

Curriculum Vitae — Tamás Kálmán

Contact Information

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Personal Information

Born on April 29, 1975 in Budapest. Hungarian citizen, married, father of two.

Language Ability

English and Hungarian: fluent. Japanese: intermediate.

Research Interests

Geometric topology, contact and symplectic geometry, the Floer theory of holomorphic curves (MSC 53, 57, 58). Knot theory (classical and Legendrian). Graph, hypergraph, and polymatroid theory (MSC 05, 52).

Professional Experience

2022–	Principal Investigator, World Premier International Research Center for Sustainability with Knotted Chiral Meta Matter, Hiroshima University
2018–2019	Visiting Associate Professor, Massachusetts Institute of Technology, Department of Mathematics
2013–	Associate Professor, Tokyo Institute of Technology, Department of Mathematics
2010–2013	Assistant Professor, Tokyo Institute of Technology, Department of Mathematics and Global Edge Institute
2008–2010	Global Center of Excellence Visiting Assistant Professor, University of Tokyo, Graduate School of Mathematical Sciences
2007–2008	Japan Society for the Promotion of Science research fellow at the University of Tokyo (host: Takashi Tsuboi)
2004–2007	Assistant Professor (non-tenure-track), University of Southern California, Department of Mathematics
Summer 2005	Research fellow, Alfréd Rényi Institute of Mathematics, Budapest, Hungary

Education

- 1999–2004 Ph.D. in Mathematics
UNIVERSITY OF CALIFORNIA AT BERKELEY
Dissertation: Contact homology and one parameter families of Legendrian knots
Advisors: Michael Hutchings and Robion C. Kirby
- 1996–1999 High school Mathematics teaching certificate
EÖTVÖS LORÁND UNIVERSITY, Budapest, Hungary
- 1993–1998 B.S. in Mathematics
EÖTVÖS LORÁND UNIVERSITY, Budapest, Hungary
Thesis: Global singularity theory
Supervisor: András Szűcs

Grants

- 2023–2027 JSPS Grant-in-Aid for Scientific Research C, no. 23K03108
- 2017–2022 JSPS Grant-in-Aid for Scientific Research C, no. 17K05244
- 2013–2016 JSPS Grant-in-Aid for Young Scientists B, no. 25800037
- 2009–2012 JSPS Grant-in-Aid for Young Scientists B, no. 21740041
- 2007–2009 Grant-in-Aid for JSPS Fellows, no. 19-07029

Honors and Awards

- 2021 Tokyo Tech Education Award
- 2014 Tokyo Tech Challenging Research Award
- 2005 Géza Grünwald Memorial Prize of the János Bolyai Mathematical Society
- 1998 Outstanding Student of the Faculty of Natural Sciences, Eötvös University
- 1993 First Prize, Kürschák József Memorial Competition, Hungary

Memberships

- 2009– Mathematical Society of Japan
- 1999– American Mathematical Society
- 1993– János Bolyai Mathematical Society, Hungary

Publications

- *Degrees of interior polynomials and parking function enumerators* (with Lilla Tóthmérész), arXiv:2304.03221, submitted.
- *h^* -vectors of graph polytopes using activities of dissecting spanning trees* (with Lilla Tóthmérész), arXiv:2203.17127, submitted.

- *Ehrhart theory of symmetric edge polytopes via ribbon structures* (with Lilla Tóthmérés), arXiv:2201.10501, submitted.
- *Clock theorems for triangulated surfaces* (with Camden Hine), arXiv:1808.06091, submitted.
- *The sandpile group of a trinity and a canonical definition for the planar Bernardi action* (with Seunghun Lee and Lilla Tóthmérés), *Combinatorica* 42 (2022), suppl. 2, 1283–1316.
- *Ruling invariants for Legendrian graphs* (with Byung Hee An and Youngjin Bae), *J. Symp. Geom.* 20 (2022), no. 1, 49–97.
- *Root polytopes and Jaeger-type dissections for directed graphs* (with Lilla Tóthmérés), *Mathematika* 68 (2022), no. 4, 1176–1220.
- *Universal Tutte polynomial* (with Olivier Bernardi and Alexander Postnikov), *Adv. Math.* 402 (2022), article 108355.
- *Hypergraph polynomials and the Bernardi process* (with Lilla Tóthmérés), *Algebraic Combinatorics* 3 (2020), no. 5, 1099–1139.
- *Tight contact structures on Seifert surface complements* (with Daniel Mathews), *J. Topology* 13 (2020), no. 2, 730–776.
- *Root polytopes, parking functions, and the HOMFLY polynomial* (with Hitoshi Murakami), *Quantum Topol.* 8 (2017), no. 2, 205–248.
- *Root polytopes, Tutte polynomials, and a duality theorem for bipartite graphs* (with Alexander Postnikov), *Proc. London Math. Soc.* 114 (2017), no. 3, 561–588.
- *Legendrian knots and exact Lagrangian cobordisms* (with Tobias Ekholm and Ko Honda), *J. Eur. Math. Soc.* 18 (2016), no. 11, 2627–2689.
- *A version of Tutte’s polynomial for hypergraphs*, *Adv. Math.* 244 (2013), no. 10, 823–873.
- *Sutured Floer homology and hypergraphs* (with András Juhász and Jacob Rasmussen), *Math. Res. Lett.* 19 (2012), no. 6, 1309–1328.
- *Inner products on the Hecke algebra of the braid group*, *Topology Appl.* 158 (2011), no. 5, 643–646.
- *Meridian twisting of closed braids and the Homfly polynomial*, *Math. Proc. Camb. Phil. Soc.* 146 (2009), no. 3, 649–660.
- *Isotopies of Legendrian 1-knots and Legendrian 2-tori* (with Tobias Ekholm), *J. Symp. Geom.* 6 (2008), no. 4, 407–460.

- *Rulings of Legendrian knots as spanning surfaces*, Pacific J. Math. 237 (2008), no. 2, 287–297.
- *Maximal Thurston–Bennequin number of +adequate links*, Proc. Amer. Math. Soc. 136 (2008), no. 8, 2969–2977.
- *Braid-positive Legendrian links*, Int. Math. Res. Not. 2006, Art. ID 14874.
- *Contact homology and one parameter families of Legendrian knots*, Geom. Topol. 9 (2005), 2013–2078.
- *On double points of immersed surfaces* (with András Szűcs), Proc. of the János Bolyai Math. Society 8th International Topology Conference (Gyula, 1998); Topology Appl. 123 (2002), no. 1, 131–134.
- *Stable maps of surfaces into the plane*, Topology Appl. 107 (2000), no. 3, 307–316.

Professional Service

2013	Co-organizer of the workshop “Riemann surfaces and Discontinuous groups 2013” (Osaka, January 12–14, 2013)
2012	Co-organizer of the “Winter School on Low-dimensional topology” (Sugadaira, December 10–14, 2012) Co-organizer of the Seventh Pacific Rim Complex Geometry Conference (Kyoto, August 6–10, 2012) Co-organizer of the conference “Tokyo Workshop on Low-dimensional Topology” (Tokyo, March 19–23, 2012)
2010	Co-organizer of the Fifth Pacific Rim Conference on Complex and Symplectic Geometry (Nagoya and Ise, July 26–30, 2010) Co-organizer of the conference “Knots, Contact Geometry, and Floer Homology” (Tokyo, May 24–28, 2010)
2006–2007	Colloquium organizer of the USC Department of Mathematics
2005–2006	Organizer of the Geometry/Topology seminar at USC
2005–	Reviewer for Mathematical Reviews and referee for various journals
1997–1998	Secretary of the organizing committee of the Kürschák József Memorial Competition for high school students, Hungary

Teaching ExperienceLecture courses given*in Japan* (at the Tokyo Institute of Technology):

for graduate students: Knots and holomorphic curves (Morse–Witten theory, Lagrangian intersections, Chekanov–Eliashberg homology, Heegaard Floer theory); many times in various versions
Differential Topology

for undergraduates, all in Japanese: Linear Algebra I (five times) and II (twice)
Calculus I and II (twice)
Algebraic Topology
Set Theory and Metric Spaces (four times)

in the United States (mostly at the University of Southern California):

upper division (third and fourth year students) Vector Analysis and Introduction to Differential Geometry
Geometry and Transformations
Complex Analysis (at UC Berkeley)

lower division (first and second year students) Linear Algebra and Linear Differential Equations (twice)
Calculus I (twice)
Calculus II (three times)
Calculus III (three times)

Exercise classes conducted

at TIT: Linear Algebra and Differential Calculus (twice)
General Topology

at UC Berkeley: Linear Algebra (upper division)
Calculus I (twice)
Calculus II (twice)
Linear Algebra and Differential Equations

at Eötvös University: Geometry (three semesters)
Topology problem solving seminar

PhD students

2021 Keita Nakagane, *Quantum link invariants and full twists*
2020 Keiju Kato, *Polynomial invariants of knots and graphs*
2017 Kouki Sato, *Knot concordance in general 4-manifolds*

Talks – 2023

The unreasonable effectiveness of ribbon structures, at the conference on Characteristic polynomials of hyperplane arrangements and Ehrhart polynomials of convex polytopes, Kyoto University, in February 2023

– 2021 –

Floer homology, the HOMFLY polynomial, and combinatorics, in Le séminaire Topologie, Géométrie et Algèbre, University of Nantes, France (online), in March 2021

– 2020 –

Floer homology, the HOMFLY polynomial, and combinatorics, in the Australian Geometric Topology Webinar (online), in September 2020

Clock theorems for triangulated surfaces, at the Intelligence of Low-dimensional Topology conference, Kyoto University (online), in May 2020

Tight contact structures on Seifert surface complements, at the Knot Theory on Okinawa mini-symposium, Okinawa Institute of Science and Technology, in February 2020

– 2019 –

The Homfly polynomial, Floer homology, and combinatorics, at the Autumn Meeting of the Mathematical Society of Japan, Kanazawa University, in September 2019

Tight contact structures on Seifert surface complements, at the Spring Central and Western Joint Sectional Meeting of the American Mathematical Society, University of Hawaii, USA, in March 2019

Hypergraph polynomials and the Bernardi process, at the Spring Central and Western Joint Sectional Meeting of the American Mathematical Society, University of Hawaii, USA, in March 2019

Floer homology and the HOMFLYPT polynomial, at the Massachusetts Institute of Technology, USA, in February 2019

Tight contact structures on Seifert surface complements, at Boston College, USA, in January 2019

– 2018 –

Tight contact structures on Seifert surface complements and knot invariants, at Brandeis University, USA, in December 2018

Ribbon structures and dissections of root polytopes, at Brown University, USA, in November 2018

Ribbon structures and dissections of root polytopes, at Brandeis University, USA, in October 2018

Hypergraph polynomials and the Bernardi process, at the Massachusetts Institute of Technology, USA, in October 2018

Tight contact structures on Seifert surface complements, at the University of Nantes, France, in June 2018

Tight contact structures on Seifert surface complements, at the University of Tokyo in April 2018

Tight contact structures on Seifert surface complements, at the Workshop on Contact Structures, Singularities, Differential Equations and Related Topics held at Kanazawa University in January 2018

– 2017 –

The Homfly polynomial, Floer homology, and contact structures, at the Center for Geometry and Physics, POSTECH, South Korea, in May 2017

The Tutte polynomial, hypergraphs, and duality, at Monash University, Australia, in March 2017

The Homfly polynomial, Floer homology, and contact structures, at Monash University, Australia, in March 2017

The Homfly polynomial and Floer homology, at the Twelfth East Asian School of Knots and Related Topics, held at the University of Tokyo in February 2017

– 2016 –

The Homfly polynomial and Floer homology, at Uppsala University, Sweden, in September 2016

A new look at the Tutte polynomial, at the 3rd Uppsala–Tokyo Tech Joint Symposium, held at Uppsala University, Sweden, in September 2016

Hypergraph polynomials, at Cornell University, USA, in March 2016

Hypergraph polynomials, at Tohoku University in January 2016

– 2015 –

Hypergraph polynomials, at the 2nd Uppsala–Tokyo Tech Joint Symposium, held at the Tokyo Institute of Technology in November 2015

Parking functions and knot invariants, at the Tokyo Institute of Technology in January 2015

– 2014 –

Computing Homfly coefficients from Floer homology, at Boston College, USA, in January 2014

Polynomial invariants of bipartite graphs and hypergraphs, at the Massachusetts Institute of Technology, USA, in January 2014

– 2013 –

Relating Jones-type and Ozsváth-Szabó-type knot invariants, at the Institut Mathématiques de Jussieu, Paris, France, in March 2013

– 2012 –

Relating Jones-type and Ozsváth-Szabó-type knot invariants, at the Rényi Institute of Mathematics, Budapest, Hungary, in August 2012

Relating Jones-type and Ozsváth-Szabó-type knot invariants, at the Seventh Pacific Rim Complex Geometry Conference, Kyoto University, in August 2012

– 2011 –

A new type of combinatorics in knot theory, at the conference “Circle valued Morse theory and Alexander invariants,” the University of Tokyo, in November 2011

Tutte's polynomial for hypergraphs and polymatroids, at the Fall Southeastern Section Meeting of the American Mathematical Society, Wake Forest University, Winston-Salem, North Carolina, USA, in September 2011

A new type of combinatorics in knot theory, at the Fall Southeastern Section Meeting of the American Mathematical Society, Wake Forest University, Winston-Salem, North Carolina, USA, in September 2011

A new type of combinatorics in knot theory, at the Rényi Institute of Mathematics, Budapest, Hungary, in August 2011

A new kind of combinatorics in knot theory, at the Tokyo Institute of Technology in June 2011

Hypergraphs, polymatroids, and their Tutte polynomials, at the Massachusetts Institute of Technology, USA, in March 2011

– 2010 –

Heegaard Floer homology and the Homfly polynomial, at Hiroshima University in November 2010

Heegaard Floer homology and the Homfly polynomial, at the workshop “Foliations and Groups of Diffeomorphisms,” Tambara Institute of Mathematical Sciences, The University of Tokyo, in October 2010

Heegaard Floer homology and the Homfly polynomial, at the University of Southern California, USA in October 2010

Heegaard Floer homology and the Homfly polynomial, at the Rényi Institute of Mathematics, Budapest, Hungary in August 2010

Legendrian knots and exact Lagrangian cobordisms, at the Fifth Pacific Rim Complex and Symplectic Geometry Conference, Nagoya University, in July 2010

Extremal coefficients in the Homfly polynomial, at the Tokyo Institute of Technology in May 2010

Hypergraphs, Tutte polynomials, and lattice polytopes, at the Ikuta Seminar on Toric Topology, Meiji University, in March 2010

– 2009 –

Extremal coefficients in the Homfly polynomial, at Cambridge University, UK in November 2009

Extremal coefficients in the Homfly polynomial, at the Rényi Institute of Mathematics, Budapest, Hungary in August 2009

Extremal coefficients in the Homfly polynomial, at the 56th Topology Symposium held at Hokkaido University in August 2009

The Kauffman polynomial and maximum Thurston–Bennequin number for knots, at the Tokyo Institute of Technology in July 2009

Rulings and Lagrangian caps of Legendrian knots, at the symposium “Topology and Singularity of Mappings,” Shinshu University, in June 2009

Legendrian knots and contact homology mappings, at the conference “Symplectic topology, contact topology and applications,” Hokkaido University, in March 2009

Legendrian knots bounding Lagrangian surfaces, at the Workshop on Contact Structures, Singularities, Differential Equations and Related Topics held at Gifu University in January 2009

– 2008 –

Legendrian knots bounding Lagrangian surfaces, at the Ikuta International Workshop on Symplectic Geometry, Meiji University in December 2008

Lagrangian surfaces and oriented rulings of alternating knots, at the Tambara Institute of Mathematical Sciences in October 2008

Computation of contact homology invariants of positive braids, at the “Topology and Computer” workshop held at the Tokyo Institute of Technology in August 2008

Rulings and the maximal Thurston–Bennequin number of knots, at the University of Tokyo in May 2008

Contact homology and one parameter families of Legendrian knots, at the KOOK seminar, Osaka City University in May 2008

Rulings and the maximal Thurston–Bennequin number of knots, at Osaka City University in May 2008

The Homfly polynomial of braids with a full twist, at the Rényi Institute of Mathematics, Budapest, Hungary in March 2008

The Homfly polynomial of braids with a full twist, at the Fourth East Asian School of Knots and Related Topics, held at the University of Tokyo in January 2008

Legendrian knots bounding Lagrangian surfaces, at the workshop “Topics in Poisson Geometry and Mathematical Physics” held at Keio University in January 2008

– 2007 –

Contact homology and one parameter families of Legendrian knots, at Kyushu University in December 2007

Contact homology and one parameter families of Legendrian knots, at the Tokyo–Seoul Conference in Mathematics, University of Tokyo, in December 2007

Contact homology and one parameter families of Legendrian knots, at Keio University in October 2007

Legendrian knots bounding Lagrangian surfaces, at the Tambara Institute of Mathematical Sciences in September 2007

Contact homology and one parameter families of Legendrian knots, at Uppsala University, Sweden in July 2007

Legendrian knots bounding Lagrangian surfaces, at Pomona College, USA in April 2007

Contact homology and one parameter families of Legendrian knots, at the University of North Carolina at Chapel Hill, USA in April 2007

Legendrian knots bounding Lagrangian surfaces, at the University of Southern California, USA in April 2007

– 2006 –

Constructions of Legendrian knots, at Pomona College, USA in July 2006

Contact homology and one parameter families of Legendrian knots, at the University of California, Riverside, USA in March 2006

– 2005 –

Braid-positive Legendrian links, at the Rényi Institute of Mathematics, Budapest, Hungary in June 2005

Contact homology and one parameter families of Legendrian knots, at the Université du Québec à Montréal, Canada in April 2005

Contact homology and one parameter families of Legendrian knots, at Columbia University, New York, USA in February 2005

– 2004 –

Contact homology and one parameter families of Legendrian knots, at the University of Pennsylvania, Philadelphia, USA in November 2004

Braid-positive Legendrian links, at Bryn Mawr College, Pennsylvania, USA in November 2004

Contact homology and one parameter families of Legendrian knots, at Pomona College, California, USA in November 2004

Contact homology and one parameter families of Legendrian knots, at the University of Southern California, Los Angeles, USA in September 2004

Contact homology and one parameter families of Legendrian knots, at the Georgia Topology Conference (University of Georgia, USA) in August 2004

Contact homology and one parameter families of Legendrian knots, at the Clay Mathematics Institute's "Floer Homology, Gauge Theory, and Low Dimensional Topology" summer school (Rényi Institute, Budapest, Hungary) in June 2004

– 2003 –

Contact homology and one parameter families of Legendrian knots, at the University of California, Berkeley, USA in October 2003

– 2002 –

Legendrian circle fibrations, at the ICM Satellite Conference in Geometric Topology, Xi'an, China in August 2002

– 2000 –

Fold maps of surfaces into the plane, at UC Berkeley, USA in October 2000

Other

Aikido: black belt (4th dan).