental cosmology with galaxy redshift surveys* ✦ **Mikhail Ivanov**, Member, School of Natural Sciences

September 27
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Forward modeling in the era of cosmological surveys Topic 2:Multi-wavelength cluster mass estimation with machine learning* ✦ **Boryana Hadzhiyska**, Center for Astrophysics, Harvard University ✦ *Multi-wavelength cluster mass estimation with machine learning* ✦ **Digvijay Wadekar**, Member, School of Natural Sciences

September 28
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *All you need is a Normalizing Flow* ✦ **Uros Seljak**, University of California, Berkeley

September 30
Institute for Advanced Study Astrophysics Seminar ✦ *Mapping Matter in Strong Gravity: Spectral-Timing of Black Holes and Neutron Stars* ✦ **Abigail Stevens**, Michigan State

October 4
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Baryonic effects in the Effective FieldTheory of Large-Scale Structure and an analytic recipe for lensing in CMB-S4* ✦ **Matthew Lewandowski**, Northwestern University

October 5
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The PAH Revolution: Cold, Dark Carbon at the Earliest Stages of Star Formation* ✦ **Brett McGuire**, Massachusetts Institute of Technology

October 7
Institute for Advanced Study Astrophysics Seminar ✦ *"Observing" Jet/Accretion Flow/Black Hole (JAB) Simulations (Now with Positrons!)* ✦ **Richard Anantua**, Center for Astrophysics, Harvard University

October 11
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Assembly bias in quadratic bias parameters from forward modeling* ✦ **Titouan Lazeyras**, Scuola Internazionale Superiore di Studi Avanzati ✦ *Galactic-Scale Tests of Fundamental Physics* ✦ **Deaglan Bartlett**, University of Oxford

October 12
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Gemini Observatory in the 2020's* ✦ **Jennifer Lotz**, Space Telescope Science Institute

October 14
Institute for Advanced Study Astrophysics Seminar ✦ *Undetected Black Holes: Far and Near* ✦ **Fabio Pacucci**, Center for Astrophysics, Harvard University

October 18
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Topic 1: N-point Correlation Functions—Work in Progress and Outlook Topic 2: Anisotropies of icosahedral inflation* ✦ **Jiamin Hou**, University of Florida; **Guanhao Sun**, Columbia University

October 21
Institute for Advanced Study Astrophysics Seminar ✦ *Probing magnetic field direction and strength in interstellar medium, galactic center and clusters of galaxies* ✦ **Alex Lazarian**, University of Wisconsin-Madison

October 25
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Numerical Construction of Wave Dark Matter Halos* ✦ **Tomer Yavetz**, Kavli Institute for Cosmology, Cambridge

October 26
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Implications, Tests, and Unsolved Problems in Cosmic Ray Feedback* ✦ **Ellen Zweibel**, University of Wisconsin-Madison

October 28
Institute for Advanced Study Astrophysics Seminar ✦ *Magnetized Models for the Formation of the Moon* ✦ **Patrick Dean Mullen**, Member, School of Natural Sciences

November 1
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Resolving Debate Over the Tip of the Red Giant Branch Method's Calibration and its Application to Measuring the Hubble Constant* ✦ **Taylor Hoyt**, University of Chicago ✦ *The CAMELS-SAM simulations: new 'hump' for constraining cosmology with galaxy clustering and neural networks* ✦ **Lucia Perez**, Arizona State University

November 2
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Magnetism in planet-forming disks and the solar nebula* ✦ **Xuening Bai**, Tsinghua University

November 4
Institute for Advanced Study Astrophysics Seminar ✦ *Using (Galactic) Supernova Remnants to Study Supernova Progenitors* ✦ **Chris Kochanek**, Ohio State University

November 15
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Potential new insights about reionization from the cosmic microwave background and the Lyman alpha forest* ✦ **Xiaohan Wu**, Center for Astrophysics, Harvard University ✦ *Massive-neutrino Perturbations without the Boltzmann Hierarchy* ✦ **Lingyuan Ji**, Johns Hopkins University

November 16
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Astrophysics of white dwarfs in the era of modern surveys* ✦ **Nadia Zakamska**, Johns Hopkins University; Member, School of Natural Sciences

November 18
Institute for Advanced Study Astrophysics Seminar ✦ *Dynamical Evolution of Binaries in Star Clusters and Galaxies* ✦ **Chris Hamilton**, Member, School of Natural Sciences

November 22
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Could quasar lensing time-delays hint to a core component in halos, instead of H0 tension?* ✦ **Kfir Blum**, CERN ✦ *AGN Variability and HEAN in the age of VRO* ✦ **Cyril Creque-Sarbinowski**, Johns Hopkins University

November 23
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Cosmology from weak lensing—is lensing low?* ✦ **Alexandra Amon**, Stanford University, KIPAC

November 29
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Weak lensing: globally optimal estimator and a new probe of the high-redshift Universe* ✦ **Abhishek Maniyar**, New York University ✦ *Hidden symmetries of black holes and the vanishing of the Love numbers* ✦ **Luca Santoni**, Abdus Salam International Centre for Theoretical Physics

November 30
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Mars: History of a Habitable World and Lessons for Terrestrial Planet Evolution* ✦ **Bethany Ehlmann**, California Institute of Technology

December 2
Institute for Advanced Study Astrophysics Seminar ✦ *The Observational Quest for Transiting Exomoons* ✦ **David Kipping**, Columbia University

December 6
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Seeking solutions for the Hubble tension* ✦ **Meng-Xiang Lin**, Kavli Institute for Cosmological Physics, University of Chicago ✦ *Likelihood approximations for (future) large angular scale CMB data* ✦ **Roger de Belsunce**, Kavli Institute for Cosmology, Cambridge

December 9
Institute for Advanced Study Astrophysics Seminar ✦ *3D magnetic field observations associated with filamentary molecular clouds* ✦ **Mehrnoosh Tahani**, Dominion Radio Astrophysical Observatory (DRAO)

December 16
Institute for Advanced Study Astrophysics Seminar ✦ *Black hole catalysis of false vacuum decay: The semiclassical decay rate and importance of greybody factors* ✦ **Sergey Sibiryakov**, Perimeter Institute

January 24
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Finding Evidence of Inflation and Galactic Magnetic Fields with CMB Surveys* ✦ **Sayan Mandal**, Stony Brook University

January 25
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *New Frontiers of Short Wavelength Exploration: From Astromineralogy to Exoplanet* ✦ **Lía Corrales**, University of Michigan

January 27
Institute for Advanced Study Astrophysics Seminar ✦ *Cosmology with compact binary coalescences* ✦ **Jose Maria Ezquiaga**, University of Chicago

February 1
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *A Galaxy Property Census with Line Intensity Mapping* ✦ **Anthony Pullen**, New York University

February 7
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *The Kinetic Sunyaev-Zeldovich Effect with Projected Fields* ✦ **Boris Bolliet**, Columbia University

February 8
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The Chiral Universe* ✦ **Stephon Alexander**, Brown University

February 10
Institute for Advanced Study Astrophysics Seminar ✦ *Improving astrophysical scaling relations with machine learning* ✦ **Digvijay Wadekar**, Member, School of Natural Sciences

February 15
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Learning Symbolic Equations with Deep Learning* ✦ **Shirley Ho**, Flatiron Institute

February 22
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Cosmic Ray Acceleration by Magnetic Reconnection: Probing Extreme Energies and the Origin of Gamma-Ray and Neutrino Emission from Black Holes and Relativistic Jets of Active Galaxies* ✦ **Elisabete M. de Gouveia Dal Pino**, Universidade de Sao Paulo

February 24
Institute for Advanced Study Astrophysics Seminar ✦ *Tides in the high-eccentricity migration of hot Jupiters: effects of nonlinear mode interaction* ✦ **Hang Yu**, California Institute of Technology

March 1
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Pathways to Earth-Mass Planets with Precision Spectroscopy* ✦ **Suvrath Mahadevan**, Pennsylvania State University

March 15
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Satellite Swarms vs. Astronomy and the Night Sky* ✦ **James Lowenthal**, Smith College

March 17
Institute for Advanced Study Astrophysics Seminar ✦ *Core-collapse Supernovae as a Probe of New Physics* ✦ **Andrea Caputo**, Tel Aviv University; Weizmann Institute of Science

March 21
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Deep Learning the Dark Sector* ✦ **Michael Toomey**, Brown University

March 22
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The birth of the first massive galaxies and black holes* ✦ **Eduardo Bañados**, Max-Planck-Instituts für Astronomie

March 24
Institute for Advanced Study Astrophysics Seminar ✦ *Collider tools for classical gravity* ✦ **Julio Parra Martinez**, California Institute of Technology

March 28
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ I*s the Stellar Initial Mass Function Truly Universal?* ✦ **Charles Steinhardt**, Dark Cosmology Centre, Niels Bohr Institute, University of Copenhagen ✦ *A Stimulating Explanation of the Extragalactic Radio Excess* ✦ **Andrea Caputo**, Tel Aviv University

March 29
Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *Searching for axion-like particles with X-ray observations of galaxy clusters* ✦ **Christopher Reynolds**, University of Cambridge

March 31
Institute for Advanced Study Astrophysics Seminar ✦ *Galaxies Far, Far Away: Modeling challenges for precision weak lensing and combined-probe cosmology* ✦ **Jonathan Blazek**, Northeastern University

April 4
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *The two-loop bispectrum of large-scale structure* ✦ **Petter Taule**, Technische Universität

München ✦ *Theoretical modeling of probability distribution function for cosmological counts in cell* ✦ **Anton Chudaykin**, McMaster University

April 5

Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The Baryon Cycle in Dwarf-Dwarf Mergers: Fueling Hierarchical Assembly* ✦ **Sabrina Stierwalt**, Occidental College

April 7

Institute for Advanced Study Astrophysics Seminar ✦ *Alien Oceans: The Search for Life in the Depths of Space* ✦ **Kevin Hand**, California Institute of Technology

April 11

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Backpropagating" the gravitational wave population* ✦ **Kaze Wong**, Center for Computational Astrophysics, Flatiron Institute ✦ *Measuring the Hubble rate using the equality scale with present and future galaxy surveys* ✦ **Gerrit Farren**, University of Cambridge

April 12

Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The Wild West of Nuclear Transients* ✦ **Suvi Gezari**, Space Telescope Science Institute

April 14

Institute for Advanced Study Astrophysics Seminar ✦ *Black hole searches for ultralight bosons* ✦ **Masha Baryakhtar**, University of Washington

April 18

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Publication trends in Astrophysics—before and during COVID* ✦ **Vanessa Boehm**, University of California, Berkeley

April 19

Institute for Advanced Study/Princeton University Joint Astrophysics Colloquium ✦ *The Atmosphere-Interior Connection of Super-Earths and Sub-Neptunes: From Formation and Evolution to Observations* ✦ **Hilke Schlichting**, University of California, Los Angelos

April 21

Institute for Advanced Study Astrophysics Seminar ✦ *Ultralight Dark Matter and Cosmological Condensed Matter Physics* ✦ **Evan McDonough**, University of Winnipeg

April 25

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Probing the Universe's expansion and the origin of compact object binaries with multi-messenger astronomy* ✦ **Antonella Palmese**, University of California, Berkeley

April 28

Institute for Advanced Study Astrophysics Seminar ✦ *Not your grandparents' binary stars* ✦ **Hsiang-Chih Hwang**, Member, School of Natural Sciences

May 2

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Traces of a Heavy Field in Gravitational Waves* ✦ **Keisuke Inomata**, KICP ✦ *Aligning the Cosmic Web: Superclustering at the intersection of ACT+DES data and simulations* ✦ **Matrine Lokken**, University of Toronto

May 9

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *COSMOPOWER: Machine Learning—accelerated Bayesian inference from next-generation cosmological surveys* ✦ **Satya Gontcho A Gontcho**, Lawrence Berkeley National Laboratory, University of California, Berkeley

May 12

Institute for Advanced Study Astrophysics Seminar ✦ *Neutrino Quantum Kinetics in Neutron Star Mergers* ✦ **Sherwood Richers III**, University of California, Berkeley

May 16

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Testing the equivalence principle in the dark sector* ✦ **Emanuele Castorina**, Università degli Studi di Milano

May 17

Institute for Advanced Study Astrophysics Seminar ✦ *Lessons from Astrophysical Models of Sgr A* and the Event Horizon Telescope* ✦ **George Wong**, Member, School of Natural Sciences

May 19

Institute for Advanced Study Astrophysics Seminar ✦ *Stellar Basins* ✦ **Ken Van Tilburg**, New York University

May 23

Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Gravitational Waves from the Dark Side of the Universe* ✦ **Laura Sagunski**, Johann Wolfgang Goethe-Universität Frankfurt am Main

May 26

Institute for Advanced Study Astrophysics Seminar ✦ *New test of the black hole metric with EHT images of Sgr A** ✦ **Lia Medeiros**, Member, School of Natural Sciences

HIGH ENERGY THEORY

September 8

Joint Course with TIFR and IAS ✦ *The Quantum Phases of Matter* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

September 13

Joint Course with TIFR and IAS ✦ *The Quantum Phases of Matter* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

September 15

Joint Course with TIFR and IAS ✦ *The Quantum Phases of Matter* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *New Heavy Exotics* ✦ **Marek Karliner**, Tel Aviv University

September 17

High Energy Theory Seminar ✦ *The Euclidean Path Integral in Supergravity* ✦ **Gustavo Joaquin Turiaci**, Member, School of Natural Sciences

September 20

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Electron Hubbard Model: Luttinger Theorem, Antiferromagnetism, and d-wave Superconductivity* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

High Energy Theory Seminar ✦ *Celestial Operator Product Expansions and w1+infinity Symmetry for All Spins* ✦ **Monica Pate**, Harvard University

September 22

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Antiferromagnetism and Superconductivity in the Electron Hubbard Model* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Possible Transition Between String Scale Black Holes and Self-gravitating Fundamental Strings* ✦ **Juan Maldacena**, Carl P. Feinberg Professor, School of Natural Sciences

September 23

Black Holes & Quantum Information Group Meeting ✦ *Informal Discussion on Black Holes and Qubits* ✦ **Yiming Chen**, Princeton University; **Joaquin Turiaci**, Member, School of Natural Sciences

September 24

High Energy Theory Seminar ✦ *Small Cosmological Constants in String Theory* ✦ **Liam McAllister**, Cornell University

September 27

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Antiferromagnetism in Metals* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

High Energy Theory Seminar ✦ *The Anomaly that was not meant IIB* ✦ **Miguel Montero**, Harvard University

September 29

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Paramagnon Theory of Metals* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Non-supersymmetric Smooth Solitonic Solutions in Einstein-Maxwell Type Theories* ✦ **Ibrahima Bah**, Johns Hopkins University; Member, School of Natural Sciences

September 30

Black Holes & Quantum Information Group Meeting ✦ *Entanglement Wedge Cross Section and the Markov Gap* ✦ **Nima Lashkari**, Purdue University; Member, School of Natural Sciences

October 4

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Resonating Valence Bonds and the Z2 Spin Liquid* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

High Energy Theory Seminar ✦ *Quantum Circuits, Cellular Automata and Tensor Networks* ✦ **Ignacio Cirac**, Max-Planck-Institut für Quantenoptik

October 6

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Resonating Valence Bonds and the Z2 Spin Liquid" (continued)* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Preparation and Verification of Tensor Network States* ✦ **Ignacio Cirac**, Max-Planck-Institut für Quantenoptik

October 8

High Energy Theory Seminar ✦ *Sequential Discontinuities of Scattering Amplitudes* ✦ **Hólmfríður Hannesdóttir**, Member, School of Natural Sciences

October 11

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Z2 Spin Liquids and Z2 Gauge Theories* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

October 13

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Z2 Spin Liquids and Z2 Gauge Theories (continued)* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Gravity and Integrability* ✦ **Robert Penna**, Member, School of Natural Sciences

October 14

Black Holes & Quantum Information Group Meeting ✦ *Generalised Entanglement Wedges* ✦ **Geoff Penington**, University of California, Berkeley; Junior Visiting Professor, School of Natural Sciences

October 18

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Z2 Gauge Theory: Anyon Condensation; Experiments on Rydberg Atoms* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

High Energy Theory Seminar ✦ *The Onset of Quantum Chaos in Disordered Systems* ✦ **Adar Sharon**, Weizmann Institute of Science

October 19

Physics Informal Talk ✦ *Gravity Without Averaging* ✦ **Jorrit Kruthoff**, Stanford University

October 20

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Chiral Spin Liquid* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *The Principles of Deep Learning Theory* ✦ **Dan Roberts**, Massachusetts Institute of Technology; Salesforce

October 21

Black Holes & Quantum Information Group Meeting ✦ *Quantum Gravity from Probability* ✦ **S. Josephine Suh**, Kavli Institute for Theoretical Physics, University of California, Santa Barbara

October 22

High Energy Theory Seminar ✦ *Old and New Physics Prospects for q-Virasoro* ✦ **Nathan Haouzi**, Member, School of Natural Sciences

October 25–26

Workshop on Ultra-Quantum Matter ✦ *Short Talks* ✦ **Leon Balents**, Kavli Institute for Theoretical Physics, University of California, Santa Barbara; **Xie Chen**, California Institute of Technology; **Victor Galitski**, University of Maryland; **Ashvin Vishwanath**, Harvard University ✦ *Short Talks* ✦ **Michael Hermele**, University of Colorado Boulder; **Andreas Karch**, The University of Texas at Austin; **Senthil Todadri**, Massachusetts Institute of Technology ✦ *Short Talks* ✦ **Etienne Granet**, University of Chicago; **Baurzhan Mukhametzhanov**, Member, School of Natural Sciences; **Wilbur Shirley**, Member, School of Natural Sciences; **Lev Spodyneiko**, Massachusetts Institute of Technology; **David Stephen**, University of Colorado Boulder; California Institute of Technology; **Ruben Verresen**, Harvard University ✦ *Short Talks* ✦ **Michael Levin**, University of Chicago; **Victor Gurarie**, University of Colorado Boulder; **Nathan Seiberg**, Professor, School of Natural Sciences; **Dam Thanh Son**, University of Chicago ✦ *Short Talks* ✦ **Matthew Fisher**, University of California, Santa Barbara; **John McGreevy**, University of California, San Diego; **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences; **Xiao-Gang Wen**, Massachusetts Institute of Technology

October 25

High Energy Theory Seminar ✦ *Lattice Edge Theories for Topological Phases of Matter* ✦ **Michael Levin**, University of Chicago

October 26

Special High Energy Theory Seminar ✦ *Spacetime and Quantum Mechanics; Particles and "Strings"; Polytopes, Binary Geometries and Quiver Categories* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

October 27

Physics Group Meeting ✦ *A Toolkit for Infinite Dimensional Symmetries* ✦ **Lisa Carbone**, Rutgers University–New Brunswick; Member, School of Natural Sciences

October 28–29

Informal Physics Talks ✦ *A Guided Tour Through the Theory of Deep Learning* ✦ **Michael Douglas**, Center of Mathematical Sciences and Applications, Harvard University

October 29

High Energy Theory Seminar ✦ *The Area Operator in Gravity and Holography* ✦ **Venkatesa Chandrasekaran**, Member, School of Natural Sciences

November 1

Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Chiral Spin Liquid and Fractional Quantum Hall States* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

November 2

Amplitudes Group Meeting ✦ *Epsilon Factorized Differential Equations for Feynman Integrals in Elliptic Sectors* ✦ **Hjalte Frellesvig**, Niels Bohr Institute, University of Copenhagen

November 3
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *The Kondo Impurity Model* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Heavy Exotic Mesons* ✦ **Angelo Esposito**, Member, School of Natural Sciences

November 4
Black Holes & Quantum Information Group Meeting ✦ *Krylov Complexity* ✦ **Alexandre Streicher**, Member, School of Natural Sciences

November 8
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Kondo Impurity and Lattice Models* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

November 9
Amplitudes Group Meeting ✦ *Monopole Catalysis from Scattering Amplitudes* ✦ **Ofri Telem**, Lawrence Berkeley National Laboratory, University of California, Berkeley

November 10
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Kondo Impurity and Lattice Models (continued)* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Bootstrapping Automorphic Spectra* ✦ **Dalimil Mazac**, Member, School of Natural Sciences

November 11
Black Holes & Quantum Information Group Meeting ✦ *Late Time Chaos and Causal Symmetry Breaking* ✦ **Phil Saad**, Member, School of Natural Sciences

November 12
High Energy Theory Seminar ✦ *The Uses of Zeta-Instantons* ✦ **Ahsan Z. Khan**, Member, School of Natural Sciences

November 15
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Kondo Lattice Models and the Heavy Fermi Liquid* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

November 16
Amplitudes Group Meeting ✦ *The Duals of Feynman Integrals* ✦ **Andrzej Pokraka**, McGill University

November 17
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *The Luttinger Relation and the Fractionalized Fermi Liquid* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Quantum Error-Correcting Codes and CFTs* ✦ **Alfred Shapere**, University of Kentucky; Member, School of Natural Sciences

November 18
Black Holes & Quantum Information Group Meeting ✦ *Remarks on a Paper of Liu and Leutheusser* ✦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

November 23
Amplitudes Group Meeting ✦ *(2,2) Scattering and the Celestial Torus* ✦ **Adam Ball**, Harvard University

November 29
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *The Non-Perturbative Luttinger Relations* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

November 30
Amplitudes Group Meeting ✦ *Unitarity, Positivity and the Information-theoretic Constraints in QFT* ✦ **Nima Lashkari**, Purdue University; Member, School of Natural Sciences

December 1
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *The SYK Model* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Physics Group Meeting ✦ *Wick Rotation and the Positivity of Energy in Quantum Field Theory* ✦ **Graeme Segal**, University of Oxford

December 2
Black Holes & Quantum Information Group Meeting ✦ *Non-Locality in Quantum Gravity* ✦ **Ahmed Almheiri**, Member, School of Natural Sciences

December 3
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *The SYK Model (continued)* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

December 6
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *The SYK Model (continued)* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

December 6–8
Workshop on Quantum Information and Spacetime ✦ *Bending the Padic Tensor Network and Emergent Einstein Equation* ✦ **Ling-Yan (Janet) Hung**, Fudan University ✦ *Quantum Complexity of Experiments* ✦ **Jordan Cotler**, Harvard University ✦ *Proofs of Two Brown-and-Susskind Complexity Conjectures* ✦ **Nicole Yunger Halpern**, National Institute of Standards and Technology, University of Maryland ✦ *On Estimating the Entropy of Shallow Circuit Outputs* ✦ **Andru Gheorghiu**, ETH Zürich ✦ *Tensor Network and Approximate Holographic Codes* ✦ **ChunJun (Charles) Cao**, University of Maryland ✦ *Lorentzian Threads and Holographic Complexity* ✦ **Juan Pedraza**, University of Barcelona ✦ *Spin Glasses and Holography* ✦ **Felix M. Haehl**, Member, School of Natural Sciences ✦ *Topological Pseudo Entropy* ✦ **Tatsuma Nishioka**, Yukawa Institute for Theoretical Physics, Kyoto University ✦ *Branching Time in SYK-like Models* ✦ **Pengfei Zhang**, California Institute of Technology ✦ *Quantum Circuit and Collisions in the Black Hole Interior* ✦ **Ying Zhao**, University of California, Santa Barbara ✦ *Late Time von Neumann Entropy and Measurement-induced Phase Transition* ✦ **Shaokai Jian**, Brandeis University ✦ *Comments on Wormholes and Factorization* ✦ **Phil Saad**, Member, School of Natural Sciences ✦ *Gravity Factorized* ✦ **Jorrit Kruthoff**, Stanford University ✦ *The Volume of the Black Hole Interior at Late Times* ✦ **Luca Iliesiu**, Stanford University ✦ *Failure of the Split Property in Gravity and the Information Paradox* ✦ **Suvrat Raju**, International Centre for Theoretical Sciences, Bengaluru ✦ *A Page-like Transition in Quantum Cosmology* ✦ **Thomas Hertog**, Katholieke Universiteit Leuven ✦ *Island Finder and Singularity Theorem* ✦ **Arvin Shahbazi-Moghaddam**, Stanford University ✦ *Scattering Strings Off Quantum Extremal Surfaces* ✦ **Adam Levine**, Member, School of Natural Sciences ✦ *One-Shot Holography* ✦ **Geoff Penington**, University of California, Berkeley; Junior Visiting Professor, School of Natural Sciences ✦ *Charge Fluctuation Entropy of Hawking Radiation: A Replica-free Way to Find Large Entropy* ✦ **Alexey Milekhin**, University of California, Santa Barbara

December 8
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Fermi Surfaces without Quasiparticles* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

December 10
Joint Course with TIFR and IAS—The Quantum Phases of Matter ✦ *Fermi Surfaces without Quasiparticles (continued)* ✦ **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

December 15
Physics Group Meeting ✦ *AdS3/CFT2 and Integrability* ✦ **Alessandro Sfondrini**, University of Padova; Member, School of Natural Sciences

December 20
High Energy Theory Seminar ✦ *A New Look at Completeness and Generalized Symmetries* ✦ **Javier Magan**, University of Pennsylvania

January 11
Amplitudes Group Meeting ✦ *Geometric Soft Theorems* ✦ **Julio Parra-Martinez**, California Institute of Technology

January 13
Black Holes & Quantum Information Group Meeting ✦ *Introduction to One Shot Quantum Shannon Theory* ✦ **Geoff Penington**, University of California, Berkeley; Junior Visiting Professor, School of Natural Sciences

January 19
Physics Group Meeting ✦ *Multipartitioning Topological Phases and Quantum Entanglement* ✦ **Shinsei Ryu**, Princeton University

January 20
Black Holes & Quantum Information Group Meeting ✦ *Possible Versions of the "Central Dogma" in de Sitter Space* ✦ **Edgar Shaghoulian**, University of Pennsylvania

January 27
Black Holes & Quantum Information Group Meeting ✦ *Probing the Black Hole Interior via the OPE* ✦ **Herman Verlinde**, Princeton University

February 1
Amplitudes Group Meeting ✦ *String Perturbation Theory for Dummies* ✦ **Lorenz Eberhardt**, Member, School of Natural Sciences

February 7
High Energy Theory Seminar ✦ *Scattering Amplitudes in Gauge Theory as Chiral Algebra Correlators* ✦ **Kevin Costello**, Perimeter Institute

February 8
Amplitudes Group Meeting ✦ *Einstein Yang-Mills Amplitudes from Intersection of Twisted Forms* ✦ **Pouria Mazloumi**, Max-Planck-Institut für Physik

February 9
Physics Group Meeting ✦ *Harnessing S-duality in N=4 SYM and in Gravity* ✦ **Scott Collier**, Princeton University

February 10
Informal Physics Seminar ✦ *The Amplituhedron BCFW Triangulation* ✦ **Chaim Even-Zohar**, Technion – Israel Institute of Technology; **Tsviqa Lakrec**, Universität Zurich

Black Holes & Quantum Information Group Meeting ✦ *Introduction to One Shot Quantum Shannon Theory – Part II* ✦ **Geoff Penington**, University of California, Berkeley; Junior Visiting Professor, School of Natural Sciences

February 11
High Energy Theory Seminar ✦ *O(N), Sp(2M), and OSp(1|2M) Models* ✦ **Igor Klebanov**, Princeton University; Distinguished Visiting Professor, School of Natural Sciences

February 15
Amplitudes Group Meeting ✦ *Folding Amplitudes into Form Factors* ✦ **Ömer Gürdoğan**, University of Southampton

February 16
Physics Group Meeting ✦ *Constraints on Single-Field Inflation from the BOSS Galaxy Survey* ✦ **Giovanni Cabass** and **Mikhail Ivanov**, Members, School of Natural Sciences

February 22
Amplitudes Group Meeting ✦ *String Perturbation Theory for Dummies – Part 2* ✦ **Lorenz Eberhardt**, Member, School of Natural Sciences

February 24
Black Holes & Quantum Information Group Meeting ✦ *Encoding Other Universes Beyond the Cosmological Horizon* ✦ **Adam Levine**, Member, School of Natural Sciences

February 25
High Energy Theory Seminar ✦ *Hyperuniformity in Classical and Quantum States of Matter* ✦ **Salvatore Torquato**, Princeton University; Member, School of Natural Sciences

March 3
Black Holes & Quantum Information Group Meeting ✦ *No Ensemble Averaging Below the Black Hole Threshold* ✦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

March 7
High Energy Theory Seminar ✦ *Static Responses and Symmetries of Black Holes* ✦ **Austin Joyce**, University of Chicago

March 8
Amplitudes Group Meeting ✦ *String Perturbation Theory for Dummies—Part 3* ✦ **Lorenz Eberhardt**, Member, School of Natural Sciences

March 9
Physics Group Meeting ✦ *Random Matrix Models, 2D Quantum Gravity, and Holography (Part 1)* ✦ **Clifford V. Johnson**, Princeton University; University of Southern California

March 10
Black Holes & Quantum Information Group Meeting ✦ *Random Matrix Models, 2D Quantum Gravity, and Holography (Part 2)* ✦ **Clifford V. Johnson**, Princeton University; University of Southern California

March 11
High Energy Theory Seminar ✦ *Scattering Amplitudes, Positive Geometries and Surfaces* ✦ **Giulio Salvatori**, Member, School of Natural Sciences

March 14
High Energy Theory Seminar ✦ *Codes and Conformal Field Theories* ✦ **Anatoly Dymarsky**, University of Kentucky; Skolkovo Institute of Science and Technology

March 15
Amplitudes Group Meeting ✦ *Black Holes, Scattering Amplitudes and Twistors* ✦ **Alfredo Guevara**, Harvard University

March 17
Black Holes & Quantum Information Group Meeting ✦ *Spectral Form Factor for Free Large N Gauge Theory and Strings* ✦ **Yiming Chen**, Princeton University

March 22
Amplitudes Group Meeting ✦ *Feynman Polytopes and the Tropical Geometry of UV and IR Divergences* ✦ **Aaron Hillman**, Princeton University

March 24
Black Holes & Quantum Information Group Meeting ✦ *Summing Over Bordisms in 2d TQFT* ✦ **Gregory Moore**, Rutgers University–New Brunswick

March 25
High Energy Theory Seminar ✦ *Nearly BPS Black Holes in AdS5 and their Spectrum in N=4 SYM* ✦ **Matthew Heydeman**, Member, School of Natural Sciences

March 28
High Energy Theory Seminar ✦ *Following the Footprints of the B-physics Anomalies* ✦ **Javier Fuentes**, University of Granada

April 4
High Energy Theory Seminar ✦ *Emergent Times in Holography* ✦ **Hong Liu**, Massachusetts Institute of Technology

April 7
Black Holes & Quantum Information Group Meeting ✦ *Page Curve and the Black Hole Interior from Non-Isometric Codes* ✦ **Daniel Harlow**, Massachusetts Institute of Technology

April 12
Black Holes & Quantum Information Group Meeting ✦ *Gauging Discontinuous Diffeomorphisms* ✦ **Henry Maxfield**, Stanford University

April 13
Physics Group Meeting ✦ *Sailing Past the Edge and Discovering the Island* ✦ **Tarek Anous**, University of Amsterdam

April 18
High Energy Theory Seminar ✦ *Line Operators in Chern-Simons-Matter Theories and Bosonization in Three Dimensions* ✦ **Amit Sever**, Tel Aviv University

April 20
Informal Seminar ✦ *Discussion on Non-Planar Positive-Geometric Structures* ✦ **Jaroslav Trnka**, University of California, Davis

April 22
High Energy Theory Seminar ✦ *Localized Collisions and the Black Hole Interior* ✦ **Felix Haehl**, Member, School of Natural Sciences

April 26
Amplitudes Group Meeting ✦ *Standard Model Effective Theory (SMEFT)* ✦ **Michael Trott**, Niels Bohr Institute, University of Copenhagen

April 27
Physics Group Meeting ✦ *The Classification of Extended Topological Field Theories* ✦ **Jacob Lurie**, Professor, School of Mathematics

April 28
Black Holes & Quantum Information Group Meeting ✦ *JT with Matter, Generalized ETH, and Random Matrices* ✦ **Baurzhan Mukhametzhanov**, Member, School of Natural Sciences

May 2–4
Workshop on Possible and Impossible in Effective Field Theory: From the S-Matrix to the Swampland ✦ *Analytic Structure of Lorentzian Observables* ✦ **Simon Caron-Huot**, McGill University; **Lance Dixon**, SLAC, Stanford University; **Francesco Riva**, University of Geneva; **Hólmfríður Hannesdóttir**, Member, School of Natural Sciences; **Aninda Sinha**, Indian Institute of Science ✦ *Swampland Conjectures* ✦ **Cumrun Vafa**, Harvard University; **Miguel Montero**, Harvard University; **Irene Valenzuela**, CERN; Institute of Theoretical Physic Madrid; **Claudia de Rham**, Imperial College London; **Juan Maldacena**, Carl P. Feinberg Professor, School of Natural Sciences; **Grant Remmen**, Kavli Institute for Theoretical Physics, University of California, Santa Barbara; **Gary Shiu**, University of Wisconsin–Madison; **Andrew Tolley**, Imperial College London ✦ *Constraints on Gravitational Theories* ✦ **Alexander Zhiboedov**, CERN; **Dalimil Mazac**, Member, School of Natural Sciences; **Julio Parra-Martinez**, California Institute of Technology; **Leonardo Rastelli**, C.N. Yang Institute, Stony Brook University; **Lecheng Ren**, Brown University

May 2
High Energy Theory Seminar ✦ *Scattering Amplitudes in Maximally Supersymmetric Gauge Theory and a New Duality* ✦ **Lance Dixon**, Stanford University

May 5
Black Holes & Quantum Information Group Meeting ✦ *Holographic Cauchy Slices* ✦ **Aron Wall**, University of Cambridge

May 9
Informal Physics Seminar ✦ *Aspects of Field-Theory Limits of String-Theory Amplitudes at Genus One and Higher* ✦ **Piotr Tourkine**, Centre national de la recherche scientifique, Laboratoire d'Annecy-le-Vieux de Physique Théorique

May 10
Informal Physics Seminar ✦ *Wilson Loops with Lagrangian Insertions* ✦ **Johannes Henn**, Max-Planck-Institut für Physik

May 11
Physics Group Meeting ✦ *Quantum Error Correction in SYK and Bulk Emergence* ✦ **Adam Levine**, Member, School of Natural Sciences

May 20
High Energy Theory Seminar ✦ *Relating Integrable Spin Chains to Gauge Theories via String Theory* ✦ **Nafiz Ishtiaque**, Member, School of Natural Sciences

May 25
Physics Group Meeting ✦ *Off-shell Partition Functions in 3d Gravity* ✦ **Lorenz Eberhardt**, Member, School of Natural Sciences

May 26
Black Holes & Quantum Information Group Meeting ✦ *Informal and Unstructured Discussion*

June 1
Physics Group Meeting ✦ *Geometry of Decoupled Fields* ✦ **Ibrahima Bah**, Johns Hopkins University; Member, School of Natural Sciences

June 2
Black Holes & Quantum Information Group Meeting ✦ *Phases of N=2 Sachdev-Ye-Kitaev Models* ✦ **Gustavo Joaquin Turiaci**, Member, School of Natural Sciences

June 8
Physics Group Meeting ✦ *An Attempt at Harnessing Chaos* ✦ **Sridip Pal**, Member, School of Natural Sciences

June 14
Amplitudes Group Meeting ✦ *S-matrix Unitarity and Finite-Temperature Effects from Zero-Temperature Calculations* ✦ **Peter Matak**, University of Bratislava

June 15
Physics Group Meeting ✦ *Discrete Chiral Symmetry and Mass Shift in Lattice Hamiltonian Approach to Schwinger Model* ✦ **Igor Klebanov**, Princeton University; Distinguished Visiting Professor, School of Natural Sciences

July 12
Amplitudes Group Meeting ✦ *Infrared Structure of QED as a Many-Body Theory of Worldlines* ✦ **Xabier Feal**, Brookhaven National Laboratory

August 24
Informal Physics Seminar ✦ *Why Broadly Human-Level AI is Coming Soon* ✦ **Jared Kaplan**, Johns Hopkins University

SIMONS CENTER FOR SYSTEMS BIOLOGY

November 9
Members Seminar ✦ *Glassy Phase in Dynamically Balanced Networks* ✦ **Gianluigi Mongillo**, Centre National de la Recherche Scientifique; Member, School of Natural Sciences

November 10
Biology Seminar ✦ *From the Connectome to Computation and Learning* ✦ **Mitya Chklovskii**, Flatiron Institute

December 8
Biology Seminar ✦ *Bacterial Metal Homeostasis* ✦ **Deenah Osman**, Robinson Lab, Durham University

December 17
Members seminar ✦ *Dimensionality Reduction in Living Systems* ✦ **Sirio Belga Fedeli**, Member, School of Natural Sciences

January 17
Biology seminar ✦ *Engineering Flexible Machine Learning Systems Inspired by Biological Intelligence* ✦ **Guruprasad Raghavan**, California Institute of Technology

January 20
Biology seminar ✦ *Single Molecule Studies of a Novel Mechanism of Bacterial Transcription Initiation* ✦ **Debora Tenenbaum**, Brandeis University

February 7
Biology seminar ✦ *Potentials of Continuous Markov Processes and Random Perturbations* ✦ **Ying-Jen Yang**, University of Washington

February 16
Mathematical Physics Webinar Rutgers University ✦ *Mathematical Models of Human Memory* ✦ **Michail Tsodyks**, C.V. Starr Professor, School of Natural Sciences

March 31
Biology Seminar ✦ *Fly Sense of Direction* ✦ **Gaby Maimon**, Rockefeller University

April 19
Biology Seminar ✦ *A Topological Look into the Evolution of Developmental Programs* ✦ **Somya Mani**, Institute for Basic Science, Center for Soft and Living Matter, Korea

April 21
Members Seminar ✦ *Balance of Excitation and Inhibition and Robust High-Capacity Memory Networks* ✦ **Gianluigi Mongillo**, Centre National de la Recherche Scientifique; Member, School of Natural Sciences

May 3
Biology Seminar ✦ *Does Plant Growth Accelerate Rock Weathering?* ✦ **Friedhelm von Blanckenbourg**, GFZ German Research Centre for Geosciences, Potsdam

May 9
Biology Seminar ✦ *Ecohydrology, Weathering and Landscape Evolution* ✦ **Amilcare Porporato**, Princeton University

June 24
Biology Seminar ✦ *Universal Constraints on Selection Strength in Lineage Trees* ✦ **Arthur Genthon**, École supérieure de physique et de chimie industrielles de la Ville de Paris

School of Social Science

September 23
Social Science Introductory Session
Social Science Welcome Reception

September 27
Social Science Seminar ✦ *A Scene at the Border. Nocturnal Encounters and Political Dramaturgies* ✦ **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science

September 29
Social Science Theme Seminar Orientation Session

October 4
Social Science Seminar ✦ *Toward a New Theory of the Political Imaginary* ✦ **Yves Winter**, McGill University; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

October 7
Contemporary Readings in Politics ✦ Terence Renaud's *New Lefts: The Making of a Radical Tradition* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

October 11
Social Science Seminar ✦ *Ni Una Menos and the Global Feminist Tide* ✦ **Cecilia Palmeiro**, Universidad Nacional de Tres de Febrero, New York University Buenos Aires; Member, School of Social Science

October 13
Political Mobilizations and Social Movements Theme Seminar ✦ *(Un)civil Society and the Question of Violence* ✦ Readings curated by **Zahra Ali**, Rutgers University–Newark, **Zachariah Mampilly**, Marxe School of Public and International Affairs, The City University of New York, and **Judith Scheele**, EHESS–Marseille; Members, School of Social Science

Political Mobilizations and Social Movements Film Series ✦ The October 2019 Uprising in Iraq—two short films: *Iraq's Joker* produced by Al Jazeera for Talk to Al Jazeera in the Field and *Iraq Youth Take to the Streets*, produced by What's Up Productions for Arte Reportage ✦ Post-screening discussion led by **Zahra Ali**, Rutgers University–Newark; Member, School of Social Science

October 14
Contemporary Readings in Politics ✦ Terence Renaud's *New Lefts: The Making of a Radical Tradition* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

October 18
Social Science Seminar ✦ *The Power of Movement: Saharan Perspectives on Politics* ✦ **Judith Scheele**, EHESS-Marseille; Member, School of Social Science

October 20
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

October 25
Social Science Seminar ✦ *Toward a Moral Economy of Antiracism in France* ✦ **Magali Bessone**, Université Paris 1; Member, School of Social Science

October 27
Political Mobilizations and Social Movements Theme Seminar ✦ *Technology, Infrastructure, and Political Mobilization* ✦ Readings curated by **Marielle Debos**, Université Paris Nanterre, **Sonja van Wichelen**, The University of Sydney; Members, School of Social Science; and **Jorge Núñez**, Kaleidos–Center for Interdisciplinary Ethnography; Visitor, School of Social Science

November 1
Social Science Seminar ✦ *Dropping Crumbs as We Go: Community Education as Political Praxis* ✦ **Anthony Alessandrini**, Kingsborough Community College, The City University of New York; Member, School of Social Science

November 3
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

November 8
Social Science Seminar ✦ *Culture of Poverty Politics and Latinx Gender and Sexuality* ✦ **Deborah Vargas**, Rutgers University–New Brunswick; Member, School of Social Science

Contemporary Readings in Politics ✦ Mahmood Mamdani's *Neither Settler Nor Native: The Making and Unmaking of Permanent Minorities* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

November 10
Political Mobilizations and Social Movements Theme Seminar ✦ *The Politics of Knowledge Production* ✦ Readings curated by **Joan Scott**, Professor Emerita, School of Social Science; **Anthony Alessandrini**, Kingsborough Community College, The City University of New York, **Debaditya Bhattacharya**, Kazi Nazrul University, and **Asli Iğsiz**, New York University; Members, School of Social Science

Political Mobilizations and Social Movements Film Series ✦ *NO*, directed by Pablo Larraín ✦ Post-screening discussion led by **Cecilia Palmeiro**, Universidad Nacional de Tres de Febrero, New York University Buenos Aires, and **Kenneth Roberts**, Cornell University; Members, School of Social Science

November 12–14
Science and the State Theme Workshop ✦ Led by **Alondra Nelson**, Harold F. Linder Professor, School of Social Science, and **Charis Thompson**, London School of Economics and Political Science

November 15
Social Science Seminar ✦ *Fascist Utopias: A History of the Present in Palimpsests* ✦ **Asli Iğsiz**, New York University; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

Contemporary Readings in Politics ✦ Mahmood Mamdani's *Neither Settler Nor Native: The Making and Unmaking of Permanent Minorities* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

November 17
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

November 22
Social Science Seminar ✦ *Biometrics and the Promise of Democracy in Africa* ✦ **Marielle Debos**, Université Paris Nanterre; Member, School of Social Science

Political Mobilizations and Social Movements Theme Seminar ✦ *Mobilizing the State, Negotiating the State* ✦ Readings curated by **Daniel Agbiboa**, Harvard University; Member, School of Social Science and **Anne-Claire Defossez**, and **Andrea Sempértegui**, Institute for Advanced Study; Visitors, School of Social Science

November 29
Social Science Seminar ✦ *#EndSARS: Police Brutality and the Voice of the Unpeople* ✦ **Daniel Agbiboa**, Harvard University; Member, School of Social Science

Contemporary Readings in Politics ✦ Mahmood Mamdani's *Neither Settler Nor Native: The Making and Unmaking of Permanent Minorities* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

December 1
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

December 6
Social Science Seminar ✦ *Haywire Liberalism and the Market for Far-Right Rebellion* ✦ **William Callison**, Member, School of Social Science

December 8
Political Mobilizations and Social Movements Theme Seminar ✦ *The Actors in "Political Mobilizations and Social Movements"* ✦ Readings curated by **Kenneth Roberts**, Cornell University, **Elizabeth Saleh**, American University of Beiruit, and **Maka Suarez**, University of Oslo; Members, School of Social Science

Political Mobilizations and Social Movements Film Series ✦ *Ram Ke Naam*, directed by Anand Patwardhan ✦ Post-screening discussion led by **Debaditya Bhattacharya**, Kazi Nazrul University; Member, School of Social Science

December 13
Social Science Seminar ✦ *Social Movements and the Future of the Global Order* ✦ **Zachariah Mampilly**, Marxe School of Public and International Affairs, The City University of New York; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

December 15
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

December 21
Contemporary Readings in Politics ✦ Enzo Traverso's *Revolution: An Intellectual History* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

January 24
Social Science Seminar ✦ *What Is Left of Freedom?* ✦ **Wendy Brown**, UPS Foundation Professor, School of Social Science

Contemporary Readings in Politics ✦ Amia Srinivasan's *The Right to Sex: Feminism in the Twenty-First Century* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

January 26
Political Mobilizations and Social Movements Theme Seminar ✦ *Rethinking the 'Right' and the Politics of Mobilization* ✦ Readings curated by **Asli Iğsiz**, New York University, **Biko Koenig**, Franklin & Marshall College, and **William Callison**; Members, School of Social Science

January 31
Social Science Seminar ✦ *"Even so quickly may one catch the plague?": Universities, borders and illegal migrants* ✦ **Debaditya Bhattacharya**, Kazi Nazrul University; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

February 2
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

February 7
Social Science Seminar ✦ *Salvaging Labor: Growing up at a Beirut Scrapyard* ✦ **Elizabeth Saleh**, American University of Beirut; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

February 9
Political Mobilizations and Social Movements Theme Seminar ✦ *Financialization, Political Mobilizations and Social Movements* ✦ Readings curated by **Wendy Brown**, UPS Foundation Professor, School of Social Science, **William Callison**, Member, School of Social Science, and **Jorge Núñez**, Kaleidos–Center for Interdisciplinary Ethnography; Visitor, School of Social Science

February 14
Social Science Seminar ✦ *The Shooting: How Americans Live and Die by the Gun* ✦ **Harel Shapira**, The University of Texas at Austin; Member, School of Social Science

February 15
Contemporary Readings in Politics ✦ Lea Ypi's *Free: A Child and a Country at the End of History* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

February 22
Social Science Seminar ✦ *Trump 2020—Fear, Loss, & Hope Among Rust Belt Trump Activists* ✦ **Biko Koenig**, Franklin & Marshall College; Member, School of Social Science

February 27
Special Session on Political Mobilizations Related to Financialization ✦ **Michel Feher**, author of *Rated Agency: Investee Politics in a Speculative Age*

February 28
History of the School ✦ **Joan Scott** and **Michael Walzer**, Professors Emeriti, School of Social Science

Social Science Seminar ✦ *After Debt: Latin American transnational households in the struggle for the right to housing in Spain* ✦ **Maka Suarez**, University of Oslo; Member, School of Social Science

Special Session on Political Mobilizations Related to Financialization ✦ **Michel Feher**, author of *Rated Agency: Investee Politics in a Speculative Age*

March 1
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

March 4
Contemporary Readings in Politics ✦ Andreas Malm's *How to Blow Up a Pipeline* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

March 7
Social Science Seminar ✦ *Democracy's Dialectic Movements, "Backsliding," and "Deepening" Democracy* ✦ **Kenneth Roberts**, Cornell University; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

March 9
Political Mobilizations and Social Movements Theme Seminar ✦ *March 8, Transnational Feminisms on the Move* ✦ Readings curated by **Anne-Claire Defossez** and **Andrea Sempértegui**, Institute for Advanced Study; Visitors, School of Social Science, and **Cecilia Palmeiro**; Member, School of Social Science

Political Mobilizations and Social Movements Film Series ✦ *Little Palestine: Diary of a Siege, directed by Abdallah Al-Khatib* ✦ Post-screening discussion led by **Wendy Brown**, UPS Foundation Professor, School of Social Science, and **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science

March 10
Public Policy Lecture ✦ *Race for Profit: How Banks and the Real Estate Industry Undermined Black Homeownership* ✦ **Keeanga-Yamahtta Taylor**, Princeton University

March 11
Special Seminar ✦ *Race for Profit: How Banks and the Real Estate Industry Undermined Black Homeownership* ✦ **Keeanga-Yamahtta Taylor**, Princeton University

March 14
Social Science Seminar ✦ *Equality Again* ✦ **Jill Frank**, Cornell University; Member, School of Social Science

March 15–23
Summer Program in Social Science

March 16
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

March 21
Social Science Seminar ✦ *The Real Possibility of Physical Killing: A Feminist Reading of The Concept of the Political* ✦ **Robyn Marasco**, Hunter College, The City University of New York; Member, School of Social Science

March 23
Political Mobilizations and Social Movements Theme Seminar ✦ *Ethnography, Social Movements and Political Mobilizations* ✦ Readings curated by **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science, and **Biko Koenig**, Franklin & Marshall College, **Judith Scheele**, EHESS-Marseille, and **Maka Suarez**, University of Oslo; Members, School of Social Science

March 25
Contemporary Readings in Politics ✦ Amitav Ghosh's *The Nutmeg's Curse: Parables for a Planet in Crisis* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

March 28
Social Science Seminar ✦ *Engels after Frankfurt: Critical Theory between "Anthropocene" and "Information Age"* ✦ **Matthew Shafer**, Member, School of Social Science

March 30
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

April 4
Social Science Seminar ✦ *Molecular Eugenics: The Long History of Sociogenomics in the United States* ✦ **Emily Merchant**, University of California, Davis; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

April 6
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

April 11
Social Science Seminar ✦ انتفاضات: *The Iraqi Uprising and the Political Imagination* ✦ **Zahra Ali**, Rutgers University–Newark; Member, School of Social Science

April 13
Political Theory Writing Workshop ✦ Organized by **Wendy Brown**, UPS Foundation Professor, School of Social Science

April 18
Social Science Seminar ✦ *What Gives?: Money and the Black Freedom Movement* ✦ **Tanisha Ford**, The Graduate Center at The City University of New York; Member, School of Social Science

Critical Histories Writing Workshop ✦ Organized by **Joan Scott**, Professor Emerita, School of Social Science

April 19
Contemporary Readings in Politics ✦ Adolph Reed's *The South: Jim Crow and Its Afterlives* ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

April 20
Political Mobilizations and Social Movements Theme Seminar ✦ *Solidarity and Community* ✦ Readings curated by **Anthony Alessandrini**, Kingsborough Community College, The City University of New York, **Debaditya Bhattacharya**, Kazi Nazrul University, and **Matthew Shafer**; Members, School of Social Science

Political Mobilizations and Social Movements Film Series ✦ *A Place in the Sun*, directed by François Ruffin and Gilles Perret ✦ Post-screening discussion led by **Julien Brachet**, Université Paris 1, and **Anne-Claire Defossez**, Institute for Advanced Study; Visitors, School of Social Science

April 25
Social Science Seminar ✦ *Black Women, Radical Politics, and Global Visions of Freedom* ✦ **Keisha Blain**, University of Pittsburgh; Member, School of Social Science

April 26
Social Science Spring Gathering

May 27
Contemporary Readings in Politics ✦ On the topic of critical phenomenology, Cressida Heyes' *Anaesthethics of Existence*, and Lisa Guenther's "Six Senses of Critique for Critical Phenomenology" ✦ Organized by **Robyn Marasco**, Hunter College, The City University of New York, and **Yves Winter**, McGill University; Members, School of Social Science

June 14
Contemporary Readings in Politics ✦ Olúfẹ́mi O. Táíwò's *Elite Capture: How the Powerful Took Over Identity Politics (And Everything Else)*

July 18–19
Science and the State Theme Workshop ✦ Led by **Alondra Nelson**, Harold F. Linder Professor, School of Social Science, and **Charis Thompson**, London School of Economics and Political Science

Director's Office Events

July 12
Staff Tea and Welcome Back to Campus

September 12
Ice Cream Social for Members hosted by the Friends Executive Committee

September 17
Staff Picnic

September 19
Faculty Welcome and Dinner at Olden Farm

September 20
Hybrid Welcome Day
Welcome Reception

September 24
Friends Welcome Reception

September 25
Jazz Night at Harry's Bar

October 1
Friends Lunch with a Member ✦ *Governing Bioscience in Globalization* ✦ **Sonja van Wichelen**, Member, School of Social Science

Member Activity ✦ Outdoor Movie Night

October 2
Edward T. Cone Concert Series ✦ *Music and Memory* ✦ **Rolf Schulte**

October 7
Photo Day

October 12
Faculty/Colleague Dinner

October 13
IAS Film Series: Political Mobilizations and Social Movements ✦ *The October 2019 Uprising in Iraq*

October 15
Oktoberfest Member Supper

October 21
IAS Book Event ✦ *Do Not Erase: Mathematicians and Their Chalkboards* ✦ **Jessica Wynne**

October 22
Happy Hour for Friends

October 27
Artist Salon ✦ *Tania León, 2021 Pulitzer Prize and classical guitarist JIJI* ✦ **Tania León** and **Jiji Kim**

November 2
Virtual Event Series ✦ *From Celestial Mechanics to the New Field of Symplectic Dynamics* ✦ **Helmut Hofer**, Hermann Weyl Professor, School of Mathematics

November 5
Happy Hour for Members and Friends

November 6
Edward T. Cone Concert Series ✦ *REVELATION: Music in Pure Intonation* ✦ **Michael Harrison**

November 10
IAS Film Series: Political Mobilizations and Social Movements ✦ *No*, a film by Pablo Larraín

November 12
Friends Talk ✦ *Human Subjects as Research Experts* ✦ **Rosanna Dent**, Member, School of Historical Studies

November 13
Jazz Night at Harry's Bar

November 17
Artist Salon ✦ *Secrets from the Rehearsal Room* ✦ **Carey Perloff**

November 19
Friends Lunch with a Member ✦ *Negative Energy, Quantum Information and Causality* ✦ **Adam Levine**, Member, School of Natural Sciences

Thanksgiving Member Supper

December 1
Artist Salon ✦ *Directing the Ring Cycle* ✦ **Francesca Zambello**, Artistic Director, Washington National Opera

December 4
Edward T. Cone Concert Series ✦ *The Passinge Mesures* ✦ **Mahan Esfahani**

December 8
IAS Film Series: Political Mobilizations and Social Movements ✦ *Ram Ke Naam*

December 10
Friends Holiday Party

December 11
Members and Faculty Holiday Party

January 28
Friends Talk ✦ *Exploring the Institute's Archives* ✦ **Caitlin Rizzo**, Shelby White and Leon Levy Archives Center

February 10
Member Activity ✦ Star Gazing Night ✦ **Robert J. Vanderbei**, former Member, School of Natural Sciences

February 11
Friends Lunch with a Member ✦ *Theologies of Dissent at the Hellenic Polis: War, Epidemic, and the Ludic Deity on Stage* ✦ **Eleftheria Pappa**, Member, School of Historical Studies

February 25
Friends Happy Hour

March 4
Friends Lunch with a Member ✦ *Tape Music as Women's Work* ✦ **Andrea Bohlman**, Member, School of Historical Studies

March 9
IAS Film Series: Political Mobilizations and Social Movements ✦ *Little Palestine: Diary of a Siege*

St. Patricks Day Member Supper

March 10
Lecture on Public Policy ✦ *Race for Profit: How Banks and the Real Estate Industry Undermined Black Homeownership* ✦ **Keeanga-Yamahtta Taylor**, Princeton University

March 19
Edward T. Cone Concert Series ✦ *Fanm D'Ayiti (Women of Haiti)* ✦ **Nathalie Joachim** and **Spektral Quartet**

March 23
Artist Salon ✦ **Amir Elsaffar**

April 1
Friends Talk with Myles Jackson in honor of the Albers-Schönberg Professorship ✦ *Artisans and Natural Philosophers in the Early Nineteenth Century: Joseph von Fraunhofer and the Response to his Optical Glassmaking* ✦ **Myles Jackson**, Albers-Schönberg Professor in the History of Science

April 14
S.T. Lee Lecture ✦ *Directing Economic Growth: A Mission-Oriented Approach* ✦ **Mariana Mazzucato**, University College London

April 19
Faculty/Colleague Dinner

April 20
Public Program ✦ *The Man from the Future Book Launch* ✦ **Ananyo Bhattacharya** and **Marina von Neumann Whitman**

Member Supper

April 21
Historical Studies Panel Discussion ✦ *The Uses and Abuses of History: Responding to the War in Ukraine* ✦ **Suzanne Conklin Akbari** and **Angelos Chaniotis**, Professors, School of Historical Studies, **Patrick Geary**, Professor Emeritus, School of Historical Studies, **Kim Lane Scheppele**, Princeton University, **Alice Sullivan**, Tufts University

April 27
Salon Dinner ✦ *A Wing and a Prayer: Risky Design and the Space Shuttle* ✦ **Matthew Hersch**, Visitor, School of Historical Studies

April 29
Roger E. Covey Distinguished Lecture in Pre-Modern China ✦ *The Philosopher and the Khan: The Diary of Daoist Changchun's Journey to the West* ✦ **Stephen H. West**, Arizona State University

April 30
Edward T. Cone Concert Series ✦ *Beowulf* ✦ **Benjamin Bagby**

May 6
Public Program ✦ *Spacetime, Quantum Entanglement and Black Holes* ✦ **Ahmed Almheiri**, Member, School of Natural Sciences; **Juan Maldacena**, Carl P. Feinberg Professor, School of Natural Sciences; **Geoff Penington**, Junior Visiting Professor, School of Natural Sciences; **Subir Sachdev**, Harvard University; Distinguished Visiting Professor, School of Natural Sciences

Bamberger Award Ceremony and Dinner honoring **Shelby White**

May 13
Friends Happy Hour with a Member ✦ **John Urschel**, Member, School of Mathematics

May 16
IAS Film Series: Political Mobilizations and Social Movements ✦ *Mr. Jones*

May 18
International Potluck

May 20
Founders Day Celebration

Friends Annual Meeting

May 26
Celebration in Honor of the Gopal Prasad Professorship ✦ *Mass Formulae, Geometries and Dynamics* ✦ **Peter Sarnak**, Gopal Prasad

Professor, School of Mathematics and **Akshay Venkatesh**, Robert and Luisa Fernholz Professor, School of Mathematics ✦ *Prasad's Work in Arithmetic Theory of Algebraic Groups* ✦ **Andrei Rapinchuk**, University of Virginia ✦ *Matrix Group Dynamics in Work of Gopal Prasad* ✦ **Brian Conrad**, Stanford University

June 10
Staff Picnic

Digital Scholarship Conversations @IAS

September 16
The Author's Voice ✦ *Sasanian Iran: A Personal View* ✦ **Michael R. Jackson Bonner**, Canadian writer, political adviser and independent historian of Iran ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press; in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

October 27
Digital Scholarship Conversations @IAS ✦ *Where to Find Millions of Books and How to "Read" Them: HathiTrust and HTRC* ✦ **Ryan Dubnicek**, Digital Humanities Specialist, HathiTrust Research Center

November 10
Near Eastern Studies and Digital Scholarship @IAS joint lecture ✦ *The Study of Pre-modern Hebrew Philosophical and Scientific Terminology as a new Chapter in the Intellectual History of Europe and the Islamicate World: PESHAT in Context* ✦ Speakers: **Giuseppe Veltri**, University of Hamburg; **Reimund Leicht**, Hebrew University of Jerusalem; **Michael Engel**, University of Hamburg; **Florian Dunklau**, University of Hamburg

December 9
The Author's Voice ✦ *Ash'arism Encounters Avicennism: Sayf Al-Dīn Al-Āmidī (d. 631/1233) on Creation* ✦ **Laura Hassan**, Associate Faculty Member, Faculty of Oriental Studies, University of Oxford ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press; in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

February 24–25
Hidden Stories: Books along the Silk Roads: Landmark exhibition co-curated by **Suzanne Conklin Akbari**, Professor, School of Historical Studies; **Filiz Çakır Phillip**, Aga Khan Museum; along with a team of experts, step in to learn more about books along the Silk Roads and their hidden stories.

March 10
The Author's Voice ✦ *Angels Hastening: The Karbalā' Dreams* ✦ **Christopher Clohessy**, Pontifical Institute for Arabic and Islamic Studies (PISAI); Pontifical Beda College, Rome ✦ Hosted by **Sabine Schmidtke**, Professor, School of Historical Studies; **George A. Kiraz**, Research Associate, School of Historical Studies; Beth Mardutho: The Syriac Institute; and Editor-in-Chief, Gorgias Press; in cooperation with **Angelos Chaniotis**, Professor, School of Historical Studies

April 1
Near Eastern Studies, Digital Scholarship Conversations @IAS and Beth Mardutho: The Syriac Institute joint event ✦ *Simtho: Hands-on Workshop in Syriac Corpus Search*

April 27
Near Eastern Studies and Digital Scholarship Conversations @IAS joint lecture ✦ *The Preservation of Documentary Heritage in the MENASA Region: The Role of the QNL* ✦ **Stephane Ipert**, Director of Distinctive Collections, Qatar National Library (QNL)

June 23
The Author's Voice ✦ *The symbolic language of Ethiopian crosses: Explorations through form and ritual* ✦ **Maria Evangelatou**, Professor of Mediterranean Studies in the History of Art and Visual Culture Department, at the University of California Santa Cruz. 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

ACKNOWLEDGMENTS

(for the year ended June 30, 2022)

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Institute for Advanced Study—
Louis Bamberger and Mrs. Felix Fuld Foundation

Financial Statements
June 30, 2022 and 2021

(With Independent Auditors' Report Thereon)

Independent Auditors' Report

The Board of Trustees
Institute for Advanced Study–Louis Bamberger and Mrs. Felix Fuld Foundation:

Opinion

We have audited the financial statements of the Institute for Advanced Study–Louis Bamberger and Mrs. Felix Fuld Foundation (the Institute), which comprise the statements of financial position as of June 30, 2022 and 2021, and the related statements of activities and cash flows for the years then ended, and the related notes to the financial statements.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Institute as of June 30, 2022 and 2021, 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.

Basis for Opinion

We conducted our audits in accordance with auditing standards generally accepted in the United States of America (GAAS). Our responsibilities under those standards are further described in the Auditors' Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of the Institute and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audits. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with U.S. generally accepted accounting principles, and for 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.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the Institute's ability to continue as a going concern for one year after the date that the financial statements are issued.

Auditors' Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS will always detect a material misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the financial statements.

In performing an audit in accordance with GAAS, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit 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 Institute's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about the Institute's ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control related matters that we identified during the audit.

KPMG LLP

October 28, 2022

INSTITUTE FOR ADVANCED STUDY – LOUIS BAMBERGER AND MRS. FELIX FULD FOUNDATION

Statements of Financial Position

June 30, 2022 and 2021

Assets		2022	2021
Cash and cash equivalents	$	15,093,116	18,197,439
Accounts receivable and other assets		537,992	2,971,032
Grants receivable		1,839,245	1,541,672
Contributions receivable, net		5,108,989	4,626,837
Mortgages receivable		3,130,964	3,499,626
Funds held by bond trustee		139	740,099
Operating lease right-of-use asset		93,860	119,919
Land, buildings and improvements, equipment, and rare book collection, net		139,081,814	134,599,181
Investments		1,126,929,282	1,133,411,467
Total assets	$	1,291,815,401	1,299,707,272
Liabilities and Net Assets			
Liabilities:			
Accounts payable and accrued expenses	$	17,668,200	11,737,370
Deferred revenue		11,746,164	10,023,764
Finance lease liability		1,446,802	2,183,672
Operating lease liability		68,728	119,919
Liabilities under split-interest agreements		1,218,324	1,508,768
Postretirement benefit obligation		13,847,056	22,078,537
Asset retirement obligation		1,234,106	1,230,146
Bond swap liability		1,020,176	2,371,138
Long-term debt, net		75,948,729	79,574,429
Total liabilities		124,198,285	130,827,743
Net assets:			
Net assets without donor restrictions:			
Undesignated		280,351,113	283,061,331
Designated for specific purposes		187,445,332	189,871,765
Total net assets without donor restrictions		467,796,445	472,933,096
Net assets with donor restrictions:			
Purpose restricted		391,804,789	405,966,969
Endowment fund corpus		308,015,882	289,979,464
Total net assets with donor restrictions		699,820,671	695,946,433
Total net assets		1,167,617,116	1,168,879,529
Total liabilities and net assets	$	1,291,815,401	1,299,707,272

See accompanying notes to financial statements.

INSTITUTE FOR ADVANCED STUDY – LOUIS BAMBERGER AND MRS. FELIX FULD FOUNDATION

Statement of Activities

Year ended June 30, 2022

	Without donor restrictions	With donor restrictions	Total
Operating revenues, gains, and other support:			
Private contributions and grants	$ 8,270,474	26,311,621	34,582,095
Government grants	—	4,857,877	4,857,877
Investment income, net	5,424,068	7,490,841	12,914,909
Auxiliary activity	4,644,210	—	4,644,210
Net assets released from restrictions – satisfaction of program restrictions	34,786,101	(34,786,101)	—
Total operating revenues, gains, and other support	53,124,853	3,874,238	56,999,091
Operating expenses:			
School of Mathematics	11,064,958	—	11,064,958
School of Natural Sciences	13,788,356	—	13,788,356
School of Historical Studies	9,409,692	—	9,409,692
School of Social Science	4,106,536	—	4,106,536
Libraries and other academic	4,528,433	—	4,528,433
Administration and general	15,226,155	—	15,226,155
Auxiliary activity	10,308,472	—	10,308,472
Total operating expenses	68,432,602	—	68,432,602
Change in net assets from operating activities	(15,307,749)	3,874,238	(11,433,511)
Nonoperating activities:			
Change in fair value of bond swap liability	1,350,962	—	1,350,962
Loss on sale of plant assets	(977)	—	(977)
Other components of net periodic pension cost	8,821,113	—	8,821,113
Total nonoperating activities	10,171,098	—	10,171,098
Change in net assets	(5,136,651)	3,874,238	(1,262,413)
Net assets – beginning of year	472,933,096	695,946,433	1,168,879,529
Net assets – end of year	$ 467,796,445	699,820,671	1,167,617,116

See accompanying notes to financial statements.

INSTITUTE FOR ADVANCED STUDY – LOUIS BAMBERGER AND MRS. FELIX FULD FOUNDATION

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	15,637,579	—	15,637,579
Auxiliary activity	9,548,245	—	9,548,245
Total operating expenses	63,694,959	—	63,694,959
Change in net assets from operating activities	123,555,948	211,212,327	334,768,275
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	3,323,398	—	3,323,398
Total nonoperating activities	4,747,584	—	4,747,584
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.

INSTITUTE FOR ADVANCED STUDY – LOUIS BAMBERGER AND MRS. FELIX FULD FOUNDATION

Statements of Cash Flows

Years ended June 30, 2022 and 2021

	2022	2021
Cash flows from operating activities:		
Change in net assets	$ (1,262,413)	339,515,859
Adjustments to reconcile change in net assets to net cash used in operating activities:		
Depreciation of plant assets	7,596,531	7,296,690
Contributions restricted for endowment and plant	(17,979,969)	(31,006,625)
Net appreciation on investments	(15,022,479)	(354,057,061)
Change in fair value of bond swap liability	(1,350,962)	(952,201)
Loss (gain) on sale of plant assets	977	(471,985)
Amortization of debt issuance costs	73,658	53,738
Amortization of bond discount	35,642	19,942
Amortization of finance right-of-use assets	776,718	518,080
Noncash lease expense	26,059	191,201
Changes in assets/liabilities:		
Receivables and other assets	2,504,129	3,216,803
Contributions receivable	(482,152)	2,985,714
Accounts payable and accrued expenses	429,295	(196,861)
Operating lease liability	(51,191)	(191,201)
Deferred revenue	1,722,400	(306,413)
Postretirement benefit obligation	(8,231,481)	(2,540,129)
Asset retirement obligation	3,960	31,199
Net cash used in operating activities	(31,211,278)	(35,893,250)
Cash flows from investing activities:		
Proceeds from sale of plant assets	—	1,241,418
Purchase of plant assets	(7,355,324)	(7,764,360)
Proceeds from sale of investments	420,468,778	332,397,452
Purchase of investments	(398,964,114)	(304,785,381)
Net cash provided by investing activities	14,149,340	21,089,129
Cash flows from financing activities:		
Contributions restricted for endowment and plant	17,979,969	31,006,625
(Decrease) increase in liabilities under split-interest agreements	(290,444)	175,048
Increase in finance lease liability	—	2,920,444
Principal payments on finance leases	(736,870)	(736,772)
Principal payments on long-term debt	(3,735,000)	(4,325,000)
Net cash provided by financing activities	13,217,655	29,040,345
Net (decrease) increase in cash, cash equivalents and restricted cash	(3,844,283)	14,236,224
Cash, cash equivalents and restricted cash – beginning of year	18,937,538	4,701,314
Cash, cash equivalents and restricted cash – end of year	$ 15,093,255	18,937,538
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	$ 15,093,116	18,197,439
Funds held by bond trustee	139	740,099
Total cash, cash equivalents and restricted cash shown above	$ 15,093,255	18,937,538
Supplemental data:		
Interest paid	$ 2,838,312	2,871,358
Acquisition of equipment through finance leases	—	2,920,444
Right-of-use assets acquired under operating leases	47,029	311,120
Increase in accounts payable and accrued expenses related to plant assets	5,501,535	1,053,533

See accompanying notes to financial statements.

INSTITUTE FOR ADVANCED STUDY – LOUIS BAMBERGER AND MRS. FELIX FULD FOUNDATION

Notes to Financial Statements

June 30, 2022 and 2021

(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, loss/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, 2022 and 2021, 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 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 0.25% to 3.01%. 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 to be 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 and ordinary course of the Institute's activities and purpose.

(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. Simultaneously, 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 is 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 $1,613,400 and $2,473,780 for the years ended June 30, 2022 and 2021, 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 to generate 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) Reclassifications

Certain reclassifications have been made to prior-year amounts to conform with the current-year presentation.

(2) Contributions Receivable

Contributions receivable at June 30, 2022 and 2021 were as follows:

		2022	2021
Amounts expected to be collected:			
Less than one year	$	2,550,000	3,050,000
One to five years		3,050,000	1,600,000
		5,600,000	4,650,000
Discount for present value (0.25%–3.01%)		(491,011)	(23,163)
Total	$	5,108,989	4,626,837

At June 30, 2022, 98% of gross contributions receivable and 49% of contributions revenue are from four donors. At June 30, 2021, 97% of gross contributions receivable and 3.5% of contributions revenue are from one donor.

(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, 2022 and 2021 were as follows:

	2022	2021
Financial assets:		
Cash and cash equivalents	$ 15,093,116	18,197,439
Accounts receivable due less than 1 year	65,567	82,148
Mortgage receivable due less than 1 year	119,517	214,908
Contributions receivable due less than 1 year, net	2,550,000	3,050,000
Endowment appropriated for expenditure – operations	49,076,200	37,384,400
Total financial assets available within one year	66,904,400	58,928,895
Liquidity resources:		
Lines of credit	70,000,000	50,000,000
Total financial assets and liquidity resources available within one year	$ 136,904,400	108,928,895

(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 turn-around 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, 2022 and 2021, as well as related strategy, liquidity, and funding commitments:

	2022				
	Total	Level 1	Level 2	Level 3	Investment at NAV
Investments:					
Hedge funds – onshore:					
Emerging markets	$ 376,146	—	—	—	376,146
Multiple strategies	40,631,437	—	—	—	40,631,437
Hedge funds – offshore:					
Structured credit	15,705,989	—	—	—	15,705,989
Distressed/high-yield	204,083	—	—	—	204,083
Emerging markets	3,498	—	—	—	3,498
Equities – long bias	111,739,030	—	—	—	111,739,030
Equities – long/short	70,607,283	—	—	—	70,607,283
Multiple strategies	190,810,886	—	—	—	190,810,886
Quantitative/CTA	82,312,310	—	—	—	82,312,310
Insurance	10,086,492	—	—	—	10,086,492
Bio tech/healthcare	19,485,322	—	—	—	19,485,322
Energy trading	43,988	—	—	—	43,988
Total	542,006,464	—	—	—	542,006,464
Limited partnerships	373,959,741	—	—	—	373,959,741
Exchange-traded funds	466,131	466,131	—	—	—
Cash equivalents	207,263,569	207,263,569	—	—	—
Other investments:					
Assets held under split-interest agreements:	3,233,377	2,069,412	—	536,914	627,051
Total investments	$ 1,126,929,282	209,799,112	—	536,914	916,593,256
Other assets:					
Funds held by bond trustee:					
Cash equivalents	$ 139	—	139	—	—
Total other assets	$ 139	—	139	—	—

	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	—	—

The following tables present the Institute's activities for the years ended June 30, 2022 and 2021 for investments classified in Level 3:

Level 3 roll forward	2022 Assets held under split-interest agreement Fixed-income securities
Fair value at June 30, 2021	$ 651,474
Dispositions	(16,617)
Net appreciation (realized and unrealized)	(97,943)
Fair value at June 30, 2022	$ 536,914

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

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, 2022 and 2021. The total dispositions of investments classified as Level 3 are $16,617 and $24,904 for the years ended June 30, 2022 and 2021, 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, 2022, the Institute is obligated under certain limited partnership agreements to advance additional funding in the amount of $114,858,884, which is anticipated to be called over the next 10 years.

Investment liquidity for the years ended June 30, 2022 and June 30, 2021 are aggregated below based on redemption or sale period:

	2022				
	Fair value		Percent not eligible for redemption	Redemption frequency (if available)	Redemption notice period
Investments:					
Hedge funds – onshore:					
Emerging markets	$ 376,146	(a)	100 %	Illiquid	Fund in liquidation
Multiple strategies	40,631,437	(b)	2 %	Semi-Annual; Lockup	90 days notice; Fund in liquidation
Hedge funds – offshore:					
Structured credit	15,705,989	(c)	— %	Quarterly	90 days' notice
Distressed/high-yield	204,083	(d)	100 %	Illiquid	Fund in liquidation
Emerging markets	3,498	(a)	100 %	Illiquid	Fund in liquidation
Equities – long bias	111,739,030	(e)	69 %	Annual; Lockup	60-150 days' notice; Fund in liquidation; 3 year rolling lockup
Equities – long/short	70,607,283	(f)	55 %	Quarterly; Annual lockup; Illiquid	45-90 days notice; Fund in liquidation; Funds subject to lockup
Multiple strategies	190,810,886	(b)	43 %	Quarterly, Annual, Lockup, Illiquid	15-90 days notice; Fund in liquidation Fund subject to lockup
Quantitative/CTA	82,312,310	(h)	— %	Monthly, Quarterly	15-60 days notice
Insurance	10,086,492	(i)	— %	Quarterly	60 days notice
Bio tech/healthcare	19,485,322	(j)	— %	Quarterly	30-60 days notice
Energy trading	43,988	(k)	100 %	Illiquid	Fund in liquidation
Total	542,006,464				
Limited partnerships	373,959,741	(l)	100 %	Illiquid	Funds subject to lockup up by agreement
Exchange-traded funds	466,131		— %	Daily	
Cash equivalents	207,263,569		— %	Daily	
Other investments:					
Assets held under split-interest agreements	3,233,377		100 %	Illiquid	Funds subject to lockup up by agreement
Total investments	$ 1,126,929,282				

	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)	— %	Quarterly	90 days' notice
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)	75 %	Annual; Lockup	60-150 days' notice; 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)	33 %	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 subject to 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 subject to lockup up by agreement
Total investments	$ 1,133,411,467				

(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.

(c) Redemption Restrictions – Hedge Funds

At June 30, 2022, the Institute had hedge fund investments of approximately $542,006,500, of which approximately $11,329,300 was under liquidation and $189,069,300 was restricted from redemption for lock up periods. 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. 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 150 days' notice after the initial lock-up period.

The expirations of redemption lock-up periods are summarized in the table below:

	Amount
Fiscal year:	
2023	$ 141,137,100
2024	14,444,200
2025 and thereafter	33,488,000
Total	$ 189,069,300

(d) Redemption Restrictions – Limited Partnerships

At June 30, 2022 and 2021, the Institute had limited partnership investments of approximately $373,959,700 and $416,378,100, respectively, which were restricted from redemption for lock-up periods. Some of the investments with redemption restrictions allow early redemption for specified fees.

The expirations of redemption lock-up periods are summarized in the table below:

	Amount
Fiscal year:	
2023	$ 68,779,000
2024	16,993,200
2025	54,397,700
2026	60,102,500
2027	30,003,700
2028 and thereafter	143,683,600
Total	$ 373,959,700

(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 3.83% and 6.04% for 2022 and 2021, respectively. The actual spending rate for operating and capital purposes was 4.02% and 5.20% for 2022 and 2021, respectively.

The following tables summarize the investment return and its classification in the statements of activities for the years ended June 30, 2022 and 2021:

	2022		
	Without donor restrictions	With donor restrictions	Total
Investment income, net of investment expenses	$ (704,979)	(1,402,591)	(2,107,570)
Net appreciation (realized and unrealized)	6,129,047	8,893,432	15,022,479
	$ 5,424,068	7,490,841	12,914,909

	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

(6) Endowment

The Institute's endowment consists of approximately 140 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 of 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 $2,655,200 and $1,690,400 at June 30, 2022 and 2021, respectively. Subsequent gains that restore the fair value of the assets of the donor-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, 2022 and 2021:

	2022			
	Without donor restrictions	With donor restrictions		
		Original gift	Accumulated gains	Total
Undesignated	$ 264,772,881	—	—	264,772,881
Specific purpose designated funds	187,445,332	—	—	187,445,332
Donor – purpose restricted funds	—	35,386,802	331,693,717	367,080,519
Endowment fund corpus	—	308,015,882	—	308,015,882
	$ 452,218,213	343,402,684	331,693,717	1,127,314,614

	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

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, 2022 and 2021 were as follows:

	Without donor restrictions	With donor restrictions		Total
		Original gift	Accumulated gains	
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
Investment returns:				
Investment income, net	(704,979)	—	(1,217,155)	(1,922,134)
Net appreciation (realized and unrealized)	6,129,047	—	9,186,806	15,315,853
Total investment return	5,424,068	—	7,969,651	13,393,719
Contributions	1,035,130	21,386,416	—	22,421,546
Appropriation for expenditure – operations	(11,598,850)	—	(22,248,454)	(33,847,304)
Net assets, June 30, 2022	$ 452,215,213	343,402,684	331,693,717	1,127,311,614

(b) Funds with Deficiencies

From time to time, the fair value of assets associated with individual donor-restricted 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, 2022, eleven funds with an original gift of $9,549,257 were "underwater" by $2,655,189. As of June 30, 2021, eight funds with an original gift of $3,137,675 were "underwater" by $1,690,439.

(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, 2022 and 2021 is as follows:

		2022	2021
Land	$	373,738	373,738
Land improvements		3,298,348	3,087,965
Buildings and improvements		213,164,567	201,631,562
Equipment		40,846,415	40,898,223
Rare book collection		203,508	203,508
Joint ownership property		5,054,512	5,054,512
Finance lease right-of-use asset		2,920,444	2,920,444
		265,861,532	254,169,952
Accumulated depreciation		(125,484,920)	(119,052,691)
Accumulated amortization – finance lease right-of-use asset		(1,294,798)	(518,080)
Net book value	$	139,081,814	134,599,181

(8) Long-Term Debt

A summary of long-term debt at June 30, 2022 and 2021 is as follows:

	2022	2021
2006 Series B – NJEFA	$ 14,300,000	16,100,000
2006 Series C – NJEFA	12,500,000	13,100,000
2012 Taxable	13,635,000	14,070,000
2015 Taxable	13,360,000	13,700,000
2017 Taxable	22,855,000	23,415,000
Long-term debt	76,650,000	80,385,000
Less:		
Unamortized bond discount	(196,605)	(232,247)
Unamortized debt issuance costs	(504,666)	(578,324)
Total long-term debt	$ 75,948,729	79,574,429

Interest expense on long-term debt for the years ended June 30, 2022 and 2021 was $2,753,567 and $2,839,410, 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. On July 1, 2022, the Institute refinanced the 2006 Series C bond issue as part of the 2022 Senior Unsecured Notes issue.

(c) 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.

(d) 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.

(e) 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.

(f) 2022 Senior Unsecured Notes

On July 1, 2022, the Institute received proceeds of $48,000,000 from the issuance of the Senior Unsecured Notes. These private placement notes were issued to finance the advance refunding of the outstanding 2006 Series C bonds, to fund capital projects at the Institute, for other corporate purposes of the Institute and to pay certain costs incidental to the sale and issuance of the 2022 Senior Unsecured Notes.

(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. On July 1, 2022, the Institute refinanced the 2006 Series C variable rate bond issue with a fixed rate bond issue at a rate of 4.19% per annum, payable semiannually.

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.

The 2022 Senior Unsecured Notes will bear interest at a rate of 4.19% per annum, payable semiannually, are subject to redemption at various prices and require principal payments through May 1, 2053. 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, 2022 and 2021, the fair value of the interest rate swap was ($1,020,176) and ($2,371,138), respectively. The change in fair value recognized during the years ended June 30, 2022 and 2021 in the amount of $1,350,962 and $952,201, 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, 2022 and 2021, there was no requirement to post collateral imposed by the swap counterparty.

The bonds are repayable as follows at June 30, 2022:

	Amount
Year ending June 30:	
2023	$ 3,965,000
2024	4,105,000
2025	4,145,000
2026	4,385,000
2027	4,535,000
2028 through 2049	55,515,000
Total	$ 76,650,000

The 2006 Series B and 2006 Series C bonds are secured by a pledge of revenues pursuant to the respective Loan Agreements.

(i) Lines of Credit

As of June 30, 2022 and 2021, the Institute had unsecured loan agreements representing a line of credit. As of June 30, 2022, the agreements provide for borrowings up to $70,000,000, of which $30,000,000 is available through June 2024 and $40,000,000 is available through April 2025. 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 3.82% as of June 30, 2022 and for the $40,000,000 line of credit at the BSBY rate plus 45 basis points, which was 2.03% as of June 30, 2022.

As of June 30, 2021, the agreements provide for borrowings up to $50,000,000, of which $30,000,000 is available through June 2021 and $20,000,000 was available through March 2022.

There were no borrowings in fiscal year 2022 or 2021 against the lines of credit. No interest expense was incurred for the years ended June 30, 2022 and 2021.

(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, 2022 and 2021 totaled approximately $1,796,400 and $2,258,600, 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, 2022 and 2021. There are no plan assets at June 30, 2022 or 2021.

		2022	2021
Postretirement benefit obligation:			
Retirees	$	5,122,051	7,779,523
Fully eligible active plan participants		2,025,711	2,791,592
Other active plan participants		6,699,294	11,507,422
Postretirement benefit obligation	$	13,847,056	22,078,537
Change in benefit obligation:			
Benefit obligation at beginning of year	$	22,078,537	24,618,666
Service cost		976,432	1,175,253
Interest cost		611,285	648,132
Benefits paid		(386,800)	(391,984)
Actuarial (gain)/loss		(9,432,398)	(3,971,530)
Benefit obligation at end of year	$	13,847,056	22,078,537
Change in plan assets:			
Plan assets at beginning of year	$	—	—
Actual return on assets		—	—
Employer contributions		386,800	391,984
Benefits paid		(386,800)	(391,984)
Plan assets at end of year		—	—
Funded status at end of year	$	13,847,056	22,078,537
Components of net periodic benefit cost:			
Service cost	$	976,432	1,175,253
Interest cost		611,285	648,132
Amortization of net (gain)/loss		(9,432,398)	(3,971,530)
Net periodic postretirement benefit cost	$	(7,844,681)	(2,148,145)
Amounts recognized in the statement of financial position consist of the following:			
Postretirement benefit obligation liability	$	(13,847,056)	(22,078,537)

	2022	2021
Benefit obligation assumptions		
Weighted average discount rate	4.48 %	2.80 %
Net periodic cost benefit assumptions		
Weighted average discount rate	2.80 %	2.66 %

Assumed health care cost trend rates at June 30:

	2022	2021
Health care cost trend rate assumed for next year	6.05 %	6.20 %
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:	
2023	$ 413,000
2024	430,000
2025	452,000
2026	482,000
2027 through 2032	3,012,000

The Institute funds claims as they are incurred. The Institute does not expect to contribute any amounts in fiscal year 2022 or 2021, 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, 2022 consist of the following:

	2022							
	Schools of				Library and other academic	Administration and general	Auxiliary Activity	Total
	Mathematics	Natural Sciences	Historical Studies	Social Science				
Salaries	$ 2,933,334	4,022,667	3,341,294	1,130,408	1,699,346	8,011,000	1,569,875	22,707,924
Stipends	4,473,631	4,283,518	2,902,870	1,514,478	193,020	—	—	13,367,517
Employee benefits and taxes	1,190,703	1,588,615	1,282,172	415,589	615,502	2,680,091	521,941	8,294,613
Materials and supplies	31,008	64,429	26,770	32,328	78,940	614,116	368,728	1,216,319
Conferences and travel	361,211	379,405	350,333	219,730	660,616	666,305	726,293	3,363,893
Insurance, legal and professional fees	38,726	130,705	89,125	7,795	258,019	2,085,937	137,012	2,747,319
Occupancy (inc. utilities and real estate taxes)	—	—	—	—	—	918,142	1,470,294	2,388,436
Interest expense	—	—	—	—	—	1,410,409	1,346,464	2,756,873
Books and periodicals	27	2,053	26,577	—	641,689	5,232	379	675,957
Other expenses	110,958	182,104	27,873	13,464	113,317	2,039,931	52,855	2,540,502
Depreciation	73,863	568,634	56,467	16,866	157,991	3,384,797	4,114,631	8,373,249
Subtotal	9,213,461	11,222,130	8,103,481	3,350,658	4,418,440	21,815,960	10,308,472	68,432,602
Computing allocation	650,313	1,028,038	271,847	237,539	109,993	(2,297,730)	—	—
Academic building allocation	1,201,184	1,538,188	1,034,364	518,339	—	(4,292,075)	—	—
	$ 11,064,958	13,788,356	9,409,692	4,106,536	4,528,433	15,226,155	10,308,472	68,432,602

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	3,123,168	475,134	7,739,865
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	141,058	148,940	16,433	74,066	307,748	1,154,449	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	8,289,238	9,660,864	7,701,832	2,990,495	3,723,849	21,780,436	9,548,245	63,694,959
Computing allocation	601,403	950,832	251,718	119,900	101,924	(2,025,777)	—	—
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	15,637,579	9,548,245	63,694,959

(11) Net Assets

Net assets are comprised of the following at June 30, 2022 and 2021:

	2022	2021
Net assets without donor restrictions:		
Undesignated	$ 280,351,113	283,061,331
Designated for specific purpose funds:		
School of Mathematics	23,700,650	23,567,195
School of Natural Sciences	29,745,954	30,503,136
School of Historical Studies	24,711,068	24,623,032
School of Social Science	2,331,223	2,304,745
Libraries and other academic	98,245,445	100,595,920
Administration and general	8,710,992	8,277,737
Designated for specific purpose funds	187,445,332	189,871,765
Total net assets without donor restrictions	$ 467,796,445	472,933,096
Net assets with donor restrictions and appropriation through endowment spending policy:		
Subject to expenditure for specific purpose:		
School of Mathematics	$ 46,479,107	49,290,773
School of Natural Sciences	55,507,132	56,772,548
School of Historical Studies	58,305,999	60,817,527
School of Social Science	84,324,546	87,402,028
Libraries and other academic	15,015,450	16,744,384
Administration and general	132,172,555	134,939,709
Net assets with donor-purpose restrictions	391,804,789	405,966,969
Net assets held as endowed fund corpus to generate income for specified purposes	308,015,882	289,979,464
Total net assets with donor restrictions	$ 699,820,671	695,946,433

(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 years ended June 30, 2022 and 2021 consist of the following:

		2022	2021
Finance lease cost:			
Amortization of right-of-use assets	$	776,718	518,080
Interest on lease liabilities		9,808	3,975
Operating lease cost		26,059	191,201
Total lease cost	$	812,585	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 $26,059 and $191,201 at June 30, 2022 and 2021, respectively. Total cash paid for amounts included in the measurement of lease liabilities, which is recorded as financing cash flows from operating leases, is $736,870 and $736,772 at June 30, 2022 and 2021, respectively.

The following table displays the undiscounted cash flows due related to operating and finance leases as of June 30, 2022, along with a reconciliation to the discounted amount recorded on the Statements of Financial Position:

		Operating lease	Finance lease
Year ending June 30:			
2023	$	33,484	677,919
2024		30,913	593,795
2025		20,949	193,831
2026		8,313	—
2027		1,252	—
Total lease payments		94,911	1,465,545
Less present value discount		(26,183)	(18,743)
Present value of lease liabilities	$	68,728	1,446,802

The following table displays the weighted average remaining lease term and discount rates for the years ended June 30, 2022 and 2021:

	2022	2021
Operating lease:		
Weighted-average remaining lease term	2 years	2 years
Weighted-average discount rate	0.96 %	0.21 %
Finance lease:		
Weighted-average remaining lease term	3 years	3 years
Weighted-average discount rate	0.53 %	0.46 %

(13) Subsequent Events

The Institute evaluated events subsequent to June 30, 2022 through October 28, 2022, the date on which the financial statements were issued. The 2022 Senior Unsecured Notes were issued on July 1, 2022 and are discussed further in note 8.

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