Marcin Sroka

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Member of EMS Young Academy

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Scientific interests

In general: Differential Geometry, Geometric Analysis, PDEs and Pluripotential theory.

Some specific topics include: complex differential geometry (Kähler and hermitian manifolds, Calabi-Yau type theorems); existence and properties of special geometric structures (eg. related to quaternions, Calabi conjecture for quaternionic manifolds); geometrically motivated nonlinear PDEs of Monge–Ampère or more general Hessian type.

Education

- B.Sc. in mathematics, **with distinction**; Jagiellonian University, Cracow, Poland; 2012–2015

- M.Sc. in mathematics, **with distinction**; Jagiellonian University, Cracow, Poland; 2015–2017

- Ph.D. in mathematics, **with distinction**; Jagiellonian University, Cracow, Poland; 2017–2021, advisor: prof. Sławomir Kołodziej

Employment

- **research assistant**; Jagiellonian University, Cracow, Poland; 2019 - 2022

- **postdoctoral fellow**; Chalmers University of Technology, Göteborg, Sweden; spring semester (6 months) 02.2022-07.2022

- **postdoctoral fellow**; Centre interuniversitaire de recherches en géométrie et topologie (CIRGET), Centre de recherches mathématiques (CRM), Montréal, Canada; 2022-2024

- **assistant professor**; Jagiellonian University, Cracow, Poland; 2022 -

Research papers

1. M. Sroka, *Remarks on Hessian quotient equations on Riemannian manifolds*, preprint https://arxiv.org/abs/2501.03386

2. M. Sroka, *Sharp uniform bound for the quaternionic Monge-Ampère equation on hyperhermitian manifolds*, **Calc. Var. Partial Differential Equations**, 63, article number 102, 2024

3. S. Dinew, M. Sroka, *On the Alesker-Verbitsky conjecture on HyperKähler manifolds*, **Geom. Funct. Anal. (GAFA)**, 33(4), 875–911, 2023.

4. M. Sroka, *The C^0 estimate for the quaternionic Calabi conjecture*, **Adv. Math**, 70, Article 107237, 2020.

5. S. Kołodziej, M. Sroka, *Regularity of solutions to the quaternionic Monge-Ampère equation*, **J. Geom. Anal.**, 30(3), 2852–2864, 2020.

6. M. Sroka, *Weak solutions to the quaternionic Monge–Ampère equation*, **Anal. PDE**, 13(6), 1755–1776, 2020.

7. M. Sroka, *Existence of complex structures on decomposable Lie algebras*, **Univ. Iagel. Acta Math.**, 57, 25–58, 2020.

8. A. Czarnecki, M. Sroka, *Six-dimensional product Lie algebras admitting integrable complex structures*, **J. Pure Appl. Algebra**, 222, 1111–1125, 2018.

Grants

National Science Center of Poland (NCN) grant no. 2019/35/N/ST1/01372 (Preludium 18), *Geometric analysis on hyperhermitian manifolds*, PI, 2020–2023 (151 932 PLN)

National Science Center of Poland (NCN) grant no. 2020/36/T/ST1/00334 (Etiuda 8), *Nonlinear equations and hermitian geometry*, PI, 2020–2021 (150 696 PLN)

Honors, awards and fellowships

- The International Stefan Banach Prize for a Doctoral Dissertation in the Mathematical Sciences; Polish Mathematical Society; 2022

- Ministry of Science and Education of Poland Scholarship for outstanding young scientists; Minister of Science and Education of Poland; 2022-2025

- Rector of Jagiellonian University Prize; Jagiellonian University; 2021, 2024

- START fellowship, with distinction (5 out of 100); Foundation for Polish Science; 2021

- Kazimierz Kuratowski Award; Institute of Mathematics of the Polish Academy of Sciences and Polish Mathematical Society; 2021

- Polish Mathematical Society Prize for Young Mathematicians; Polish Mathematical Society; 2020

- Distinction in the competition for the Juliusz Schauder Prize for Young Mathematicians; Juliusz P. Schauder Center for Nonlinear Studies; 2020

- Award "Prominent research accomplishments achieved by young researchers"; Faculty of Mathematics and Computer Science of Jagiellonian University; 2020

- Michał Jakub Łysek Prize; Jagiellonian University; 2019

- Kartezjusz PhD fellowship; National Center for Research and Development of Poland; 2017 – 2021

- INdAM-DP-COFUND-2015 PhD fellowship; Istituto Nazionale di Alta Matematica Francesco Severi (INdAM); 2017 – 2020, declined

- Franciszek Leja Prize for the best student of mathematics of Jagiellonian University; Jagiellonian University; 2016

- Ministry of Science and Higher Education of Poland Scholarship; Minister of Science and Higher Education of Poland; twice: 2015, 2016

- First prize in LXI edition of Józef Marcinkiewicz contest for the best student's paper in mathematics; Polish Mathematical Society; 2018

- Third prize in LX edition of Józef Marcinkiewicz contest for the best student's paper in mathematics; Polish Mathematical Society; 2017

- Third prize in LIX edition of Józef Marcinkiewicz contest for the best student's paper in mathematics; Polish Mathematical Society; 2016

Conference and seminar talks

Joint Seminar of the Analysis, Geometry and Topology Department; Bulgarian Academy of Sciences; 22 October 2024; *Higher order estimates for Monge-Ampere type equations motivated by quaternionic geometry*

Complex analysis and elliptic PDEs; Jagiellonian University in Cracow; 11 December 2023; *On the real Hessian quotient equations on Riemannian manifolds*

Canadian Mathematical Society Meeting; CMS; Canada; 1–4 December 2023; *On the conjecture of Alesker-Verbitsky*

Geometric Analysis and Topology Seminar; NYU Courant Institute of Mathematical Sciences; 17 November 2023; *On the conjecture of Alesker-Verbitsky and some new geometric PDEs*

Informal Complex Geometry and PDE Seminar; Columbia University; 16 November 2023; *On the real Hessian quotient equations on Riemannian manifolds*

Postdocs at CRM Seminar (PACS); Centre de recherches mathématiques (CRM); 9 November 2023; *Demailly-Paun conjecture, Monge-Ampére equations and integro-differential bounds*

Geometric Analysis Seminar; McGill University; 3 October 2023; *Second order estimate for Monge-Ampère type equations on Riemannian manifolds*

Analytic Methods in Complex Geometry; University of Münster; Germany; 7–11 August 2023; *Fully nonlinear PDEs motivated by quaternionic geometry*

Complex analysis and elliptic PDEs; Jagiellonian University in Cracow; 22 and 29 May 2023; *Gradient estimate for complex equations*

International Banach Prize PTM Conference; IM PAN; Warsaw; Poland; 18–19 May 2023; *Geometry and Equations*

Differential Geometry, Mathematical Physics and PDE seminar; University of British Columbia; 28 March 2023; *Some real and complex fully nonlinear PDEs motivated by quaternionic geometry*

Geometric Analysis Seminar; McGill University; 8 February 2023; *Gradient estimates for complex PDEs*

Complex Analysis and Geometry Seminar; Rutgers University; 3 February 2023; *Complex Hessian non-Hessian equations*

Geometry and Topology Seminar; CIRGET, UQAM; 25 November 2022; *Monge-Ampère equation in hypercomplex geometry*

Geometric Analysis Seminar; McGill University; 16 November 2022; *On certain, geometrically motivated, Monge-Ampère type equation*

Informal Complex Geometry and PDE Seminar; Columbia University; 10 November 2022; *Complex methods for non-complex equations*

Polish Mathematical Society Mini-Conference; IM PAN; Warsaw; Poland; 02–03 June 2022; *Three fields, three geometries, three equations*

Seminar in Mathematical Modeling and Analysis; Umeå University; 4 May 2022; *Quaternionic PDEs*

KASS seminar; Chalmers University of Technology; 1 April 2022; *Monge-Ampère type equation on hypercomplex manifolds*

Algebra & Geometry seminar; University of New Mexico; 9 March 2022; *HKT from HK metrics*

Differential Geometry Seminar Torino; University and Technical University of Torino, 30 November 2021; *The conjecture of Alesker and Verbitsky under hyperKähler assumption*

Juliusz Schauder Prize for Young Mathematicians Webinar; Juliusz P. Schauder Center for Nonlinear Studies; 18 June 2021; *Geometrically motivated fully nonlinear PDEs*

Informal Complex Geometry and PDE Seminar; Columbia University; 22 April 2021; *The Monge-Ampère type equation related to quaternions*

Complex Analysis and Geometry Seminar; Florence University; 27 November 2019; *Hypercomplex Calabi-Yau's*

Fourth Central European Complex Analysis Meeting; Brno; Czech Republic; 07–09 November 2019; *Monge-Ampere equation over quaternions*

Jubilee Congress for the 100th anniversary of the Polish Mathematical Society; Cracow; Poland; 3–7 September 2019; *Monge-Ampère equation on hypercomplex manifolds*

Informal Geometry Workshop in "Paradiso"; Cogne; Itly; 22–24 January 2018; *Quaternionic Calabi Conjecture*

Differential Geometry; Bedlewo; Poland; 18–24 June 2017; *Integrable complex structures on some 6–dimensional Lie algebras*

Short research visits

University of Sofia and Bulgarian Academy of Sciences; host: S. Ivanov; 21–27 October 2024
NYU Courant Institute of Mathematical Sciences; host: V. Tosatti; 13–19 November 2023
Rutgers University; host: J. Song; 30 January – 5 February 2023
University of Florence; host: D. Angella; 22 November – 02 December 2019

Organizational experience

- A Conference in Honor of Slawomir Kolodziej on his 60th Birthday; Jagiellonian University; Cracow; Poland; 20–24 June 2022

- Postdocs at CRM Seminar (PACS); CRM; Montreal; Canada; 2023 - 2024

Teaching experience

Jagiellonian University, winter term 2017/2018, Formal Methods in Computer Science
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Jagiellonian University, winter term 2019/2020, Formal Methods in Computer Science
Jagiellonian University, winter term 2020/2021, Formal Methods in Computer Science
Jagiellonian University, winter term 2021/2022, Formal Methods in Computer Science
Jagiellonian University, winter term 2021/2022, Algebraic Methods in Computer Science
McGill University, winter term 2022/2023, MATH 236 - Algebra 2

McGill University, fall term 2023/2024, MATH 141 - Calculus 2
Jagiellonian University, winter term 2021/2022, Formal Methods in Computer Science
Jagiellonian University, winter term 2021/2022, Fully non-linear PDEs of eigenvalues

Teaching awards
Diamond chalk (main prize); Jagiellonian University; 2022
Diamond chalk (distinction); Jagiellonian University; 2019

Popularization of science
Jagiellonian Olympiad Workshops; *Linear (and multi-linear) algebra*; 19 October 2024, 23 November 2024, 14 December 2024, 18 January 2024, 8 February 2024
Mathematics Thursdays; *Couple words on the only solved millennium problem*; 5 Maj 2022
Jagiellonian Olympiad Workshops; *Partial differential equations*; 22 February 2020
Jagiellonian Olympiad Workshops; *Counting to infinity*; 5 January 2019
Gifted students workshop; *Number systems which you do not know*; 14 June 2018

Services

- Member of the European Mathematical Society Young Academy (2024–2027)

- Member of the Kazimierz Kuratowski Award jury (2024–2027)

- PhD thesis reviewer and committee member: Giovanni Gentili (University of Turin, 2023)

- referee for: Analysis & PDE, Annals of PDE, Acta Math. Sin. (Engl. Ser.), Ann. Polon. Math., Adv. Math, Comm. Partial Differential Equations, Int. Math. Res. Not. (IMRN), J. Differential Geom., J. Funct. Anal., J. Geom. Anal., J. Geom. Phys., J. Korean Math. Soc., Math. Nachr., Math. Z., Proc. Amer. Math. Soc., Univ. Iagel. Acta Math.

- reviewer for: Mathematical Reviews and zbMATH