Bjoern Muetzel

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Personal data

Low dimensional geometry and topology, systolic geometry, harmonic forms on surfaces, Teichmüller space.

Education

2011 **EPF Lausanne**, *Switzerland*, PhD in Mathematics,
Title: *Capacities, systoles and Jacobians of Riemann surfaces.*
Thesis supervised by Peter Buser and Eran Makover.

2006 **University of Marburg**, *Germany*, Diplom in Mathematics,
Title: *Minimal period length of Abelian varieties.*

2003 **Max Planck Institute for Evolutionary Anthropology, Leipzig**, Diplom in Biology,
Title: *Functional profiling of gene expression in the human and chimpanzee brain.*

Employment

2020– **Eckerd College**, Assistant Professor.

2015–2020 **Dartmouth College**, John Wesley Young Research Instructor, then Lecturer.

Summer 2014 **Karlsruhe Institute of Technology**, Germany, Postdoctoral Fellow.

2011–2013 **University of Montpellier 2**, France, Postdoctoral Fellow.

2006–2011 **EPF Lausanne**, Switzerland, Teaching Assistant.

Honors and Awards

2021 **Faculty Development Grant**, MathArt club.

2020 **WISP and UGAR Grant**, Women in Science Project,
Linear Games - educational study.

2019 **VeChain Grant**, Neukom Institute, Co-PI,
$9000, Security of verifiable delay functions.

CompX Faculty Grant, Neukom Institute,
$8000, Linear Games - games based on algorithms from Linear Algebra.

2011–2013 **Feodor-Lynen Postdoctoral Fellowship**, Alexander von Humboldt Foundation,
$108 000, since January 2014 member of the Alexander von Humboldt network.

Publications (by date of completion)

Mathematics

[11] Herrlich, F., Muetzel B. and Schmithüsen G.: *Systolic geometry of translation surfaces*, Exp. Math. (2022), doi:10.1080/10586458.2022.2108946.

[10] Buser P., Makover E., Muetzel B. and Silhol R.: *Energy distribution of harmonic 1-forms and Jacobians of Riemann surfaces with a short closed geodesic*, Math. Z. **297** (2021), 1899-1952.

[9] Gordon C., Webb D., Makover E. and Muetzel B.: *Transplantation and isogeny of intermediate Jacobians of compact Kähler manifolds*, Tohoku Math. Journal **72** (1) (2020), 127-147.

[8] Muetzel B.: *Length spectrum of geodesic loops in manifolds of non-positive curvature*, Journal of Geometry **109** (3), 43 (2018).

[7] Muetzel B.: *The Jacobian of a Riemann surface and the geometry of the cut locus of simple closed geodesics*, Ann. Acad. Sci. Fenn. Math. **42** (2017), 693-721.

[6] Akrout H. and Muetzel B.: *Construction of Riemann surfaces with large systoles*, Journal of Geometry **107** (2016), 187-205.

[5] Buser P., Makover E., Muetzel B. and Silhol R.: *Quasiconformal embeddings of Y-pieces*, Comput. Methods Funct. Theory **14** (2-3) (2014), 431-452.

[4] Massart D. and Muetzel B.: *On the intersection form of surfaces*, Manuscripta Mathematica **143** (1-2) (2014), 19-49.

[3] Muetzel B.: *Inequalities for the capacity of non-contractible annuli on cylinders of constant and variable negative curvature*, Geom. Dedicata **166** (1) (2013), 129-145.

[2] Muetzel B.: *A new lower bound for Hermite's constant for symplectic lattices*, Int. J. Number Theory **8** (4) (2012), 1067-1080.

[1] Muetzel B.: *On the second successive minimum of the Jacobian of a Riemann surface*, Geom. Dedicata **161** (1) (2012), 85-107.

submitted

[1] Buser, P., Makover, E. and Muetzel B.: *Short homology basis for hyperelliptic hyperbolic surfaces*, (2022), arXiv:2206.07213, submitted to Israel Journal of Mathematics.

in preparation

[2] Massart D. and Muetzel B.: *Algebraic intersection for Riemannian surfaces, (2022 -23)*.

[1] Akrout H. and Muetzel B.: *Construction of surfaces with large systolic ratio*, (2019), arXiv 1311.1449.

Biology

[3] Prüfer K., Muetzel B. et al.: *FUNC: a package for detecting significant association between ontological annotation and genomic data*, BMC Bioinformatics **8** (41) (2007).

[2] Khaitovich P., Weiss G., Lachmann M., Hellmann I., Enard W., Muetzel B. et al.: *A neutral model of transcriptome evolution*, PLoS Biology **2** (5) (2004), e132.

[1] Khaitovich P., Muetzel B. et al.: *Regional patterns of gene expression in human and chimpanzee brains*, Genome Research **14** (8) (2004), 1462-73.

Undergraduate Research and Mentoring

2020– **MathArt club**,
Engagement and mentoring of eight students in various mathart projects.

2019– **Undergraduate research**,
Carlson C. and Lit A.: *Harmonic functions on a certain planar domain*, 62 pages.

2019– **Software project**,
Linear Games, developed with two teams of students from the DALI Lab and a single student, www.math.dartmouth.edu/lineargames.

2018– **Outreach in geometry**,
Engagement and mentoring of students in a variety of outreach activities, http://natsci.eckerd.edu/~muetzeb@campus/outreach.php.

2018– **Exchange program in statistics in Europe**,
Arranged and organized summer internships for in total eight students and helped them to obtain funding. The internships were conducted at the following institutes:
- **INRA** Biostatistics and Spatial Processes, Avignon, *2019/20.*
- **British Antarctic Survey**, Cambridge, *2019.*
- **Wenner Gren Institute**, Department of Molecular Biosciences, Stockholm, *2019.*
- **Max Planck Institute** for Evolutionary Anthropology, Leipzig, *2018.*

Broader Impact

2021– **AR / VR initiative**,
Co-organizer of the initiative to establish a Virtual Reality lab on campus.

2019– **Math and Art**,
Exhibition of mirror solids and 3D models - photos and sculptures,
http://natsci.eckerd.edu/~muetzeb@campus/gallery.php.
- **Gathering for Gardner 14**, Atlanta, Georgia, *Apr 2022*
- JMM Art Exhibition, Joint Mathematics Meetings 2022, virtually, *Jan 2022*
- Arte e Scienza 2021, Art festival, Dipignano, Italy, *Sep 2021*
- Bridges Art Exhibition, Bridges 2021, virtually, *Aug 2021*
- JMM Art Exhibition, Joint Mathematics Meetings 2021, virtually, *Jan 2021*
- JMM Art Exhibition, Joint Mathematics Meetings 2020, Denver, Colorado, *Jan 2020*
- ICERM, Brown University - Illustrating Mathematics Program, *Sept - Dec 2019.*
Math poetry - limericks and fibs,
- **Bridges Poetry Session**, Bridges 2021, virtually, *Aug 2021*

2018– **Outreach - Geometry activities for children**,
- The Shirley Proctor Puller Foundation, St. Petersburg, *Jul 2022*
- Summer Science Splash Camp, Eckerd College, *Jun 2022*
- **St. Pete Science Festival**, co-organizer of Eckerd pavilion, virtually, *Oct 2021-*
- Hanover High School, *Jan 2020*
- NYC Math Festival, New York, *Aug 2019*
- **National Math Festival**, Washington, *May 2019*
- Crossroads Academy, Canaan Elementary School, *May 2019*
- **MoMath Family Night** in New York, BNL program in Long Island, *Dec 2018*
- Marion Cross School, Lyme School, *Sep 2018*
- Mount Lebanon School, Hanover Street School, Ray School, *May - June 2018*

Selected Presentations

2022 - *Short homology basis for hyperelliptic hyperbolic surfaces*, AMS Spring Eastern Virtual Sectional Meeting.

2021 - *Harmonic forms on pinched surfaces* , GAG seminar, College of William & Mary, Williamsburg.

2019   -*Energy distribution of harmonic 1-forms on Riemann surfaces with a short closed geodesic*, CUNY Graduate Center, New York.
  -*Build your own polyhedra*, Sonia Kovalevsky Day, Dartmouth College, Hanover.
  -*Platonic and Archimedean Solids*, Dartmouth Math Society, Dartmouth College, Hanover.
  -*Energy distribution of harmonic 1-forms on Riemann surfaces with a short closed geodesic*, Universidad de los Andes, Bogota, Colombia.

2018   - *Harmonic forms on surfaces - a visual approach*, Math Table, Harvard University, Boston.
  -*The Jacobian variety of Riemann surfaces with short simple closed geodesics*, geometry seminar, Humboldt University, Berlin, *Germany*.
  -*Collars, capacities and Uniformization of surfaces*, geometry seminar, Karlsruhe Institute for Technology, *Germany*.
  -*The Jacobian variety of Riemann surfaces with short simple closed geodesics*, Session on Differential Geometry, JMM 2018, San Diego.

2016   -*The Jacobian of Riemann surfaces with short simple closed geodesics*, VI Workshop on Differential Geometry, Cordoba, *Argentina*.

2015   -*The Jacobian of a Riemann surface and the geometry of the cut locus of simple closed geodesics*, geometry seminar, Dartmouth College.
  -*Construction of Riemann surfaces with large systoles*, geometry seminar, Dartmouth College.

2013   -*Construction of Riemann surfaces with large systoles*, differential geometry seminar, University of Freiburg, *Germany*.
  -*Construction of Riemann surfaces with large systoles*, Mathematical Colloquium, Karlsruhe Institute for Technology, *Germany*.

2012   -*Length spectrum of geodesic loops in manifolds of non-positive curvature*, seminar Gaston Darboux, University of Montpellier 2, *France*.
  -*Construction of surfaces with large systolic ratio*, differential geometry seminar, Max Planck Institute for Mathematics, Bonn, *Germany*.

▬ TEACHING

Lecturer

2015-   Teaching of a large variety of undergraduate courses including Calculus I-III, Linear Algebra and Statistics and graduate courses in Geometry and Complex Analysis.

Teaching Assistant

2014   Geometric group theory, *Summer*.

2006–2011   Calculus I and II for engineers.
Design and coding of online exercises for the courses in calculus and geometry.

2008-2009   Geometry for engineers, *Spring*.

▬ DEPARTMENT SERVICE

2021   **Member** of the computer policy group committee, Eckerd College.

2018-2020   **Co-organizer** and contributor to the course repository, Dartmouth College.

2017-2020   **Co-organizer** of the geometry seminar, Dartmouth College.

2016-2020   **Judge** for the poster session in applied and pure mathematics, Dartmouth College.

2010   **Organization** of the seminar 'Compact Riemann surfaces', EPF Lausanne.

Scholarly activities

2018– **Reviewer** for 'Complex Variables and Elliptic Equations'.

2017– **Panelist** for the Young Mathematicians Conference (Ohio State).

2014– **Reviewer** for Mathematical Reviews.

Languages

German - *mother tongue*, English - *fluent*, French - *very good*, Spanish - *good*, Latin - *good*, Russian - *beginner*.

References

John Voight, Dartmouth College, Hanover, *USA*

David Webb, Dartmouth College, Hanover, *USA*

Peter Buser, EPF Lausanne, *Switzerland*

Carolyn Gordon, Dartmouth College, Hanover, *USA*

Frank Herrlich, Karlsruhe Institute of Technology, *Germany*

Robert Silhol, University of Montpellier 2, *France*