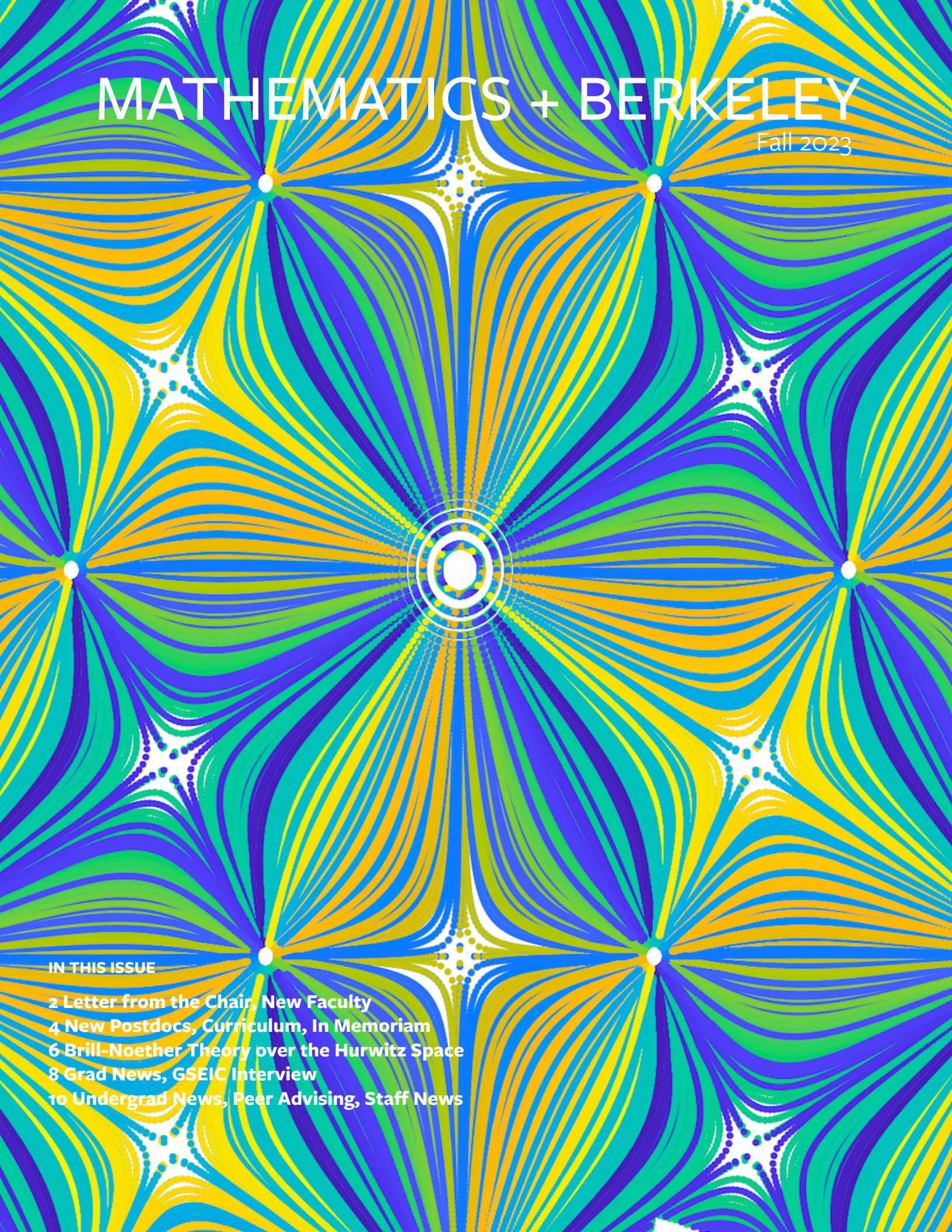
MATHEMATICS + BERKELEY

Fall 2023



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Chair Martin Olsson (PhD, Berkeley, 2001) has been a member of the math faculty since 2006. His research is in algebraic geometry. He became Chair in Fall 2023.

Dear Friends of Berkeley Math,

I am delighted to share with you this newsletter and to update you on some of the exciting things happening in the Berkeley math department. Our department is large and vibrant and there is much to share.

This past year we welcomed three new ladder faculty to our department: Hannah Larson (algebraic geometry), Svetlana Jitomirskaya (mathematical physics and dynamical systems), and Andrew Marks (mathematical logic). One of the long-term priorities of the department is to grow our faculty and we expect to continue to hire during this and coming years.

The faculty have been recognized with numerous prestigious awards. This past year, Hannah Larson received a 2024 Maryam Mirzakhani New Frontiers Prize, Ruixiang Zhang received the 2023 SASTRA Ramanujan prize, Yunqing Tang received a Sloan Fellowship and the AWM Microsoft Research Prize in Algebra and Number Theory, Lawrence C. Evans received the Leroy P. Steele Prize for Mathematical Exposition, Venkatesan Guruswami was named a 2023 Fellow of the AMS, Andrés R. Vindas Meléndez was selected for the 2023 Class of MGB-SIAM Fellows, Michael Lindsey received the John Todd Award, Richard Bamler, Svetlana Jitomirskaya, and Ruixiang Zhang received the Frontiers of Science award, and Daniel Tataru received a Doctorate Honoris Causa from the University of Iasi in Romania.

The research of the department is greatly enhanced by the many postdocs and visitors here. Please see page 4 to learn about some of the new Morrey Assistant Professors and other new postdocs.

Our teaching serves multiple purposes in the broader campus community and demand for our courses remains very high. The number of majors and interest in mathematics for its own sake remains high. At the same time a number of other fields have become increasingly mathematical, strengthening our ties with students in other majors. Developing our curriculum to meet the interests of our students, whether they are math students or primarily focused on another field, is important and a continuing effort. Over the past few years several new courses have been developed. This includes the new Math 1 (Foundations of Lower Division Math), which grew out of the Solid Foundations program, Math 56 (Linear Algebra motivated by first applications in data science and statistics) and Math 156 (Numerical Analysis for Data Science and Statistics); you can learn more about these on page 4. We are also experimenting with new modes of delivery of our courses, including offering several online courses during the summer.

Graduate students play a key part in the research and teaching of the department and supporting our students is a high priority. This past year we welcomed 30 new graduate students. The graduate program is thriving but is an area where we always strive to improve. While graduate students have formal requirements, the mentoring relationships between faculty and students, developed through the many informal interactions that arise from in-person seminars and events, are crucial to their development as mathematicians and building community is an important priority. In addition, while graduate students are an integral part of our teaching mission, being able to offer students semesters with non-teaching support for them to focus on their research is a high priority.

I took over as department chair this past summer from Michael Hutchings. It is an honor to thank Michael for his wonderful service to the department during challenging times. I also want to thank the outgoing vice chairs, who are an integral part of department administration, as well as the new vice chairs. I also want to thank the department staff whose work is such an integral part of our success. Finally I want to thank the Friends of Berkeley Math: Your support is crucial for our continued excellence and support!

I encourage you to stay connected to the department. You can learn more about our activities on our homepage and Facebook page, and you can join current and former students in the UC Berkeley Mathematics LinkedIn group.

Right: Hyeongseok Shin (center), CEO of Sejongmall Co., Ltd., the manufacturers of Hagoromo brand chalk, with Department manager Brian Underwood and Prof. Ian Agol.

New Faculty

Svetlana Jitomirskaya is joining the faculty in the Fall 2023 as a Richard and Rhonda Goldman Distinguished Chair Professor. She obtained her Ph.D. at Moscow State University in 1991, and then worked at UC Irvine, from 1991 until 2023, rising there through the ranks from a part-time lecturer to Distinguished Professor. She has also held the inaugural Elaine M. Hubbard Chair at Georgia Tech in 2022-23.

Svetlana's research in mathematical physics has been recognized by various prizes, including the APS & AIP Dannie Heineman Prize (2019) and the inaugural Olga Ladyzhenskaya Prize (2022). In 2022, she was a plenary speaker at the ICM. Most of her nearly 30 mentees are at various stages of successful academic careers.

Svetlana was born and raised in Kharkiv, Ukraine, and is a daughter of two Holocaust survivors. She is the third mathematician in her family to be affiliated with Berkeley.

Other than doing mathematics and raising mathematicians, she likes open water swimming, Russian poetry, bicycle tours, mushroom hunting, and playing Go.

Hannah Larson is joining the faculty as an Assistant Professor in Fall 2023. She is also a Clay Research Fellow (2022-2027), and spent the previous year as a Junior Fellow at Harvard. She has been awarded a 2024 Maryam Mirzakhani New Frontiers Prize. Hannah received her PhD from Stanford University, where she was advised by Ravi Vakil.

Hannah's research centers around the geometry of algebraic curves. Brill--Noether theory studies the maps of curves to projective spaces. While the Brill--Noether theory of general curves is well-understood, the story for special curves largely remains a mystery. Hannah is interested in studying these special curves. Her thesis, Brill--Noether theory over the Hurwitz space, studied the case of curves of fixed gonality and was awarded the Hertz Thesis Prize. Hannah's other main research interest is intersection theory of moduli spaces of curves, particularly questions related to their tautological rings.

Outside of work, Hannah enjoys biking, swimming, hiking, listening to music, and playing the cello. She is especially fond of the Rachmaninoff piano concertos and Brahms symphonies. She grew up in Eugene, Oregon.

Andrew Marks is joining the faculty as a professor in Fall 2023. He obtained his PhD from UC Berkeley in 2012, advised by Theodore Slaman, and was most recently a Professor of Mathematics at UCLA. His research is in descriptive set theory and its connections with computability, combinatorics, ergodic theory, and operator algebras. In his freetime, he enjoys biking and hiking in the Berkeley hills.

Above:Profs. Jitomirskaya, Larson, and Marks. Below: Faculty cheer on PhD graduates, May 2023

New Morrey Visiting Assistant Professors and Postdocs

Sergei Korotkikh (Morrey), PhD MIT. Combinatorics, representation theory, mathematical physics, probability.
Anuj Kumar (Morrey), PhD UCSC. Fluid dynamics, turbulent flow.
Kendric Schefers (Morrey), PhD Texas. Algebraic Geometry.
Jikang Wang (Morrey), PhD Rutgers. Differential geometry and metric geometry.
Catherine Cannizzo (NSF Ascend) PhD Berkeley,. Symplectic geometry, mirror symmetry.
Peter Haine (NSF), PhD MIT. Homotopy theory, algebraic geometry, microlocal sheaf theory.
Forte Shinko, PhD Caltech. Descriptive set theory, topological and measurable dynamics, geometric group theory.
Dongxiao Yu, PhD Berkeley. PDE's, nonlinear wave and dispersive equations.
Rohil Prasad (Miller), PhD Princeton. Dynamical systems, symplectic geometry, gauge theory.

Right: the nine new Morrey VAPs and postdocs in the order above. Bottom Right: Graduating PhD students, May 2023.

New Math Courses

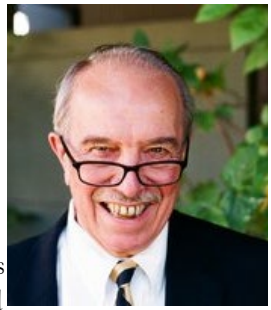
Math 1, Foundations of Lower Division Mathematics, is a new course focussing the core pre-calculus skills essential to success in all our lower division classes. The course runs twice in Fall semester in two identical, back-to-back, seven week blocks. The first block is primarily intended to be taken in parallel with our introductory calculus classes (1A, 16A, 10A), giving real-time support with key topics. The second is intended for those students going into these classes in the Spring, who need to be brought up to speed fast. This course is an evolution of the highly successful Pre-Calculus Essential Program which ran in the summer from 2020 to 2022.

Math 56, Linear Algebra, is an in-depth introduction to linear algebra in the setting of Euclidean spaces. The course is based on a new textbook, currently being written by math faculty here at Berkeley. What distinguishes Math 56 from other introductory linear algebra classes at Berkeley is a strong focus on geometric, conceptual understanding, over the blind application of algorithms. The geometry of the dot product is introduced at the very start and permeates every aspect of the class. The course also has a focus on how linear algebra can be applied to important problems in data science, with biweekly projects introducing topics such as sparse vectors, linear classifiers, computer graphics, and neural networks.

Math 156, Numerical Analysis for Data Science and Statistics. In this new course, we present the mathematical foundations of data science with an emphasis on numerical analysis. The course covers applied linear algebra topics such as matrix factorizations, orthogonal matrices, linear least squares problems, principal component analysis and low rank approximations; optimization techniques such as the Levenberg-Marquardt method, quasi-Newton line-search methods, stochastic gradient descent, and adjoint methods with applications in neural networks; and error propagation in floating-point arithmetic, backward stability analysis and condition number. The ideas and methods are explored through extensive homework and programming assignments.

—Profs. Alexander Paulin and Jon Wilkening

In Memoriam



Calvin (Cal) Moore was born on 2 November, 1936 in New York City. His father was an MD, in particular a pathologist. His ancestors came from Germany and Switzerland. Cal had an older brother. He received a BA in 1958 and a PhD in 1960, both from Harvard. His adviser was George Mackey and his PhD thesis was titled: "Extensions and Cohomology Theory of Locally Compact Groups".

Cal spent one year at the University of Chicago and then accepted an Assistant Professorship at Berkeley in 1961. He was promoted with tenure to Associate Professor in 1965, and almost immediately to Professor in 1966. This was no doubt due to an excellent research record.

However, Cal's administrative talents were soon recognized by his appointment as Dean of the Physical Sciences in 1971, for a five year term. Beginning around 1978, he, Shiing-Shen Chern and Isadore Singer proposed to the NSF a mathematical institute similar to the one in Princeton. This brought the Mathematical Sciences Research Institute (MSRI, now known as the Simons-Laufer Mathematical Sciences Institute) to Berkeley. Cal played a crucial role in the construction of the MSRI building on Cenntenial Drive, and served as the deputy director for 3 years; he was arguably the most important figure in the establishment of MSRI.

Cal was then requisitioned away from MSRI to become an Associate Vice President for Academic Affairs at the UC Office of the President, where he served from 1985 to 1994. Upon returning to campus he became an able Chair of the Math Department for 6 years, 1996–2002. Throughout his distinguished administrative career, Cal remained mathematically active, continuing to publish well into this century, and always remained a wise and respected colleague. He died on July 26, 2023. —*Prof. Robion Kirby*

Joseph (Joe) Wolf, Professor Emeritus of Mathematics, died on August 14, 2023, at the age of 86.

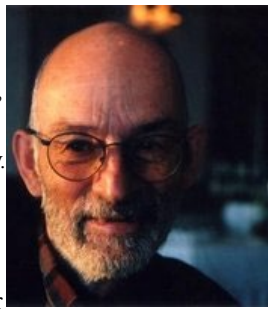
Joe's research interests included differential geometry, Lie groups and representation theory. His book "Spaces of Constant Curvature", published in 1967, gave a classification of spaces with constant curvature 1 in any dimension. These are known as spherical space forms and their classification boiled down to a difficult problem in group theory. The book also had a wealth of information about the analogous case of spaces with constant curvature 0, i.e. flat Riemannian manifolds, whose classification is still unknown.

Joe's first mathematical publication was in 1960. As of this writing, his last publication was in 2023. There are a couple of arXiv preprints from 2023 that have not yet appeared in print. One of these preprints follows up on work of Joe from 1960-1961 on the Homogeneity Conjecture.

In 1994 Joe received the Humboldt Research Award and in 1977 the Medal of the University of Liège. In 1989 he received an honorary professorship at the National University of Córdoba in Argentina. According to the Mathematics Genealogy Project, Joe had 23 PhD students and 83 descendants.

Joe was a regular attendee of the Berkeley geometry seminar. He had a lighthearted sense of humor that was much appreciated. After his early retirement, Joe traveled extensively and maintained mathematical contacts in Argentina, Belgium and Germany. In the words of one of his Argentinian colleagues, "We are all gonna miss him here in Córdoba." —*Prof. John Lott*

For the fall edition of Math on Tap, a happy hour talk and conversation bringing alums, friends and supporters together, Prof. Mina Aganagic presented on the topic of Mathematics and Duality in Quantum Theory.



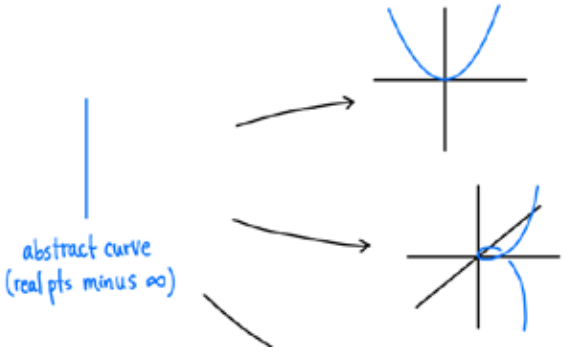
R. Sherman Lehman, Professor Emeritus of Mathematics, passed away peacefully at home on 7/28/23 (appropriately, a prime number without the slashes as his family noted) surrounded by family. He was 93. Lehman, a computational number theorist, joined the department as an Assistant Professor in 1958. He was promoted to associate professor in 1962 and full professor in 1966; he retired in 1994. Working with Prof. René de Vogelaere, Lehman played a key role in the development of the numerical analysis curriculum and in establishing computing facilities in the department. Throughout his 36 years in the department, Lehman taught numerous upper division courses, frequently served as a Major Advisor in applied mathematics, and supervised the doctoral work of eleven students. His publications in number theory continue to be cited actively.

Cover: The motion of Dirac points for twisted bilayer graphene with in-plane magnetic field as the angle of twisting changes; colors correspond to directions of the magnetic field. From a recent paper by Simon Becker (ETH) and Prof. Maciej Zworski.

Brill-Noether Theory over the Hurwitz Space

Assistant Professor Hannah Larson

Algebraic geometry studies solutions to systems of polynomial equations in many variables. When the solution set of such a system is one-dimensional, it is called an *algebraic curve*. For example, the points $S=\{(x,y) \in \mathbf{R}^2 : y=x^2\}$ form an algebraic curve. In higher dimensions, we'd work with more variables, and we'd need more than just one equation to get a curve. Historically, this is how algebraic geometers thought of curves: 1-dimensional subsets of $\mathbf{R}^r$ defined by polynomial equations. However, in the 1800s several new ideas changed the way we think about curves. Poncelet advocated for enlarging our idea of the curve in two ways: first we should consider all complex solutions, and second we should also include solutions ``at infinity.'' Technically speaking, this is accomplished by considering the solutions of the corresponding homogeneous equations in a compactification of $\mathbf{C}^r$ called *projective space* $\mathbf{P}^r$. Precisely, $\mathbf{P}^r$ is the quotient $(\mathbf{C}^{r+1} \setminus \{0\})/\mathbf{C}^*$, where $\mathbf{C}^*$ acts by simultaneously rescaling all of the coordinates. In our example, the associated complex projective curve is $S = \{[x:y:z] \in \mathbf{P}^2 : yz = x^2\}$, and $[0:1:0]$ a solution ``at infinity.''



Different concrete realizations

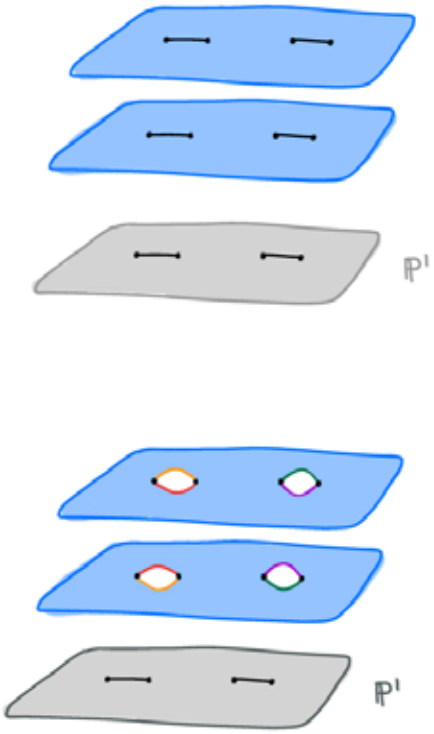
If we have a curve in projective space, we can associate three natural invariants. First, the *dimension* r of the ambient space. Second, the *degree* d, which roughly measures how much the curve wobbles around in that space. (It is defined precisely as the number of points where S meets a general hyperplane. In our example S is degree 2 since it meets a general line in 2 points.) Finally, the complex points of S form a compact surface, and the number of ``holes'' (see below) is called the *genus* $g$. (In our example, the solutions are a copy of $\mathbf{C}$ union a point ``at infinity.'' This forms a sphere, which is genus 0.)

The other, larger paradigm shift came with Reimann's work, which introduced the idea of an *abstract curve* (or what we now call a Riemann surface). With this notion, we can think of the same abstract curve as having concrete realizations in different dimensions with different degrees. For example, we could map the abstract curve $\mathbf{C} \cup \infty$ into two dimensions with degree two by $t \mapsto (t,t^2)$ (this gives our original example in the plane); we could also map it into three dimensions with degree three by $t \mapsto (t,t^2,t^3)$. Meanwhile, the genus is an intrinsic invariant of the curve, and does not change with its different representations in different spaces. Riemann's perspective naturally breaks the modern study of algebraic curves into two parts. On the one hand, we can try to understand all abstract curves. Then, we can try to understand: What are their different concrete realizations, or *maps* to projective spaces?

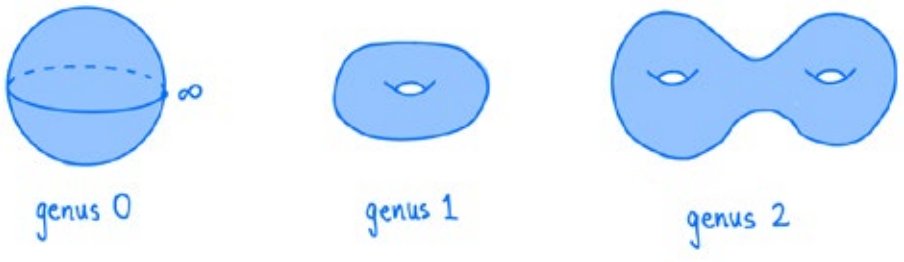
In the late 1800s, Brill and Noether developed a dimension-counting argument that suggested an answer to this second question. This heuristic predicts that a curve of genus g should have a degree d map to $\mathbf{P}^r$ if and only if

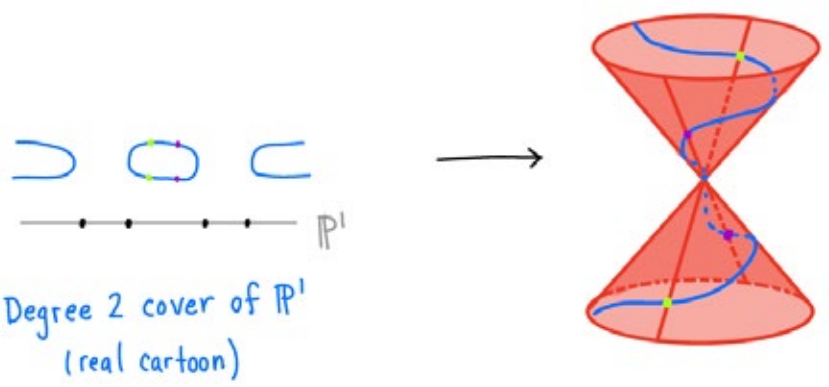
$$\rho(g,r,d) := g-(r+1)(g-d+r) \geq 0.$$

Now, there are curves that do not obey this rule, but Brill and Noether conjectured that it should at least hold for ``most'' curves of genus $g$. This conjecture was proved by Griffiths and Harris in 1980 and is now called the *Brill-Noether theorem*. Combined work of several mathematicians in the 1970s and 1980s describes the space parameterizing degree $d$ maps to $\mathbf{P}^r$ for ``most'' curves in more detail: it is smooth of dimension $\rho(g,r,d)$, irreducible when $\rho(g,r,d) > 0$, and the number of maps is known when $\rho(g,r,d) = 0$. Finally, the *Embedding*



A degree 2 cover of P^1





A concrete realization of splitting type (0,2) in P^3. Red lines join pairs of points in the same fiber (e.g. two purple points or two green points). The union of all such lines forms a surface called the scroll.

theorem of Eisenbud and Harris says that when $\rho(g, r, d) \geq 0$ and $r \geq 3$, a general degree d map $S \to \mathbf{P}^r$ is an embedding. (We expect a curve on a surface to have to cross over itself, but as soon as it goes into a three dimensional space, there is ``enough room" and it needn't cross back on itself.)

The Brill-Noether theorem is a great triumph in the modern study of curves. However, most curves we come across in real life already exist inside some projective space, and the mere fact that we can represent our curve in that way often means it is one of the special curves that fail the Brill-Noether theorem!

The first case of this is actually a slightly degenerate one: We don't quite represent a curve ``in $\mathbf{P}^1$", but a curve still has maps $S \to \mathbf{P}^1$, which are called *covers* (see picture). The degree of the cover is the number of points in a general fiber. If $\rho(g, 1, k) < 0$, equivalently $k < (g+2)/2$, then any curve that is a degree k cover of $\mathbf{P}^1$ is special and fails the Brill-Noether theorem. The space parameterizing degree k covers of $\mathbf{P}^1$ is called the *Hurwitz space*, so we call the problem of understanding the maps of these curves to other projective spaces *Brill-Noether theory over the Hurwitz space*.

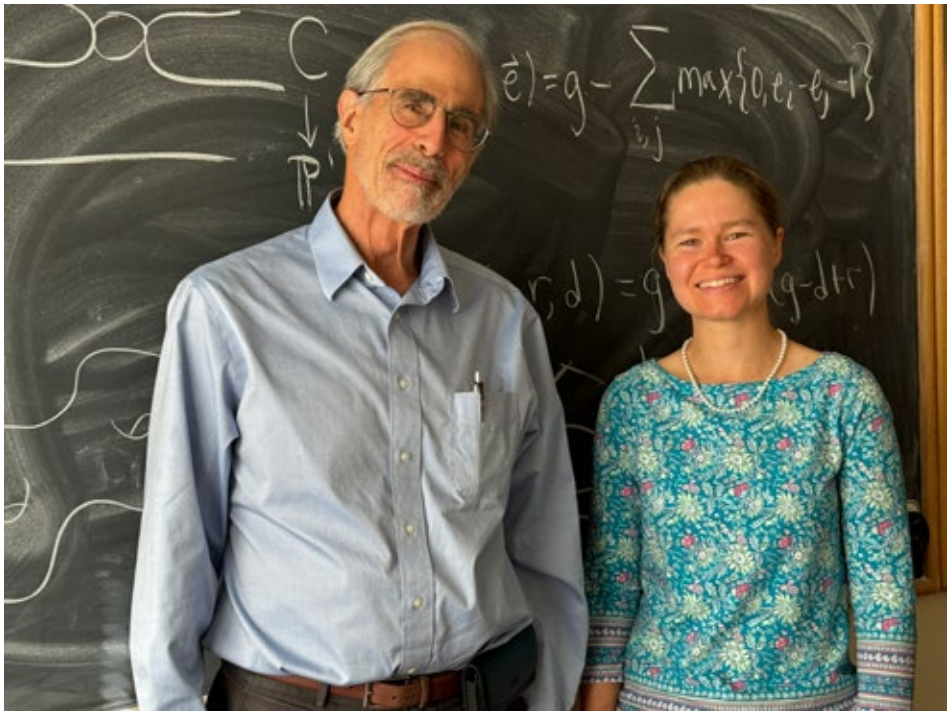
Several mathematicians in the 1990s and 2000s observed that the concrete realizations of these special curves in other projective spaces behave in unexpected ways: The space parameterizing degree d maps to $\mathbf{P}^r$ often has multiple components of varying dimensions. For a while, there seemed little hope of making sense of the zoo of components, but in my thesis, I discovered the importance of an invariant of these maps called the *splitting type* that explained this phenomenon. From that inspiration, and together with my collaborators, we have developed analogues of all the main results in classical Brill-Noether theory.

The splitting type is a tuple $\underline{e} = (e_1, \ldots, e_k)$ of k integers that describes a concrete realization of one of these special curves in some projective space. It is easy to recover the dimension r and degree d from $\underline{e}$—much like how one can recover a greyscale value from any color. A heuristic argument (vaguely analogous to Brill and Noether's) predicts that a general curve S that is a degree k cover of $\mathbf{P}^1$ should have a concrete realization of splitting type $\underline{e}$ if and only if

$$\rho'(g, \underline{e}) := g - \sum_{i,j} \max\{0, e_i - e_j - 1\} \geq 0.$$

I proved that the heuristic holds for general degree k covers $S \to \mathbf{P}^1$, and that the space of maps of splitting type $\underline{e}$ is smooth. Together with my collaborators Eric Larson and Isabel Vogt, we showed that if $\rho'(g, \underline{e}) > 0$, then the space parameterizing maps of splitting type $\underline{e}$ is irreducible. This explained the mystery of the different components of the space of maps: what was previously seen as many components of the same greyscale (same (r, d)) could now be seen as a union of irreducible components, each of a different color (type $\underline{e}$). Moreover, if $\rho'(g, \underline{e}) = 0$, so that there are finitely many maps of splitting type $\underline{e}$, we gave a combinatorial formula for the number of maps.

Finally, in joint work with Kaelin Cook-Powell, Dave Jensen, Eric Larson, and Isabel Vogt, we proved an analogue of the Embedding Theorem: General maps of splitting type $\underline{e}$ are embeddings so long as $r \geq 3$ (there is ``enough room" in the target space) and $\underline{e}$ has at least 3 non-negative parts.



Profs. David Eisenbud and Hannah Larson

Adventures in China

Emily Bain, PhD'23

I started my PhD in 2018, after spending a year in industry working for FiveAI, a self driving car startup in the UK. However, my undergrad and masters were in pure math, so after some exploration I ended up working under Nicolai Reshetikhin on dimer models in statistical mechanics, which is an interesting topic with elements of both pure and applied math, and offered opportunities to put my coding skills to practice. Then during my third year, having completed my coursework and qualification exams and beginning to make progress on my own research, my advisor hit me with a bit of a surprise. He told me how his whole life he had kept moving west, from the Soviet Union, to Boston to Berkeley, and then… he paused. Expecting him to say he was moving back to Russia. I was mildly horrified, and then relieved when he told me that no, he was moving to Beijing. Since I have lived in Mainland China before and can speak the language, this was an exciting prospect and I was happy to go along.

This turned out to be easier said than done given China's pandemic restrictions, but eventually (with the help of the Yau Mathematical Sciences Center) the Chinese consulate processed my visa, and I eventually made it to China and out of the 14 day hotel quarantine. I spent the next 1.5 years doing research at YMSC, Tsinghua University, and completed the vast majority of my PhD there. Having gotten a solid grounding in the relevant areas of mathematics at Berkeley, I did not need to take courses, and neither did I need to teach, which meant lots of time to do my own research, and also to travel.

One of many memorable travels was a winter trip to Sanya. This was courtesy of my advisor and Professor S. T. Yau, who had organized a small conference in Hainan (the Hawaii of China). I actually missed much of the conference because I was sailing in Xiamen, but I spent 10 days at the center afterwards with my advisor, doing my research in an almost abandoned but absolutely huge conference building that I only accidentally got locked inside once. The center had a swimming pool, and all meals were included. I did sometimes leave, mostly to do watersports. I even took my advisor and his colleague and his colleague Peng Shan sailing once, assuring them that there was not much wind and it would be chill, but I did not read the weather forecast very well – thankfully they enjoyed the more exhilarating kind of sailing too.

Hiking in Beijing, March 2022.

All in all, I had a lot of adventures, both good and bad, and I did enough work to have a relaxing final semester back in Berkeley. I'm very grateful to both Berkeley and YMSC for facilitating my adventures, and to Tsinghua University for the cheap but delicious food, and generally excellent campus.

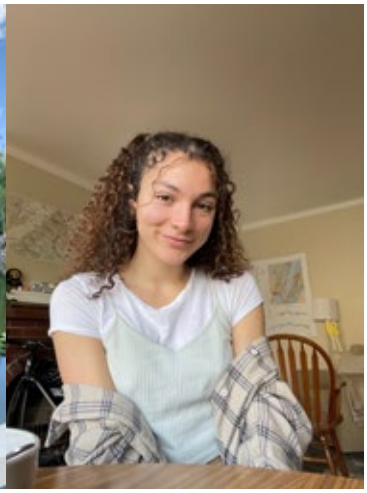
Below: During a recent visit to Beijing, Prof. Emeritus Reshetikhin, MPS Dean Steven Kahn, MPS Assistant Dean of Development Maria Hjelm, and MPS Director of Development Rachel Schafer met with department alumni.

Graduate Student Honors

- The 2022-23 Herb Alexander Prize for outstanding dissertations in pure mathematics was awarded to Hongyi Liu, Mitchell Taylor, Chi Cheuk Tsang, and Yuan Yao.
- Andrew Gitlin received the Kenneth Ribet & Lisa Goldberg Award in Algebra.
- Alex Burka, Jacopo Di Bonito, Nancy Eagles, Haya Halabieh, Connor Halleck-Dubé, Carlos Esparza, Mitsuki Hanada, Philip LaPorte, Vinh-Kha Le, Yixuan Li, Felicia Lim, Matthew Liu, Rose Lopez, Yelena Mandelshtam, Yuji Okitani, Lewis Pan, Amar Shah, Jeremy Taylor, Jiahao Yao, and Austin Zhu received 2022-23 Outstanding Graduate Student Instructor Awards.

New GSEIC Position

With generous support from the L&S Division of Mathematical and Physical Sciences, the Department introduced the position of Graduate Student Equity and Inclusion Coordinator (GSEIC) to support the Department's work on Equity and Inclusion in the graduate program. This position was held in Fall 2021 through Spring 2023 by Roy Zhao (now a postdoc at Caltech, pictured left) and in 2023-24 by Liza Jacoby (second year graduate student, right), who discuss their experiences and contributions in an email interview below with department manager Brian Underwood.



Q. What role do you think the GSEIC can play in our program?

Liza: Even in just one month of holding the position, I have been able to provide space for other graduate students to voice their concerns and have already begun implementing some solutions. The GSEIC serves as a faculty liaison for graduate students, advocating for those in our community who are most vulnerable. Without some sort of bridge between the faculty and graduate student spheres, many issues would never see the light of day, let alone be on the table of the faculty Equity and Inclusion Committee.

Roy: I think the important role of the GSEIC is the "C"-Coordinator. There are many staff members who are working on improving the department, as well as various graduate student organizations (URep, NRing, MGSA). It is important that everyone knows what everyone else is doing so that there are expectations of what events are being run by whom and no effort is duplicated or wasted. Moreover, the GSEIC should be aware of what the graduate students want and are asking for, and then work with the department so that those needs are addressed. I believe that this is how the GSEIC can tackle the Equity and Inclusion part of the title--making sure everyone's voice is heard and respected.

Q. What goals did you set for yourself in this role?

Roy: As the first holder of this position, one of my main goals was to set up the logistics and framework to support future GSEICs. Moreover, I wanted to make sure graduate students had various avenues to share their thoughts with the department, as well as the other way around. Lastly, I wanted to coordinate events to make sure that graduate students felt that they could trust the department and feel supported at Berkeley.

Liza: My major goals are gaining student and faculty trust, helping to reform the preliminary examination, and running programming that helps to instill the ideals of equitable mentorship; I really believe that I can use this opportunity to create lasting change in this department. My hope is to set an example for necessary systemic changes in the whole of academic culture.

Q. What are some of the initiatives and programs you worked on while GSEIC? How and why did you choose these initiatives/programs?

Roy: One of the major programs I worked on was a series of Community Action Meetings (CAMs). These were modeled after a successful program in the Physics department. These meetings were held every other month on a specific topic, such as teaching, advising, or funding. Members of the staff, faculty, postdocs, and graduate students were all invited to attend. Through small group discussion, wants and restrictions from each demographic could be navigated to hopefully find solutions that improve the department. These produced a list of proposals that it was up to the GSEIC to follow up on implementing, with the help of the department staff. These were envisioned to be collaborative efforts to bring together all members of the department, as opposed to the traditionally one-sided town halls.

Liza: Every month I [host] "grievance sessions"; the goal is to create a safe space for students to communicate the struggles they've been facing and the hurdles they've had to overcome in pursuing their degrees. We discuss as a group possible tangible solutions that I then present to the Equity and Inclusion Committee to directly address the concerns of students as they come.

Another main initiative of this school year is the Mentoring for Equity Conference coming up in January. I am working with Dr. Catherine Cannizzo, an NSF-Ascend postdoctoral fellow in our department, to run a workshop for faculty and graduate students on equitable practices in mathematics spaces. We are bringing Drs. Abbe Herzig and Aris Winger to host the workshop, as they have experience in running numerous successful workshops on justice, diversity, equity, and inclusion for mathematics educators. We aim to directly address issues raised by members of our community and to provide instructors with actionable steps to improve their mentorship practices.

Peer Advising Program

After a two-year hiatus, the undergraduate Mathematics Peer Advising Program is officially back with five outstanding peer advisors - Isabella Arcoleo, Audrey Guang, Kaya Poff, Daniel Tsan, and Leo Villani. The program is committed to creating innovative initiatives so that peers can effectively share their unique knowledge and build a vibrant community for students. For example, the group started a podcast titled "Dear My First-Year Self," reflecting on their experience as math students. While the program aims to improve the student community, it has also been a positive experience for the peers. They share more about their experience below:

Audrey: "After receiving so much encouragement, support, and advice from the rest of the Berkeley math community these past few years, I joined the peer advising team to pass on my experiences and help others find their support system in the math department!"

Daniel: "The Peer Advising program has allowed me to connect with the people of the math community at Berkeley. Not only can I share guidance and give direction to my peers, but I can learn from them and widen my perspective of mathematics thanks to them."

Isabella: "Since becoming a peer advisor, I have become more connected to the math undergrad community, more confident in my ability to help others, and more self-assured of my place in the department. I am extremely grateful for the opportunity to learn from and offer advice to my peers and be an active math community member."

Kaya: "I joined the peer advising team because of my personal struggles to feel a sense of belonging in the math department at Berkeley. I figured that other math students must be experiencing these feelings of isolation. Since becoming a peer advisor, it has been so rewarding to be a part of other people's journey toward finding their place in the math community.

Leo: "Being a peer advisor has given me the opportunity to tell people what the do's and don'ts of the math major are. It also has made me somewhat known and connected on the 9th floor. Multiple people have said that they saw me on one of the fliers around Evans, which is always funny."

Below: Peer Advisors In front of Evans Hall

2023 Graduating PhDs

(with their advisors)

Emily L. Bain (Nicolai Reshetikhin)
Yonah Borns-Weil (Maciej Zworski)
Daniel O. Chupin (David Nadler)
Ravi K. Fernando (Martin Olsson)
Jorge Garza Vargas (Nikhil Srivastava, Dan-Virgil Voiculescu)
Andrew M. Gitlin (Sylvie Corteel)
Lauren C. Heller (David Eisenbud)
Magda L. Hlavacek (Mark Haiman, Matthias Beck)
Frederick Huang (Sylvie Corteel)
Irit Huq-Kuruvilla (Alexander Givental)
Jeffrey Kuan (Suncica Canic)
Hongyi Liu (Song Sun)
Kiran Luecke (Constantin Teleman)
Scott I. Mutchnik (Thomas Scanlon)
Kristina Nelson (Kenneth Ribet, Melanie Wood)
Eduardo Reyes (Ian Agol)
James J. Rowan (Daniel Tataru)
Mitchell A. Taylor (Daniel Tataru)
Nathaniel Thurston (David Gabai, Robion Kirby)
Chi Cheuk Tsang (Ian Agol)
Luya Wang (Michael Hutchings)
Yuan Yao (Michael Hutchings)
Roy Zhao (Martin Olsson, Xinyi Yuan)
Haotian Gu (Fraydoun Rezakhanlou, Xin Guo)
Andrew Shi (Per-Olof Persson, Matthew Zahr)
Jiaming Wang (Ming Gu)
Sridhar Ramesh (Thomas Scanlon)

Undergrad Honors

- The 2022-23 Department Citation was awarded to Miles Kretschmer .
- The 2022-23 Paul Chernoff Memorial Prize in Mathematics was awarded to Miles Kretschmer.
- Bryce Goldman, Haydn Gwyn, Jon William Hilery, Yuming Huang, Jacob Krantz, Choco (Tianyue) Li, Scott McIntyre, Mingze Yu, and David (Zhaoqi) Zhu received the Dorothea Klumpke Roberts Prize in Mathematics.
- Eshaan Bhansali, Catherine (Siyu) Gai, Jack Hale, Selena Li, Vishal Raman, Christopher Randall, Nate Tausik, and Tom Zhang received the Percy Lionel Davis Award for Excellence in Scholarship in Mathematics.
- Rohith Sajith was a finalist for the university medal.
- J Preston Fu, Andrew Huang, Theodore Lysek, and Jianzhi Wang were ranked between 100 and 200 at the 83nd Annual Putnam Competition. UC Berkeley's Team received an honorable mention.

Staff News

Christian Natividad & Clay Calder

With a focus on community building, collaboration, and growth, this past year has been a highly productive and busy time for the Math Department Staff. During the Fall semester, the voluntary staff committee on Diversity, Equity, Inclusion, Belonging, Accessibility, and beyond ("DEIBA+") started a "Meet a Math Staff" program to provide opportunities for members of the math community to gather and learn more about our staff and their lives and interests outside of the department. The committee hosted two community-wide presentations starting with Marsha Snow's kick-off event showcasing her exceptional clothing design skills and the launch of her 70's influenced fashion line, and Zhanara Gallegos hosted a lunchtime event entitled, "Art, Food, and Affect", where she served up a delicious Paella to more than 120 members of the math community. In addition to these community-wide events, the committee also organized several staff-specific lunchtime events including presentations on Turkish Coffee Making & Tradition (by Alev Hatay), Cambodian Rock n' Roll (by Siti Keo), The Journey from Acoustic to Electric Guitars (by Brian Underwood), and Mochi (by Jasan Fujii).

Zhanara Gallegos serves Paella to Students. Art, Food, and Affect, March, 2023.

With the start of the Spring semester, we were excited to welcome two new Graduate Student Administrative Officers ("GSAO") to the department with Clay Calder joining us in January, and Christian Natividad joining us in February. Both worked previously on campus and prior to joining the Department of Mathematics, Clay was an academic advisor on the degrees team with the Graduate Division, and Christian was a graduate advisor for the Department of Physics. They have been a wonderful addition to our program and we are grateful to have them working with us.

During this past year, we had one staff departure: Jon Phillips, GSAO, accepted a position in November 2022 with the School of Journalism as an Academic Personnel Analyst.

The department staff is made up of many exceptional and high achieving individuals, and we were overjoyed to recognize and celebrate the math staff recipients of Specific Project or Task awards ("SPOT") through the campus Staff Appreciation and Recognition Award Program ("STAR"): Thomas Brown, Cecilia Coca, Brandon Eltiste, Jasan Fujii, Zhanara Gallegos, Amy Gonsalves, Alev Hatay, Siti Keo, Vicky lee, Marsha Snow, and Hahn Tran. Additionally, Department Manager, Brian Underwood, received a Chancellor's Outstanding Staff Award ("COSA") in June for his work in the department.

—Brian Underwood, Department Manager

Left: Staff, students, and friends model Marsha Snow's fashion line.

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MATHEMATICS + BERKELEY

Fall 2023 newsletter

Entering class of graduate students in Mathematics and Logic, 2023 (Photo: Vicky Lee)

A Note on Strategic Priorities

The Department of Mathematics is working hard to maintain its excellence in all aspects of research and education and to bridge the resource gap that separates us from our better-funded peers. For this we continue to rely on donations from alumni and friends of the department. Here are some of the department's current top priorities:

- Graduate Student Fellowships are needed to enable the department to make competitive, attractive offers to the very strongest applicants to our graduate program, who are often being lured by our private peers with offers of higher stipends and lower teaching loads.
- Endowed Faculty Chairs and Endowed Postdocs are needed in order to improve the department's ability to make competitive offers for the recruitment and retention of world-class faculty and postdocs.
- Research Visitor Funds make it easier to invite high-profile visitors to come to Berkeley to deliver lectures in our department or collaborate with our faculty. These intellectual exchanges are of tremendous value to our research and education.

Besides these specific goals, we welcome gifts to the department's discretionary fund, which give the Chair of the department much-needed flexibility in funding graduate student recruitment, parts of the faculty recruitment process, research travel for graduate students, and many other initiatives that make our program competitive and rewarding. Undergraduate Research Fellowships are needed to enable undergraduate students to participate in summer research groups with faculty, postdocs, and graduate students.

We invite you to join us in keeping UC Berkeley Mathematics strong through your gifts to the department. All donations, large or small, are greatly valued. You may choose whether to direct your gift toward a specific goal of your choice or to have your donation used for our most pressing needs at the department's discretion.

For further information, please contact Associate Development Director Ryan Guasco, email: rguasco@berkeley.edu or Department of Mathematics Chair Prof. Martin Olsson, e-mail: chair@math.berkeley.edu.

Newsletter Contributors: *Editors:* Martin Olsson and Nikhil Srivastava. Thanks to Melanie VandenBerghe, Vicky Lee, and Brian Underwood. *Photography:* George Bergman, Meghan Long.

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