



2021 Levi L. Conant Prize

Dan Margalit was awarded the 2021 Levi L. Conant Prize at the Annual Meeting of the AMS, held virtually January 6–9, 2021.



Dan Margalit

Citation

The 2021 Levi L. Conant prize is awarded to Dan Margalit for the article “The Mathematics of Joan Birman,” *Notices of the American Mathematical Society* 66 (2019), 341–353.

Joan Birman’s work spans several interconnected areas of algebra, low-dimensional geometry, topology, and dynamics. She has made key contributions and opened up new areas of research in many directions,

from braid groups to geometrization and Lorenz attractors. Her work underpinned two Fields medals (Jones and Mirzakhani) and set the stage for the acclaimed work of Johnson (on Torelli groups) and Ghys (on Lorenz knots). Her work continues to be hugely influential to this day.

Margalit’s article, in just ten pages, conveys the breadth and depth of her mathematics. It starts with basic objects in low-dimensional topology (knots, braids, surfaces, and 3-manifolds), introducing them in an accessible manner and using elementary motivating problems (how to distinguish two knots) as a vehicle for introducing larger questions and more advanced areas of research (e.g., the subtleties of the conjugacy problem for braid groups). The author identifies the common themes and interconnections among these objects.

Birman’s best known and most cited works are included here, along with interesting yet often overlooked details about them, such as the fact that her classic text *Braids, Links, and Mapping Class Groups* contains the first complete proof of what is known as Markov’s Theorem. The article also highlights some of Birman’s key contributions that are perhaps less widely known, such as her work with Williams on Lorenz attractors and its connections with Thurston’s

theory of 3-manifolds. The illustrations (by David Dumas, Shane Scott, and Thierry Dugnonolle) are well chosen, helpful, and intuitive.

Margalit’s portrait of Birman shows a visionary mathematician who was often ahead of her time, forged her own paths, and followed “her own vision, interests, and curiosity” while simultaneously building bridges across disciplines through highly productive collaborations. The author takes a long view, highlighting the significance of Birman’s work in ways that are only possible in a major retrospective. He chooses to provide an overview of Birman’s career that focuses exclusively and deservedly on her mathematics rather than on her nontraditional career trajectory. He tells a coherent and engaging mathematical story, offering a broad perspective on these topics, but also bringing a highly detailed knowledge of them to the front as needed. Readability and accessibility are never compromised, so that the article could also serve as an excellent introduction to a wide variety of topics in these areas of mathematics.

Biographical Sketch

Dan Margalit grew up in Flanders, New Jersey, the son of two Israeli immigrants. He received his ScB in Mathematics from Brown University in 1998 and his PhD in Mathematics from the University of Chicago in 2003 under the direction of Benson Farb. He was on the faculty at the University of Utah and Tufts University before coming to Georgia Institute of Technology, where he became professor in 2016. Margalit’s mathematical interests generally fall under the heading of geometric group theory, with particular focus on surfaces, braids, and complex dynamics.

Margalit is on the editorial boards at *Algebraic and Geometric Topology* and *Advances in Mathematics*. He has written a book, *A Primer on Mapping Class Groups*, with Benson Farb, has coedited a book, *Office Hours with a Geometric Group*

Theorist with Matt Clay, and has written an online textbook, *Interactive Linear Algebra*, with Joe Rabinoff.

Margalit received a Sloan Research Fellowship in 2009 and a National Science Foundation CAREER Award in 2010. In 2016, he was the inaugural recipient of the Leddy Family Faculty Fellowship in the Georgia Tech College of Sciences. Margalit was elected as a Fellow of the American Mathematical Society in 2019 “for contributions to low-dimensional topology and geometric group theory, exposition, and mentoring.”

Margalit’s interests outside of mathematics include guitar, hiking, and juggling. He is married to Kathleen Margalit and they have two children, Lily and Simon.

Response from Dan Margalit

I am honored to receive the 2021 Levi L. Conant Prize. I would like to thank the AMS for recognizing my article with this award. I would also like to thank Dorothy Buck and Erica Flapan for inviting me to write the article for the *Notices*.

I am grateful to David Dumas and Shane Scott for the illustrations that they made. I would also like to thank Tara Brendle, Benson Farb, Justin Lanier, and Kevin Wortman for their invaluable feedback and suggestions, which greatly improved the quality of the article.

I first met Joan Birman in March 2002 at an AMS Special Session at the University of Michigan. She introduced herself and told me that she had missed my talk. She said that she heard it was good, and so she wanted to know if I would like to visit her at Columbia to speak in their topology seminar. This was a pivotal moment in my career. That such an esteemed mathematician took interest in my work gave me confidence and hope that I did not have before.

I met Joan at many conferences afterward, and often I spotted her encouraging another young mathematician during the breaks between talks. While my article was about the impact of Joan’s mathematical work, her humanity toward the younger generations of mathematicians has had an equally important and far-ranging impact.

Eventually, Joan and I became close colleagues and frequent travel partners, sharing a train to Aarhus, an airport shuttle to Banff, a car ride to the University of Georgia, and on and on. Through our conversations about family, politics, our careers, our shared religion, and (of course) mathematics, we developed a deep kinship. As a close friend, I am especially honored and grateful to have been able to shed more light on her remarkable career.

I have been lucky to have had mentor/friends like Joan throughout my journey as a mathematician. Thomas Banchoff, my undergraduate mentor, showed me the beauty and wonder of mathematics. Benson Farb, my graduate advisor, is a constant source of inspiration, mathematical and otherwise. Mladen Bestvina, my postdoc advisor, expanded my abilities and horizons in many ways. I am grateful to all of my mentors for believing in me, caring for me, and investing in me.

To close, I would like to thank my family. My parents, Batya and Zamir, sacrificed endlessly so their children could realize their dreams. My brother, Ron, and my sister, Thalia, are constant sources of love, support, and direction. Finally, my wonderful wife, Kathleen, and our two beautiful children, Lily and Simon, support me with love and provide me with purpose. I love you and am grateful to you all.

About the Prize

The Levi L. Conant Prize is awarded annually to recognize an outstanding expository paper published in either the *Notices of the AMS* or the *Bulletin of the AMS* in the preceding five years.

Established in 2001, the prize honors the memory of Levi L. Conant (1857–1916), who was a mathematician at Worcester Polytechnic Institute. The prize carries a cash award of US\$1,000.

The Conant Prize is awarded by the AMS Council acting on the recommendation of a selection committee. The selection committee members for the 2021 Conant Prize were:

- Frank Calegari
- Izabella J. Laba, Chair
- Rafe Mazzeo

A list of the past recipients of the Levi L. Conant Prize can be found at https://www.ams.org/prizes-awards/pabrowse.cgi?parent_id=29.

Credits

Photo of Dan Margalit is courtesy of Joseph Rabinoff.