

Byungdo Park

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RESEARCH INTERESTS

Differential geometry and algebraic topology. Secondary characteristic classes, geometric structures on higher bundles, generalized cohomology theories and their equivariant, differential, and twisted refinements, higher categories and sheaves, index theory, noncommutative geometry, and topology of matters.

ACADEMIC APPOINTMENTS

Chungbuk National University, Cheongju, Korea September 2019 – Present
Assistant Professor at the Department of Mathematics Education

Korea Institute for Advanced Study (KIAS), Seoul, Korea October 2017 – August 2019
Research Fellow (Postdoc) at School of Mathematics

The City University of New York (CUNY), New York NY, USA January 2017 – May 2017
Adjunct Assistant Professor (Hunter College and the Bronx Community College) of Mathematics

Max Planck Institute for Mathematics, Bonn, Germany October 2016 – December 2016
Postdoctoral Fellow

VISITING POSITIONS

The Hebrew University of Jerusalem, Jerusalem, Israel February 2020
Host: Zachary McGuirk

Hausdorff Research Institute for Mathematics, Bonn, Germany May 2017 – August 2017
Guest (Postdoc)
Trimester program “K-Theory and Related Fields”

Hausdorff Research Institute for Mathematics, Bonn, Germany August 2015
Guest (PhD Student)
Trimester program “Homotopy theory, manifolds, and field theories”

EDUCATION

CUNY Graduate Center, New York NY, USA August 2010 – September 2016
Doctor of Philosophy in Mathematics
Thesis title: A geometric model of twisted differential K -theory
Advisor: Mahmoud Zeinalian

CUNY Graduate Center, New York NY, USA February 2015
Master of Philosophy in Mathematics
Advancement to candidacy.

Yonsei University, Seoul, Korea March 2001 – February 2009
Bachelor of Science in Mathematics
Senior Thesis: Notes on L-Infinity algebras
Advisor: Jae-Suk Park
Member of honor program in sciences
On Leave from October 2002 to February 2006 for a mandatory military service.

PUBLICATIONS

A classification of equivariant gerbe connections with Corbett Redden, *Commun. Contemp. Math.*, **21**(2) (2019) 1850001 1–40. arXiv:1709.06003.

Geometric models of twisted differential K -theory I, *J. Homotopy and Relat. Struct.* **13**(1) (2018) 143–167. arXiv:1602.02292

A smooth variant of Hopkins-Singer differential K -theory, *New York J. Math.* **23** (2017) 655–670. arXiv:1607.08686

PREPRINTS

Noncommutative differential K -theory, with Arthur Parzygnat, Corbett Redden, and Augusto Stoffel, (2021) arXiv:2106.12073.

Brown representability for directed graphs, with Zachary McGuirk, (2020) arXiv:2003.07426.

WORK IN PROGRESS	Cycle maps in twisted differential K-theory , with Daniel Grady	
	Equivariant arithmetic Chow groups and equivariant differential cohomology , with Sreedhar Bhamidi	
SELECTED PRESENTATIONS	Mathematics Department Colloquium	
	Chungbuk National University, Cheongju, Korea	November 2020
	<i>The Atiyah-Jänich theorem and its twisted refinement</i>	
	Host: Sejong Kim	
	KIAS Topology Seminar	
	Korea Institute for Advanced Study (KIAS), Seoul, Korea	December 2019
	<i>Twisted differential K-theory, geometric models, and sheaves of spectra</i>	
	Host: Hsuan-Yi Liao	
	DG Seminar	
	Korea Institute for Advanced Study (KIAS), Seoul, Korea	February 2019
	<i>What is an ∞-category? (1), (2), (3)</i>	
	Host: Bumsig Kim	
	2018 Seoul – Tokyo Conference in Mathematics	
	Korea Institute for Advanced Study (KIAS), Seoul, Korea	December 2018
	<i>Cycle maps in differential K-theory</i>	
	Host: Jinsung Park	
	Topology in Australia and South Korea 2018	
	IBS Center for Geometry and Physics (IBS-CGP), Pohang, Korea	April 2018
	<i>A classification of equivariant gerbe connections</i>	
	Host: Gabriel C. Drummond-Cole	
	The 13th KIAS Winter School on Differential Geometry	
	Korea Institute for Advanced Study (KIAS), Seoul, Korea	January 2018 – February 2018
	<i>Introduction to differential cohomology</i> (3 lectures)	
	Host: Insong Choe and Jaigyoung Choe	
	Conference venue: Hill Condominium, High 1 Resort, Jeongseon, Korea	
	Higher Categories and Mirror Symmetry	
	Korea Institute for Advanced Study (KIAS), Seoul, Korea	December 2017
	<i>A classification of equivariant gerbe connections</i>	
	Host: Bumsig Kim and Gregory Ginot	
	Topology Workshop – Cohomology Theories, Categories, and Applications	
	University of Pittsburgh, Pittsburgh, PA USA	March 2017
	<i>A geometric model of twisted differential K-theory</i>	
	Host: Hisham Sati	
	Research Seminar	
	The Bronx Community College, CUNY, Bronx NY USA	February 2017
	<i>Aspects of equivariant gerbes with connection</i>	
	Host: Cormac O’Sullivan	
	Algebraic Topology Seminar	
	Princeton University, Princeton NJ USA	February 2017
	<i>A geometric model of twisted differential K-theory</i>	
	Host: Tony Bahri and Martin Bendersky	
	K-theory Seminar	
	Hausdorff Research Institute for Mathematics, Bonn, Germany	November 2016
	<i>Models of differential K-theory and comparison problems</i>	
	Host: Kristian Jonsson Moi	

Higher Differential Geometry Seminar

Max Planck Institute for Mathematics, Bonn, Germany

November 2016

A geometric model of twisted differential K-theory

Host: Christian Blohmann

Geometry and Physics (GAP) Seminar

Pennsylvania State University, University Park, PA USA

September 2016

A geometric model of twisted differential K-theory

Host: Ping Xu and Mathieu Stiénon

GAP XIV: Geometry and Physics “Séminaire itinérant” — Graded geometry and applications to physics

University of Sheffield, Sheffield, UK

August 2016

A geometric model of twisted differential K-theory

Poster presentation

Deformation Theory Seminar

University of Pennsylvania, Philadelphia PA USA

June 2016

A geometric model of twisted differential K-theory

Host: James Stasheff

2016 Lehigh University Geometry and Topology Conference

Lehigh University, Bethlehem PA USA

May 2016

*A geometric model of twisted differential K-theory***GRANTS****Basic Research Program in Science and Engineering**

The National Research Foundation of Korea (NRF)

March 2020–February 2023

The Ministry of Science and ICT, Republic of Korea

Project title: A study on differential cocycles via higher sheaves on manifolds

Research Director. Amount KRW 90,000,000 (equivalent to \$80,000)

Grant No. 2020R1G1A1A01008746

Research Grant for New Faculty

Chungbuk National University

September 2019–August 2020

Project title: Geometry and topology of directed graphs

Research Director. Amount KRW 17,000,000 (equivalent to \$15,111)

Development of New Leading Scientists**KIAS School of Mathematics Group Seminar**

Korea Institute for Advanced Study

January 2019–August 2019

The Ministry of Science and ICT, Republic of Korea

Project title: KIAS Topology Seminar

Co-organizer. Annual grant KRW 7,500,000 (equivalent to \$6,667)

Project title: Three W's Seminar

Co-organizer. Annual grant KRW 7,500,000 (equivalent to \$6,667)

Development of New Leading Scientists

Korea Institute for Advanced Study

October 2017–August 2019

The Ministry of Science and ICT, Republic of Korea

Project title: Differential cocycles in algebraic topology and their applications

Research Director. Amount KRW 25,917,000 (equivalent to \$23,037)

Doctoral Student Research Grant

CUNY Graduate Center

June 2015–May 2016

Project title: Twisted differential K-theory, infinity categories, and mathematical physics

Principal Investigator. Amount \$1,000

CUNY Doctoral Students' Council Grant

Fall 2015

A grant for organizing seminars and conferences

Project title: The Homotopy Theory Learning Group

Principal Investigator. Amount \$700

CUNY Doctoral Students' Council Grant

Fall 2014

A grant for organizing seminars and conferences
 Project title: The Algebraic Topology Student Seminar
 Principal Investigator. Amount \$600

SERVICE**Scholarly Service**

Referee for Journal of Geometry and Physics.
 Reviewer for Mathematical Reviews June 2018 – Present
 Reviewer for Zentralblatt Math March 2016 – Present
 External reviewer for tenure-track faculty hiring process. June 2020 – Present
 Assessed major suitability and scholarly excellence for short-listed candidates for 2 national university and 3 private universities in Korea.
 PhD thesis reader (Committee vice chair) for 1 PhD in Mathematics Education.
 Organizer for Geometry Seminar at CBNU Mathematics Education dept. October 2020–Present
 Organizer for Topology Seminar at KIAS January 2018–August 2019
 Organizer for the three W's Seminar at KIAS January 2019–August 2019
 Postdocs' seminar addressing Was, Warum, Wie (what, why, and how in German) on each research topic.
 Organizer for the Homotopy Theory Learning Group at CUNY Fall 2015
 Organizer for the Algebraic Topology Student Seminar at CUNY Fall 2014

University Service (at Chungbuk National University)

Academic advisor of 23 students (cumulative) September 2019 – Present
 Steering committee member of the Education Research Institute December 2019 – Present
 Member of the Task-Force Committee for Future Education Center construction and pilot operation project August 2020 – February 2021
 Member of the Curriculum committee of the College of Education May 2020 – May 2022

Departmental Service (at Chungbuk National University)

Departmental Scholarship Committee August 2020 – Present
 Member of the Curriculum committee March 2020 – Present
 Interviewer for personality and aptitude test for undergraduate admission November 2019 – Present

Outreach and Community Service

Invited speaker for a career lecture for freshmen in the High School of the College of Education, Chungbuk National University July 2020
 Advisory panel for an expansion plan of Chungbuk Mathematics Experience Center, Chungbuk Natural Sciences Education Center November 2019 – December 2019

SUPERVISION EXPERIENCES**A study on differential cocycles via higher sheaves on manifolds (2 students)**

May 2020 – June 2021
 Mentoring a undergraduate student for reading Atiyah, Bott, and Shapiro, *Clifford Modules* and a Master's student for Freed and Hopkins *Chern-Weil forms and abstract homotopy theory*.

Geometry and topology of directed graphs (2 students)

September 2019 – February 2020
 Mentored undergraduate students for learning algebraic tools for research, providing support for participating conferences, and teaching \LaTeX .

Characteristic Classes Learning Group (2 students)

May 2013 – February 2014
 Lecturing and mentoring in a learning group of Milnor and Stasheff's Characteristic Classes.

**TEACHING
EXPERIENCES**

List of courses taught

Foundation of Mathematics I (A graduate course on non-Euclidean geometry)
 Topics in Geometry I (Graduate course)
 Geometry and Education (Undergraduate topics course on teaching topics in geometry, 3 semesters; incl. Fall 2021)
 Differential Geometry II (3 semesters; incl. Fall 2021)
 Differential Geometry I (2 semesters)
 Complex Analysis II (Will be teaching in Fall 2021)
 Complex Analysis I
 Geometry for Teachers II (2 semesters; Introduction to Euclidean, non-Euclidean, and projective geometries, 2 semesters)
 Geometry for Teachers I (2 semesters; a through overview on analytic geometry)
 Vector Analysis (Multivariable calculus and differential forms)
 Calculus III (Multivariable calculus)
 Calculus II (Integral calculus)
 Calculus II Lab (MAPLE simulation)
 Calculus I (Differential calculus, 3 semesters)
 Calculus I Lab (MAPLE simulation)
 Precalculus
 Trigonometry and College Algebra (Community College teaching experience)
 College Algebra
 Tasks Involved: Lecturing, grading, and writing and administering exams.

**ACADEMIC
HONORS
& AWARDS**

Dissertation Year Fellowship, CUNY Graduate Center	Fall 2015 – Spring 2016
Quantitative Reasoning Fellowship, CUNY Graduate Center	Fall 2014 – Spring 2015
Graduate Teaching Fellowship, CUNY Graduate Center	Fall 2012 – Spring 2014
University Fellowship, CUNY Graduate Center	Fall 2013 – Spring 2014
Science Fellowship, CUNY Graduate Center	Fall 2010 – Spring 2012
Yonsei Special Awards, Yonsei University	Spring 2006, Fall 2006, Fall 2007, and Spring 2008
Highest Honors Student, High Honors Student, Honors Student, Yonsei University	Fall 2001, Spring 2001, and Fall 2007
University Designated Scholarship, Yonsei University	Fall 2002
The Kwanjeong Scholarship, Kwanjeong Educational Foundation	April 2002

**SELECTED
TRAVEL
SUPPORT
RECEIVED**

Workshop on gauge theory and Floer homology Peking University, Beijing, China. Full accommodation support.	December 2019
International Workshop on Algebraic Topology Southern University of Science and Technology, Shenzhen, China. Travel award \$ 500 and full accommodation support.	June 2018
Summer School “Coarse Index Theory” Albert-Ludwigs-Universität Freiburg, Freiburg, Germany. Travel and accommodation award €1,580.	September 2016
GAP XIV: Geometry and Physics “Séminaire itinérant” — Graded geometry and applications to physics University of Sheffield, Sheffield, UK Travel and accommodation award \$1,380.	August 2016
Topology of Manifolds: A conference in honour of Machael Weiss’ 60th birthday University of Lisbon, Lisbon, Portugal. Travel and accommodation award \$2,340.	June 2016

GAP XIII: Geometry and Physics “Séminaire itinérant” — Derived geometry July 2015
 IBS Center for Geometry and Physics, Pohang, South Korea.
 Travel award \$1,600 and full accommodation support.

LANGUAGES	Languages English: Fluent. Korean: Native. French and German: Basic proficiency. Proficiency in Computer Languages C/C++, MATLAB, FORTRAN, MAPLE \LaTeX
SELECTED OFFERS	Korea Institute for Advanced Study (KIAS) , Seoul, Korea March 2019 Research Fellow (Postdoc) in School of Mathematics 2-year extension of the contract (October 2019 – September 2021 – Resigned as of August 31, 2019). Eduard Čech Institute for Algebra, Geometry and Physics , Prague, The Czech Republic 16-month postdoctoral position (Offer declined) April 2017 In the research group of Branislav Jurčo and Martin Markl
REFERENCES	Mahmoud Zeinalian (Doctoral advisor) Professor of Mathematics CUNY Graduate Center and Lehman College mzeinalian@gc.cuny.edu Józef Dodziuk (Teaching) Visiting Professor of the Hebrew University of Jerusalem Professor of Mathematics Emeritus at CUNY Graduate Center jdodziuk@gmail.com Martin Bendersky Professor of Mathematics CUNY Graduate Center and Hunter College mbendersky1@gmail.com James Stasheff Visiting Faculty at University of Pennsylvania Professor of Mathematics Emeritus at University of North Carolina at Chapel Hill jds@math.upenn.edu Corbett Redden Associate Professor of Mathematics Long Island University C. W. Post Campus Corbett.Redden@liu.edu Thomas Tradler Professor of Mathematics CUNY Graduate Center and New York City College of Technology ttradler@citytech.cuny.edu Jae-Suk Park Professor of Mathematics Pohang University of Science and Technology jaesuk@postech.ac.kr
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