

# Piotr W. Nowak

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## Positions

Associate Professor, Institute of Mathematics of the Polish Academy of Sciences, 2017–present  
Scientific Director, 2018–2022

Joint appointment:

Assistant Professor, Institute of Mathematics of the Polish Academy of Sciences, 2011–2017  
Assistant Professor, University of Warsaw, 2011–2017

Research Member, Mathematical Sciences Research Institute, Berkeley, Fall 2016

Visiting Scholar, Mathematical Institute, University of Oxford, 4 months, Summer 2014

Postdoctoral Fellow, Mathematical Sciences Research Institute, Berkeley, Fall 2011

Visiting Assistant Professor, Texas A&M University, College Station, 2008–2011

## Degrees

Habilitation, with distinction, Institute of Mathematics of the Polish Academy of Sciences, October 2016

Ph.D. in Mathematics, Vanderbilt University, May 2008. Advisor: Guoliang Yu.

M.A. in Mathematics, Vanderbilt University, May 2006

Magister in Mathematics, University of Warsaw, June 2003. Advisor: Henryk Toruńczyk.

Licencjat in Mathematics, University of Warsaw, June 2001

## Honors and awards

Kazimierz Bartel Medal 2017

Prime Minister's Award for the Habilitation 2017

*XXIII Wojtek Pulikowski Lecture*, Uniwersytet Adama Mickiewicza, Poznań, 2016

Plenary Address at the 6th Forum of Polish Mathematicians, 09/2015

*Rector's Award for Scientific Achievements* (2nd degree), University of Warsaw, 2013

*Outstanding Young Scientist Fellowship*, Ministry of Science and Higher Education, 2012–2015

*Bjarni Jónsson Prize for Research*, Vanderbilt University, 2008

*Summer Research Award*, College of Arts and Science, Vanderbilt University, 2005 and 2007

*Marcinkiewicz Prize*, Polish Mathematical Society, 2003

## Research interests

Geometric and analytic group theory, Topology of manifolds, Index theory.

## Funding

European Research Council Starting Grant, 2016-2021, Principal Investigator

*Premia na Horyzoncie*, Ministry of Science and Higher Education, 2016-2021

Clay Mathematics Institute, Enhancement partnership in an MSRI programmatic workshop, 2016 (with G. Arzhantseva, C. Druţu and G. A. Niblo)

National Science Center, Sonata Bis, 2014-2016, Principal Investigator

Foundation for Polish Science, Homing Plus grant, 2012-2014, Principal Investigator

National Science Foundation grant DMS-1105664, Analysis/Topology, 2011-12, Principal Investigator

National Science Foundation grant DMS-0900874, Analysis, 2009-2012, Principal Investigator

Foundation for Polish Science, Conference Travel Grant, 2007

## Publications

### Books

*Large Scale Geometry*

Piotr W. Nowak & Guoliang Yu

EMS Textbooks in Mathematics. European Mathematical Society Publishing House, 2012.

### Articles

1. (with M. Kaluba and D. Kielak) *On property (T) for  $\text{Aut}(F_n)$  and  $\text{SL}_n(\mathbb{Z})$*   
preprint
2. (with Y. C. Chung) *Expanders are counterexamples to the  $p$ -coarse Baum-Connes conjecture*  
preprint
3. (with Y. Jiang) *Singular subgroups in  $\tilde{A}_2$ -groups and their von Neumann algebras*  
preprint
4. (with M. Kaluba and N. Ozawa)  *$\text{Aut}(\mathbb{F}_5)$  has property (T)*  
preprint
5. (with E. Reckwerdt) *Complements of Kazhdan projections in semisimple groups*  
*Studia Mathematica*, to appear.

6. (with M. Kaluba) *Certifying numerical estimates of spectral gaps*  
Groups Complexity Cryptology, to appear.
7. (with C. Druţu) *Kazhdan projections, random walks and ergodic theorems*  
Journal für die reine und angewandte Mathematik (Crelle's journal), accepted.
8. *Group 1-cohomology is complemented*  
Bulletin of the London Mathematical Society 49 (2017), no. 2, 216–219.
9. (with F. Diana) *Eilenberg swindles and higher large scale homology of products of trees*  
Groups, Geometry & Dynamics 11 (2017), no. 1, pp. 371–392.
10. (with D. Sawicki) *Warped cones and spectral gaps*  
Proceedings of the American Mathematical Society 145 (2017), no. 2, 817–823.
11. *Poincaré inequalities and rigidity for actions on Banach spaces*,  
Journal of the European Mathematical Society (JEMS) 17 (2015), no. 3, 689–709.
12. *Group Actions on Banach Spaces*,  
In: Handbook of Group Actions, vol. II, 121–149. Edited by L. Ji, A. Papadopoulos, S.-T. Yau. Advanced Lectures in Mathematics (ALM) 32, International Press, Somerville; Higher Education Press, Beijing, 2015.
13. (with U. Bader) *Cohomology of deformations*,  
Journal of Topology and Analysis 7 (2015), no. 1, 81–104.
14. (with K. Juschenko) *Uniformly bounded representations and exact groups*,  
Journal of Functional Analysis 266 (2014), no. 3, 1667–1673
15. (with M. Marcinkowski) *Aperiodic tilings of manifolds of intermediate growth*,  
Groups, Geometry & Dynamics 8 (2014), no. 2, 479–483.
16. (with J. Brodzki, G. A. Niblo and N. Wright) *Amenable actions, invariant means and bounded cohomology*,  
Journal of Topology and Analysis 4 (2012), no. 3, 321–334.
17. (with J. Brodzki, G. A. Niblo and N. Wright) *A homological characterization of topological amenability*.  
Algebraic & Geometric Topology 12 (2012), no. 3, 1767–1780.
18. (with R. G. Douglas) *Every finitely generated group is weakly exact*.  
Journal of Functional Analysis 261 (2011), no. 12, 3723–3734.
19. (with R. I. Grigorchuk) *Diameters, distortion and eigenvalues*  
European Journal of Combinatorics 33 (2012), 1574–1587.
20. (with D. Kerr) *Residually finite actions and crossed products*.  
Ergodic Theory and Dynamical Systems 32 (2012), no. 5, 1585–1614.
21. (with R. G. Douglas) *Invariant expectations and vanishing of bounded cohomology for exact groups*.  
Journal of Topology and Analysis 3 (2011), no. 1, 89–107.
22. (with R. G. Douglas) *Hilbert  $C^*$ -modules and amenable actions*.  
Studia Mathematica 199 (2010), no. 2, 185–197.
23. (with J. Špakula) *Controlled coarse homology and isoperimetric inequalities*.  
Journal of Topology 3 (2010), no. 2, 443–462.
24. *Zero-in-the-spectrum conjecture on regular covers of compact manifolds*.  
Commentarii Mathematici Helvetici 84 (1) (2009), 213–222.

25. (with G. Yu) *What is... Property A?*  
Notices of the American Mathematical Society **55** (2008), no. 4, 474–475.
26. *Isoperimetry of group actions.*  
Advances in Mathematics **219** (1) (2008), 1–26.
27. *Coarsely embeddable metric spaces without Property A.*  
Journal of Functional Analysis **252** (1) (2007), 126–136.
28. *On exactness and isoperimetric profiles of discrete groups.*  
Journal of Functional Analysis **243** (1) (2007), 323–344.
29. *Group actions on Banach spaces and a geometric characterization of  $a$ -T-menability.*  
Topology and its Applications **153** (2006), no. 18, 3409–3412.
30. *On coarse embeddability into  $\ell_p$ -spaces and a conjecture of Dranishnikov.*  
Fundamenta Mathematicae **189** (2006), no. 2, 111–116.
31. *Coarse embeddings of metric spaces into Banach spaces.*  
Proceedings of the American Mathematical Society **133** (2005), no. 9, 2589–2596.

## Talks

Over 150 invited talks at international conferences, schools, seminars and colloquia around the world.

## Lecture series

### *Rigid groups and their algebras*

4 lectures at *Recent Advances in Operator Theory and Operator Algebras*, Indian Statistical Institute, Bangalore, 12/2018

### *Property (T) and higher index theory*

4 lectures at *Glances at Manifolds II*, Jagiellonian University, Kraków, 08/2016

### *Rigidity of groups and higher index theory*

5 lectures at *Rigidity School*, University of Tokyo, 11/2015

### *Property (T) and large scale geometry*

4 lectures at *Cohomology and Large Scale Geometry Summer School*, Universität Regensburg, 07/2015

### *Deformations, cohomology and fixed point properties*

2 lectures at *Metric Geometry and Analysis*, Kyoto University, Japan, 12/2013

### *Large Scale Geometry*

15 lectures, Adam Mickiewicz University, Poznań, Fall 2013

### *Amenable actions and bounded cohomology*

2 lectures at the  $G^3$  Conference, South Padre Island, Texas, 03/2013

### *Large Scale Geometry*

10 lectures, Waseda University, Tokyo, 09/2012

### *Coarse Homology Theories*

3 lectures, *Workshop on Geometric and Algebraic Topology*, Banach Center, Warsaw, 07/2012

## Property A

2 lectures during the Semester on *Limits of Graphs in Group Theory and Computer Science*, Centre Interfacultaire Bernoulli at EPFL, Lausanne, Switzerland, 06/2007

## Conferences and seminars

*Workshop Groups and Group Rings*, St.Petersburg State University, Russia 06/2019 (scheduled)

Operator Algebras Seminar, KU Leuven, 04/2019 (scheduled)

Pure Maths Colloquium, Southampton University, 10/2018

*14th Korea Operator Algebras Seminar*, Pusan, South Korea, 06/2018

*GPOTS 2018*, 06/2018

*Large Scale Geometry and Applications*, Fields Institute, Toronto, 05/2018

*Superexpanders and Their Coarse Geometry*, Mathematisches Forschungsinstitut Oberwolfach, 04/2018

*Large Scale Geometry of Polish Groups*, Bernoulli Center, EPFL, 03/2018

Groups, Actions and von Neumann Algebras Seminar, Paris-Sud, Orsay, 03/2018

Midrasha seminar, Weizmann Institute of Science, 11/2017

Oberseminar  $C^*$ -Algebren, Universität Münster, 07/2017

Colloquium, University of Warsaw, 03/2017

*Recent Advances in Operator Theory and Operator Algebras 2016*, ISI Bangalore, India, 12/2016

Operator Algebras Seminar, University of Copenhagen, 09/2016

*Wabash Conference*, IUPUI, Indianapolis, 09/2016

Colloquium, Indiana University, Bloomington, 09/2016

*Groups, Dynamics, and Operator Algebras*, Queen Mary University of London, 07/2016

Geometry and Analysis on Groups seminar, University of Vienna, 06/2016

XXIII Wojtek Pulikowski lecture, Adam Mickiewicz University, Poznań, 06/2016

Geometry Seminar, Indiana University, Bloomington, 11/2015

Plenary Address, 6th Forum of Polish Mathematicians, 09/2015

*Dubrovnik VIII - Geometric Topology, Geometric Group Theory & Dynamical Systems*, Croatia, 06/2015

Colloquium, Université de Neuchâtel, 05/2015

Noncommutative Geometry Seminar, Fudan University, Shanghai, 05/2015

Research Center for Operator Algebras, East China Normal University, Shanghai, 05/2015

Geometry Seminar, Uniwersytet Wrocławski, 02/2015

*Geometric Topology*, Mathematisches Forschungsinstitut Oberwolfach, 01/2015

Groups, Dynamics and Related Topics Seminar, Technion - Israel Institute of Technology, Haifa, 11/2014  
*Quantum Groups, Operators and Non-commutative Probability meeting*, Lancaster University, 09/2014  
*Groups and Topology 2014, DMV-PTM Meeting*, Będlewo/Poznań, 09/2014  
Topology Seminar, University of Oxford, 06/2014  
Geometry and Analysis on Groups seminar, Universität Wien, 05/2014  
Noncommutative Geometry Seminar, Fudan University, Shanghai, 04/2014  
Research Center for Operator Algebras, East China Normal University, Shanghai, 04/2014  
Séminaire Analyse et Géométrie, Université Denis Diderot - Paris 7, 02/2014  
*Groups Acting on Rooted Trees*, Insitute Henri Poincaré, Paris, 02/2014  
*Metric Geometry, Geometric Topology and Groups*, BIRS, Banff, 08/2013  
*Eilenberg Centenary Conference*, University of Warsaw, 07/2013  
*International Conference on Operator Theory and Operator Algebras in Honor of the 75th Birthday of Ron Douglas*, Fudan University, Shanghai, 07/2013  
Groups, Dynamics and Related Topics Seminar, Technion - Israel Institute of Technology, Haifa, 06/2013  
Graduierertenkolleg-Kolloquium, Universität Regensburg, 06/2013  
*Mini-conference following the Jankowski Lecture*, University of Gdańsk, 05/2013  
Oberseminar Topologie/Geometrie, Universität Göttingen, 05/2013  
Oberseminar Topologie, Universität Münster, 05/2013  
Operator Algebras seminar, Department of Physics, University of Warsaw, 11/2012  
Workshop on *General and geometric topology today and their problems*, RIMS, Kyoto, 09/2012  
Differential Topology Seminar, Kyoto University, 09/2012  
Colloquium, Waseda University, Tokyo, 09/2012  
Topology Seminar, Tokyo Institute of Technology, 09/2012  
Topology Seminar, University of Tokyo, 09/2012  
*Group actions and applications in geometry, topology and analysis*, Kunming University of Science and Technology, Kunming, China, 07/2012  
*Geometric Topology: Satellite Thematic Session*, 6th European Congress of Mathematics, Krakow, 07/2012  
*Coarse Geometry of Infinite Groups*, Université Lille 1, Lille, France, 06/2012  
*Graduate Colloquium*, Polish Academy of Sciences, 02/2012  
*Young Geometric Group Theory Meeting*, Będlewo, Poland 01/2012  
Research Seminar, MSRI, Berkeley, 10/2011  
Postdoc Seminar, MSRI, Berkeley, 09/2011

*Dubrovnik Topology Conference*, Dubrovnik, Croatia, 06/2011

*Geometrical methods in high dimensional topology*, The Ohio State University, 05/2011

*Index theory and Hopf algebras – Noncommutative Geometry and Operator Algebras Spring Institute*, Vanderbilt University, 05/2011

Colloquium, SUNY Buffalo, 03/2011

Colloquium, Case Western Reserve University, 03/2011

Presentation, University of Warwick, United Kingdom, 03/2011

AMS Southeastern Section meeting, Special Session on Geometric Group Theory, Statesboro, GA, 03/2011

Colloquium, Indiana University – Purdue University Indianapolis, 02/2011

Colloquium, University of Houston, 01/2011

MAA – AMS Joint Meetings, Special Session on Geometric Group Theory, New Orleans, LA, 01/2011

Analysis Seminar, SUNY Buffalo, 11/2010

*Workshop in Analysis and Probability*, Texas A&M University, 07/2010

Analysis Seminar, University of Houston, 03/2010

*44th Spring Topology and Dynamics Conference*, Geometric Group Theory and Geometric Topology session, 03/2010

Wabash Modern Analysis Seminar (joint seminar for UIUC, IU, Purdue and IUPUI), 11/2009

*International Workshop and AMS Special Session on Concentration, Functional Inequalities and Isoperimetry*, Boca Raton, 10/2009

*Conference on Algebraic Topology*, University of Warsaw, 07/2009

*Affine Isometric Actions of Discrete Groups*, ETHZ Centro Stefano Franscini, Ascona, Switzerland, 06/2009

Noncommutative Geometry Seminar, Vanderbilt University, 04/2009

*Workshop in Analysis and Probability*, Texas A&M University, 06/2008

*Analysis on Groups*, University of Puerto Rico, San Juan, 03/2008

Geometric Group Theory Seminar, The Ohio State University, 02/2008

*International Conference on Geometric Topology*, Dubrovnik, 10/2007

*First Joint Meeting of the AMS and the Polish Mathematical Society*, Special Session on Geometric Group Theory, Warsaw, 07/2007

*Semester on Amenability*, Erwin Schrödinger Institute, Vienna, 07/2007

Colloquium, University of North Carolina at Greensboro, 03/2007

*4th East Coast Operator Algebras Symposium*, Georgia Institute of Technology, 09/2006

*Workshop in Analysis and Probability*, Texas A&M University, 07/2006

*Metric Geometry and Geometric Embeddings of Discrete Metric Spaces*, Texas A&M University, 07/2006

Geometry and Differential Topology Seminar, University of Wrocław, 06/2006

*Banach Spaces and Their Applications in Analysis*, Miami University, 05/2006

40th Spring Topology and Dynamics Conference, Geometric Topology and Geometric Group Theory Session, 03/2006

Algebraic Topology Seminar, University of Warsaw, 12/2005, 06/2006

Geometric Functional Analysis Seminar, Pennsylvania State University, 02/2006

Colloquium, Polish Academy of Sciences, Warsaw, 01/2006

Geometric Topology Seminar, University of Warsaw, 12/2005, 12/2006, 12/2007

AMS Sectional Meeting, Special Session on Geometry and Algorithms in Metric Spaces, Johnson City, 10/2005

## Non-mathematical meetings and symposia

Speaker, *Granty dla najlepszych*, organized by the EU National Contact Point at the University of Warsaw, 09/2018

Speaker, *Zdobądź grant European Research Council*, Politechnika Krakowska, 06/2018

Panelist, Seminar *Jak wspierać granty ERC*, National Contact Point, 03/2017

Speaker and panelist, Sympozjum Krajowej Rady Koordynatorów Projektów Badawczych UE, Politechnika Warszawska, 11/2016

Panelist, *ERC od kuchni*, organized by the EU National Contact Point at the Nencki Institute, 09/2016

## Organization

### Seminars

*Geometric Group Theory Seminar*, January 2012-present  
Institute of Mathematics of the Polish Academy of Sciences  
Co-organized with Tadeusz Januszkiewicz

### Conferences and workshops

100th Anniversary Meeting of the Polish Mathematical Society 09/2019  
Member of the Scientific Council of the meeting

Simons Semester: Geometric and Analytic Group Theory  
IMPAN Warszawa, Spring 2019  
With Uri Bader, Pierre-Emmanuel Caprace, Tadeusz Januszkiewicz, Damian Osajda, Piotr Przytycki

*Workshop on Assembly Maps*  
IMPAN Warszawa, December 2018  
Co-organized with Yeong Chyuan Chung and Kang Li



*Workshop on Operator Algebras, Geometry, and Actions*  
 IMPAN Warszawa, September 2017  
 Co-organized with David Kerr

*Asymptotic decomposition methods in geometry, dynamics and operator algebras*  
 Satellite Workshop, Newton Institute program *Non-Positive Curvature, Group Actions and Cohomology*  
 University of Southampton, 27–31 March 2017  
 Co-organized with Erik Guentner and Graham Niblo

*Amenability, coarse embeddability and fixed point properties*  
 Programmatic workshop during the Geometric Group Theory Program, MSRI, Berkeley, 6–9 Dec 2016  
 Co-organized with Goulnara Arzhantseva, Cornelia Druţu and Graham A. Niblo

*Glances at Manifolds II (conference). Group Actions, K-Theory, C\*-algebras and Topology of Manifolds*  
 Jagellonian University, Kraków, Poland, August 2016.  
 Member of the Scientific Committee

*Geometric Function Theory meets Geometric Group Theory*  
 Banach Center, Warsaw, October 2015  
 Co-organized with Tomasz Adamowicz

*Topology Retreat*, Banach Center, Będlewo, September 30 – October 2, 2015  
 Co-organized with Roman Sauer

*Conference on Geometric Group Theory*  
 University of Wrocław, June/July 2014  
 Co-organized with Jan Dymara, Tomasz Elsner, Światosław Gal, Jacek Świątkowski

*Concentration Week on Non-Linear Geometry of Banach Spaces, Differentiability and Geometric Group Theory*,  
 August 2011, Texas A&M University  
 Co-organized with Florent Baudier, William B. Johnson and Bunyamin Sari

*Geometric Group Theory Workshop*, June 2011  
 Heilbronn Institute for Mathematical Research, University of Bristol  
 Co-organized with Talia Fernós and Graham A. Niblo

## Student supervision

### Graduated:

- Michał Marcinkowski, Ph.D. at University of Wrocław defended 10/2015  
 co-advised with Ś. R. Gal  
 First position: SFB postdoc at Universität Regensburg, Germany
- Karol Strzałkowski, Ph.D. at IMPAN Warsaw defended 06/2016  
 Recipient of the NCN Preludium grant  
 First position: Postdoctoral Fellow at MSRI, Geometric Group Theory program, Fall 2016
- Damian Sawicki, Ph.D. at IMPAN Warsaw defended 08/2018  
 Recipient of the NCN Preludium grant  
 First position: 2-year postdoc at Max Planck Institute, Bonn.

### Current Ph.D. students:

Tomasz Odrzygóźdź, expected graduation 2018; Recipient of the NCN Preludium grant.  
 Damian Orlef, expected graduation 2020

External member of PhD committees:

Francesca Diana, Universität Regensburg, December 2014  
 Thibault Pillon, Université de Neuchâtel, May 2015  
 Markus Steenbock, Universität Wien, June 2016

Magister theses supervised: D. Sawicki (2014); B. Szymański (2017).

6 Licencjat theses

Supervision of visiting students:

M. Marcinkowski, visiting PhD student from University of Wrocław, Spring 2012; Spring 2014  
 F. Diana, visiting PhD student from Universität Regensburg, Fall 2013  
 Ł. Garncarek, visiting PhD student from University of Wrocław, Fall 2014, Spring 2015

Postdoc supervision:

Łukasz Garncarek, 2015 – 2016  
 Marek Kaluba, 2015 – 2017  
 Eric Reckwerdt, 2016 – 2018  
 Yeong Chyuan Chung, 2017 – present  
 Yongle Jiang, 2017 – present  
 Kang Li, 2018 – present

## Teaching

### Institute of Mathematics of the Polish Academy of Sciences

*Atiyah-Singer Index Theorem*, Spring 2016  
*K-theory*, graduate course, Fall 2015  
*Analysis on metric spaces*, graduate reading course, Fall 2014.  
*Volume and bounded cohomology*, graduate reading course, Spring 2014.

### University of Warsaw

Algebra II: recitations, Spring 2014  
 L<sub>2</sub>-methods in topology, graduate course, Fall 2013  
 Topology I, honors course: recitations, Fall 2013  
 Asymptotic methods in group theory: proseminar, AY 2013/2014  
 Linear Algebra, honors course: recitations, Spring 2013  
 Large Scale Geometry: graduate course, Fall 2012  
 Large Scale Geometry: proseminar, AY 2012/2013

## Texas A&M University

math 323: Linear Algebra, Spring 2011

math 308: Differential Equations (2 sections), Fall 2010

math 602 (graduate): Methods and Applications of Partial Differential Equations, Spring 2010

math 251: Engineering Mathematics III (2 sections), Fall 2009

math 308: Differential Equations, Spring 2009

math 302: Discrete Mathematics, Fall 2008

## Vanderbilt University

math 150A: Calculus I, Spring 2008

math 205B: Multivariable Calculus and Linear Algebra (Teaching Assistant), Spring 2007

math 150A: Calculus I, Fall 2006

math 155B: Accelerated Calculus II (Teaching Assistant), Spring 2006

math 155B: Accelerated Calculus II (Teaching Assistant), Fall 2005

## Professional Service

Member of the Ministry of Science and Higher Education committee on evaluation of research journals

Member of the Advisory Board, *Simons Semesters* program at IMPAN

Member of the Jury of the European Union Competition for Young Scientist (EUCYS) organized in Poland by the Polish Children's Fund, 2019-2021

Member of the Jury of the Kuratowski Prize, 2017-2020

Panel member, National Science Center (NCN) ST1 Panel, Opus, Sonata and Preludium grant

Reviewed funding proposals for *National Science Foundation*, *Israel Science Foundation*, *United States - Israel Binational Science Foundation*, *Austrian Academy of Sciences*, *French National Research Agency - ANR*, *The Leverhulme Trust*, *Swiss National Science Foundation*, internal university grants (USA)

Referee for over 40 journals, including *Advances in Mathematics*, *Compositio Mathematica*, *Crelle's journal*, *Geometry & Topology*, *Journal of the American Mathematical Society*, *Journal of Functional Analysis*, *Journal of Noncommutative Geometry*, *Journal of Topology*, *Journal of Topology and Analysis*, *Mathematische Annalen*, *Proceedings of the LMS*.