

# Curriculum Vitae

Dmitry Zakharov

## Education

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- Ph.D., Columbia University, 2010  
Thesis: *The discrete Dirac operator and the discrete generalized Weierstrass representation in pseudo-Euclidean spaces*  
Advisor: Igor Krichever
- Specialist Degree in Physics, Honours Diploma, Moscow State University, 2005  
Undergraduate Thesis: *Periodic finite-gap densities for the acoustic operator via isoperiodic deformations*  
Advisor: Petr Grinevich
- Degree in Mathematics, Independent University of Moscow, 2006

## Employment

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- Associate Professor, Central Michigan University      September 2022—present
- Assistant Professor, Central Michigan University      July 2017—August 2022
- Visiting Assistant Professor, Courant Institute      September 2015—May 2017
- Courant Instructor, Courant Institute, NYU      September 2013—August 2015
- James H. Simons Instructor, Stony Brook      September 2010—August 2013
- Internship, Los Alamos National Laboratory      June 2004—August 2004

## Preprints

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- (1) Felix Röhrle, Dmitry Zakharov, *A matroidal perspective on the tropical Prym variety*, arxiv:2311.09872
- (2) Margaret Meyer, Dmitry Zakharov, *Chip-firing on graphs of groups*, arXiv:2307.03348
- (3) Arkabrata Ghosh, Dmitry Zakharov, *The Prym variety of a dilated double cover of metric graphs*, arXiv:2303.03904
- (4) Felix Röhrle, Dmitry Zakharov, *The tropical  $n$ -gonal construction*, arXiv:2210.02267
- (5) Martin Ulirsch, Dmitry Zakharov, *Tropical double ramification loci*, arXiv:1910.01499

## Publications

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- (1) Yoav Len, Martin Ulirsch, Dmitry Zakharov, *Abelian tropical covers*, to appear in Mathematical Proceedings of the Cambridge Philosophical Society, 2023
- (2) Emily Clader, Felix Janda, Xin Wang, Dmitry Zakharov, *Topological recursion relations from Pixton's formula*, Mich. Math. J. 73, 227-241, 2023
- (3) Andreas Gross, Martin Ulirsch, and Dmitry Zakharov, *Principal bundles on metric graphs: the  $GL_n$  case*, Adv. Math. 411, 108775, 2022

- (4) Yury Stepanyants, Dmitry Zakharov, and Vladimir Zakharov, *Lump interactions with plane solitons*, Radiophysics and Quantum Electronics, Vol. 64, No. 10, 665-680, 2022
- (5) Yoav Len and Dmitry Zakharov, *Kirchhoff's theorem for Prym varieties*, Forum Math. Sigma 10:e11, 1-54, 2022.
- (6) Dmitry Zakharov, *Zeta functions of edge-free quotients of graphs*, Lin. Alg. Appl. 629, 40-71, 2021
- (7) Charles Lester, Andrey Gelash, Dmitry Zakharov, Vladimir Zakharov, *Lump chains in the KP-I equation*, Stud. Appl. Math. 147.4, 1425-1442, 2021.
- (8) Dmitry Zakharov, Vladimir Zakharov, *Generalized primitive potentials*, Doklady Math. 101 (2), 117-121, 2020
- (9) Sergey Dyachenko, Patrik Nabelek, Dmitry Zakharov, Vladimir Zakharov, *Primitive solutions of the Korteweg-de Vries equation*, Theor. Math. Phys. 202 (3), 334-343, 2020
- (10) Patrik Nabelek, Dmitry Zakharov, Vladimir Zakharov, *On symmetric primitive potentials*, Journal of Integrable Systems 4 (1), xyz006, 1-20, 2019
- (11) Dmitry Zakharov, Vladimir Zakharov, *Non-periodic one-gap potentials in quantum mechanics*, Geometric Methods in Physics XXXV, 2018, 213-225.
- (12) Emily Clader, Samuel Grushevsky, Felix Janda, Dmitry Zakharov, *Powers of the theta divisor and relations in the tautological ring*, Int. Math. Res. Not. IMRN 2018, no. 24, 7725-7754
- (13) Dmitry Zakharov, Vladimir Zakharov, Sergey Dyachenko, *Non-periodic one-dimensional ideal conductors and integrable turbulence*, Phys. Lett. A 380, no. 46, 3881-3885, 2016
- (14) Dmitry Zakharov, Sergey Dyachenko, Vladimir Zakharov, *Bounded solutions of KdV and non-periodic one-gap potentials in quantum mechanics*, Lett. Math. Phys. 106 (2016) no. 6, 731-740
- (15) Sergey Dyachenko, Dmitry Zakharov, Vladimir Zakharov, *Primitive potentials and bounded solutions of the KdV equation*, Phys. D 333, 148-156, 2016
- (16) Federico Buonerba, Dmitry Zakharov, *Closed symmetric 3-differentials on complex surfaces*, European Journal of Mathematics, 2(4), 984-992, 2016
- (17) Izzet Coskun, Majid Hadian, Dmitry Zakharov, *Dense PGL-orbits in products of Grassmannians*, J. Algebra 429 (2015), 75-102
- (18) Samuel Grushevsky, Dmitry Zakharov, *The zero section of the universal semiabelian variety and the double ramification cycle*, Duke Math. J. 163 (2014), no. 5, 953-982
- (19) Samuel Grushevsky, Dmitry Zakharov, *The double ramification cycle and the theta divisor*, Proc. Amer. Math. Soc. 142 (2014), no. 12, 4053-4064
- (20) Dmitry Zakharov, *Weierstrass representation for discrete isotropic surfaces in  $\mathbb{R}^{2,1}$ ,  $\mathbb{R}^{3,1}$  and  $\mathbb{R}^{2,2}$* , Funct. Anal. Appl. 45 (2011), no. 1, 25-32
- (21) Igor Krichever, Dmitry Zakharov, *A note on critical points of integrals of soliton equations*, Anal. Math. Phys. 1 (2011), no. 1, 15-35

- (22) Dmitry Zakharov, *A discrete analogue of the Dirac operator and the discrete modified Novikov–Veselov hierarchy*, Int. Math. Res. Not. 2010, 18, 3463–3488
- (23) Dmitry Zakharov, *Isoperiodic deformations of the acoustic operator and periodic solutions of the Harry Dym equation*, Theor. Math. Phys. 153 (2007), no. 1, 1388–1397

## Grants

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- NSF grant DMS-1715323 “Spectra of Linear Differential Operators and Turbulence in Integrable Systems”.

## Seminar and Conference Talks

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### *Tropical Prym varieties*

- McMaster University, Colloquium, March 2023
- CMU Colloquium, October 2022
- Algebraic Geometry, Mathematical Physics, and Solitons, Columbia University, October 2022
- Goethe University Frankfurt, July 2022

### *Lumps and lump chain solutions of the KP-I equation*

- Krasnoyarsk Math Seminar “Mathematical Models and Integration Methods”, 2021
- IMACS Conference on Nonlinear Evolution Equations, Athens, GA, 2022
- University at Buffalo Applied Mathematics Seminar, 2022

### *Kirchhoff’s theorem and semi-canonical representatives for the tropical Prym variety*

- Trieste Algebraic Geometry Summer School, 2021
- Algebraic Geometry seminar, Ohio State University, 2020

### *Zeta functions of edge-free quotients of graphs*

- Algebra and Combinatorics seminar, Central Michigan University, 2020

### *Abelian tropical covers*

- Algebra seminar, Georgia Institute of Technology, 2019
- Algebraic Geometry seminar, University of Georgia, 2019

### *Maps to trees and loci in the moduli space of tropical curves*

- AIM workshop “Double ramification cycles and integrable hierarchies”, 2019
- Goethe University Frankfurt, 2019
- FRAGMENT Seminar, Colorado State University, 2019
- Algebraic Geometry Seminar, Courant Institute, 2019
- Geometry and Topology Seminar, University of Waterloo, 2018
- Algebra and Combinatorics Seminar, Central Michigan University, 2018

### *Pixton’s relations and vanishing in the tautological ring*

- Workshop on Geometry and Physics of Quantum Curves, Banff, 2018
- Goethe University Frankfurt, 2018
- Special Session on Algebraic and Combinatorial Aspects of Tropical Geometry, AMS Sectional Meeting at Ohio State University, 2018
- Geometry and Physics seminar, University of Michigan, 2017
- Seminar on Integrable Systems and Poisson Geometry, Michigan State University, 2017
- Algebraic Geometry seminar, UC Davis, 2017
- Algebraic Geometry seminar, Brown University, 2017
- Colloquium, Central Michigan University, 2017
- Algebraic Geometry seminar, Higher School of Economics, Moscow, 2016
- Colloquium, University of Arizona, 2016
- Algebraic Geometry seminar, New York University, 2016
- Algebraic Geometry seminar, Columbia University, 2016
- Georgia Summer Workshop in Algebraic Geometry, 2016

*Closed symmetric differentials on complex surfaces*

- Geometry and Physics seminar, University of Miami, 2016
- Algebraic Geometry seminar, University of South Carolina, 2015

*Bounded solutions of KdV and non-periodic potentials in quantum mechanics*

- Solitons, Collapses and Turbulence: Achievements, Developments and Perspectives, Yaroslavl, Russia, 2019
- Midwest Workshop in Asymptotic Analysis, Fort Wayne, 2016
- Math Physics Seminar, IUPUI, 2016
- Workshop on Moduli Spaces, Integrable Systems and Topological Recursion, CRM Montréal, 2016
- Colloquium, University of Central Florida, 2015
- Applied Mathematics seminar, SUNY Buffalo, 2015
- Statistical Mechanics seminar, Princeton University, 2015
- Statistical Mechanics seminar, University of Toronto, 2015
- 23rd International Colloquium on Integrable Systems, Prague, 2015
- SIAM Conference on Nonlinear Waves, Cambridge, 2014

*The Abel–Jacobi map and cycles on the moduli space of curves of compact type*

- Algebraic Geometry seminar, University of Utah, 2014
- Algebraic Geometry seminar, Yale University, 2013
- Algebraic Geometry and Number Theory seminar, Boston College, 2013
- AMS sectional meeting, Boston, 2013
- Workshop on Integrable Systems and Moduli Spaces, Banff, 2013

*Partial compactification of the zero section of the universal abelian variety*

- Simons Postdoctoral Fellows Meeting, Stony Brook, 2012

- Géométrie Algébrique en Liberté XX, Grenoble, 2012
- Algebraic Geometry seminar, New York University, 2012

*The discrete conformal Weierstrass representation*

- Special Session on Differential Geometry of Smooth and Discrete Surfaces in Euclidean and Lorentz Spaces, AMS Sectional Meeting at the University of North Texas, 2017
- Hausdorff Institute for Mathematics, 2012
- Nonlinear Evolution Equations and Dynamical Systems, 2012

*A discretization of the generalized Weierstrass representation*

- Indiana University—Purdue University, 2009
- 7th Conference on Differential Equations and Dynamical Systems, 2010
- Nonlinear Evolution Equations and Wave Phenomena, 2011

## Teaching

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### Central Michigan University

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|--|-------------|
| • Calculus III   | Fall 2022   |
| • Theory of Modules and Fields                           | Fall 2022   |
| • Pre-Calculus   | Spring 2022 |
| • Algebraic Topology                                     | Spring 2022 |
| • Calculus I   | Fall 2021   |
| • Introduction to Complex Variables                      | Fall 2021   |
| • Calculus II  | Spring 2021 |
| • Capstone in Mathematics                                | Spring 2021 |
| • Pre-Calculus   | Fall 2020   |
| • Calculus II  | Spring 2020 |
| • Linear Algebra   | Spring 2020 |
| • Introduction to Complex Variables                      | Fall 2019   |
| • Linear Algebra and Differential Equations (2 sections) | Fall 2019   |
| • Topics in Algebra: Algebraic Number Theory             | Spring 2019 |
| • Advanced Calculus II                                   | Spring 2019 |
| • Introduction to Complex Variables                      | Fall 2018   |
| • Advanced Calculus I                                    | Fall 2018   |
| • Topology   | Spring 2018 |
| • Calculus II  | Spring 2018 |
| • Calculus I   | Fall 2017   |

### New York University

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|---------------------------------|-------------|
| • Introduction to Number Theory | Spring 2017 |
| • Combinatorics                 | Spring 2017 |

- Calculus I Fall 2016
- Calculus III Fall 2016
- Differential Geometry Spring 2016
- Mathematics for Economics II Fall 2015
- Linear Algebra Spring 2015
- Honors Algebra I Fall 2014
- Mathematics for Economics I Spring 2014
- Calculus I Fall 2013

### **Stony Brook University**

- Foundations of Analysis Spring 2013
- Linear Algebra Spring 2013
- Differential Geometry of Curves and Surfaces Spring 2012
- Applied Algebra Fall 2011
- Calculus III with Applications Fall 2011
- Linear Algebra Spring 2011
- Calculus A Spring 2011
- Calculus B Fall 2010

### **Columbia University**

- Undergraduate Seminar: Topics in Complex Analysis Spring 2010
- Calculus III Summer 2010
- Calculus II Spring 2009
- Calculus I Fall 2008
- Undergraduate Seminar: Representations of Finite Groups Fall 2006
- Undergraduate Seminar: Proofs from the Book Fall 2006

## **Service**

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### **CMU Mathematics Department**

- Long Term Planning Committee (Spring 2018).
- Graduate Committee (2019-2023).
- Topology Qualifying Exam Committee (August 2018, January 2019, January 2020).
- Analysis Qualifying Exam Committee (August 2019, March 2020, August 2020, January 2021, August 2021, August 2022).
- Algebra Qualifying Exam Committee (January 2022).
- Prioritization Committee (Fall 2020).
- Special Events Committee (2020-2023).

- Awards and Scholarships Committee (2021-23).
- KME faculty mentor (2021-22).

### University

- Awards, Standards, and Honors Committee of the Academic Senate (2018-2021, chair in Fall 2020).
- CSE Scholarship Committee (2021-22).
- Off-Campus Academic Council (2021-22).

### Thesis committees

Masters Thesis Committee for Tanuj Gupta (Spring 2019), Benjamin Doyle (Spring 2022).

PhD Thesis Committee for Anirban Dawn (Spring 2021), Arkabrata Ghosh (Spring 2022).

### Service to Community

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- Lecturer at 7th Summer School “Algebra and Geometry”, Yaroslavl’, Russia, 2017
- Organizer of Topology, Analysis, and Geometry Seminar at Central Michigan University, 2017-2021
- Organizer of conference in Arithmetic Algebraic Geometry in honor of Fedor Bogomolov’s 70th birthday, NYU, August 29th-September 2nd 2016
- Organizer of Algebraic Geometry seminar at New York University, 2013-2017
- Mentor for summer Undergraduate Math Research at NYU, 2016
- Mentor for Undergraduate Student, 2016-2017
- Referee for *Physica D*, *Int. Math. Res. Not.*, *Math Research Letters*, *Adv. Math.*, *Eur. J. of Math.*, *Lett. Math. Phys.*, *Bulletin LMS*, *Geometry and Topology*, *Arnold Math. J.*, and *Proceedings AMS*.
- Reviewer for *Math Reviews*.
- Translator for *Theoret. and Math. Phys.*