

# 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

**On the smoothness of the geodesic spray for the Camassa-Holm equation**, with Jae Min Lee, *J. Math. Anal. Appl.*, **516**(1) (2022) 126472 1–12.

**Noncommutative differential  $K$ -theory**, with Arthur Parzygnat, Corbett Redden, and Augusto Stoffel, *J. Geom. Phys.*, **174** (2022) 104446 1–40. arXiv:2106.12073.

**A note on Venice lemma in differential  $K$ -theory**, *Arch. Math.*, **118**(2) (2022) 215–224.

**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

<b>PREPRINTS</b>	<b>Brown representability for directed graphs</b> , with Zachary McGuirk, (2020) arXiv:2003.07426. <b>Geometric families define differential <math>K</math>-theory</b> , with Jae Min Lee, (2022).	
<b>WORK IN PROGRESS</b>	<b>Cycle maps in twisted differential <math>K</math>-theory</b> , with Daniel Grady <b>Equivariant arithmetic Chow groups and equivariant differential cohomology</b> , with Sreedhar Bhamidi <b>Equivariant eta forms in local index theory</b> , with Jae Min Lee. <b>The Euler–Arnold theory via algebraic topology: Sullivan’s methodology</b> , with Jae Min Lee.	
<b>SELECTED PRESENTATIONS</b>	<b>Mathematics Department Colloquium</b> Pusan National University, Busan, Korea <i>An introduction to differential <math>K</math>-theory</i> Host: Donghoon Jang	May 2022
	<b>Three W’s Seminar</b> Korea Institute for Advanced Study (KIAS), Seoul, Korea <i>The Atiyah–Jänich theorem and its twisted refinement</i> Host: Sreedhar Bhamidi	December 2020
	<b>Mathematics Department Colloquium</b> Chungbuk National University, Cheongju, Korea <i>The Atiyah–Jänich theorem and its twisted refinement</i> Host: Sejong Kim	November 2020
	<b>KIAS Topology Seminar</b> Korea Institute for Advanced Study (KIAS), Seoul, Korea <i>Twisted differential <math>K</math>-theory, geometric models, and sheaves of spectra</i> Host: Hsuan-Yi Liao	December 2019
	<b>DG Seminar</b> Korea Institute for Advanced Study (KIAS), Seoul, Korea <i>What is an <math>\infty</math>-category? (1), (2), (3)</i> Host: Bumsig Kim	February 2019
	<b>2018 Seoul – Tokyo Conference in Mathematics</b> Korea Institute for Advanced Study (KIAS), Seoul, Korea <i>Cycle maps in differential <math>K</math>-theory</i> Host: Jinsung Park	December 2018
	<b>Topology in Australia and South Korea 2018</b> IBS Center for Geometry and Physics (IBS-CGP), Pohang, Korea <i>A classification of equivariant gerbe connections</i> Host: Gabriel C. Drummond-Cole	April 2018
	<b>The 13th KIAS Winter School on Differential Geometry</b> Korea Institute for Advanced Study (KIAS), Seoul, Korea <i>Introduction to differential cohomology</i> (3 lectures) Host: Insong Choe and Jaigyoung Choe Conference venue: Hill Condominium, High 1 Resort, Jeongseon, Korea	January 2018 – February 2018
	<b>Higher Categories and Mirror Symmetry</b> Korea Institute for Advanced Study (KIAS), Seoul, Korea <i>A classification of equivariant gerbe connections</i> Host: Bumsig Kim and Gregory Ginot	December 2017
	<b>Topology Workshop – Cohomology Theories, Categories, and Applications</b> University of Pittsburgh, Pittsburgh, PA USA <i>A geometric model of twisted differential <math>K</math>-theory</i> Host: Hisham Sati	March 2017

**Research Seminar**

The Bronx Community College, CUNY, Bronx NY USA

February 2017

*Aspects of equivariant gerbes with connection*

Host: Cormac O’Sullivan

**Algebraic Topology Seminar**

Princeton University, Princeton NJ USA

February 2017

*A geometric model of twisted differential K-theory*

Host: Tony Bahri and Martin Bendersky

**K-theory Seminar**

Hausdorff Research Institute for Mathematics, Bonn, Germany

November 2016

*Models of differential K-theory and comparison problems*

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–August 2023

The Ministry of Science and ICT, Republic of Korea

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

Principal Investigator. Amount KRW 90,000,000 (equivalent to \$80,000)

Grant No. 2020R1G1A1A01008746

**National University Forstering Project – Creativity of next-generation researchers**

Chungbuk National University

May 2022–December 2022

Project title: An approach on Euler-Arnold equations via algebraic topology: Sullivan’s methodology

Principal Investigator. Amount KRW 9,000,000 (equivalent to \$8,000)

**Research Grant for New Faculty**

Chungbuk National University

September 2019–August 2020

Project title: Geometry and topology of directed graphs

Principal Investigator. 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  
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)

January 2019–August 2019

**Development of New Leading Scientists**

Korea Institute for Advanced Study  
The Ministry of Science and ICT, Republic of Korea  
Project title: Differential cocycles in algebraic topology and their applications  
Principal Investigator. Amount KRW 25,917,000 (equivalent to \$23,037)

October 2017–August 2019

**Doctoral Student Research Grant**

CUNY Graduate Center  
Project title: Twisted differential  $K$ -theory, infinity categories, and mathematical physics  
Principal Investigator. Amount \$1,000

June 2015–May 2016

**CUNY Doctoral Students' Council Grant**

A grant for organizing seminars and conferences  
Project title: The Homotopy Theory Learning Group  
Principal Investigator. Amount \$700

Fall 2015

**CUNY Doctoral Students' Council Grant**

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

Fall 2014

**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 referee for tenure-track faculty hiring process. June 2020 – Present  
Assessed major suitability and scholarly excellence for short-listed candidates for 4 national universities and 5 private universities in Korea (counted with multiplicity).  
External interviewer for tenure-track faculty hiring process. January 2021  
Assessed mock lessons and job talks for short-listed candidates for 1 national university 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)**

Representative of Faculty Assembly (legislation subcommittee – statute, regularions, and human resoures affairs) September 2022 – August 2024  
Steering committee member of the Education Research Institute December 2019 – Present  
Member of the Curriculum committee of the College of Education May 2020 – May 2022  
Internal admission officer June 2021 – December 2021  
Member of the Task-Force Committee for Future Education Center construction and pilot operation project August 2020 – February 2021

**Departmental Service (at Chungbuk National University)**

Member of the departmental scholarship committee August 2020 – February 2023  
Member of the curriculum committee March 2020 – August 2023  
Member of the tenure-track faculty search committee October 2021 – December 2021  
Interviewer for personality and aptitude test for undergraduate admission November 2019 – January 2021

## Outreach and Community Service

Invited speaker for a public lecture for high school students in Chungbuk Province and Sejong City (8 high schools on-site, 17 high schools via online) May 2022 – August 2022

Invited speaker for a public lecture for high school students in Chungbuk Province (5 high Schools) December 2021

Invited speaker for a public 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  $\text{\LaTeX}$ .

**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

### At Chungbuk National University

Advanced Topics in History of Mathematics and Mathematics Education

Foundation of Mathematics II (graduate course)

Foundation of Mathematics I (graduate course)

Topics in Geometry I (3 semesters; graduate course)

Geometry and Education (Undergraduate topics course on teaching geometry, 2 semesters)

Differential Geometry II (4 semesters; incl. Fall 2022)

Differential Geometry I (3 semesters)

Complex Analysis II

Complex Analysis I

Geometry for Teachers II (2 semesters. Introduction to Euclidean, non-Euclidean, and projective geometries)

Geometry for Teachers I (3 semesters. Conics and the classification theorem)

Calculus II (currently teaching)

Calculus I

### At the City University of New York

Vector Analysis (Multivariable calculus and differential forms)

Calculus III (Multivariable calculus)

Calculus II (Integral calculus, 2 semesters)

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.

## TEACHING AWARDS

Faculty Teaching Excellence, Chungbuk National University

3 semesters: Fall 2021, Fall 2020, Fall 2019

## 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
<b>SELECTED TRAVEL SUPPORT RECEIVED</b>	<b>Workshop on gauge theory and Floer homology</b> Peking University, Beijing, China. Full accommodation support.	December 2019
	<b>International Workshop on Algebraic Topology</b> Southern University of Science and Technology, Shenzhen, China. Travel award \$ 500 and full accommodation support.	June 2018
	<b>Summer School “Coarse Index Theory”</b> Albert-Ludwigs-Universität Freiburg, Freiburg, Germany. Travel and accommodation award €1,580.	September 2016
	<b>GAP XIV: Geometry and Physics “Séminaire itinérant” — Graded geometry and applications to physics</b> University of Sheffield, Sheffield, UK Travel and accommodation award \$1,380.	August 2016
	<b>Topology of Manifolds: A conference in honour of Machael Weiss’ 60th birthday</b> University of Lisbon, Lisbon, Portugal. Travel and accommodation award \$2,340.	June 2016
	<b>GAP XIII: Geometry and Physics “Séminaire itinérant” — Derived geometry</b> IBS Center for Geometry and Physics, Pohang, South Korea. Travel award \$1,600 and full accommodation support.	July 2015
<b>LANGUAGES</b>	<b>Languages</b> English: Fluent. Korean: Native. French and German: Basic proficiency. <b>Proficiency in Computer Languages</b> C/C++, MATLAB, FORTRAN, MAPLE $\LaTeX$	
<b>SELECTED OFFERS</b>	<b>Korea Institute for Advanced Study (KIAS)</b> , Seoul, Korea Research Fellow (Postdoc) in School of Mathematics 2-year extension of the contract (October 2019 – September 2021 – Resigned as of August 31, 2019).	March 2019
	<b>Eduard Čech Institute for Algebra, Geometry and Physics</b> , Prague, The Czech Republic 16-month postdoctoral position (Offer declined) In the research group of Branislav Jurčo and Martin Markl	April 2017
<b>REFERENCES</b>	<p><b>Mahmoud Zeinalian</b> (Doctoral advisor) Professor of Mathematics CUNY Graduate Center and Lehman College mzeinalian@gc.cuny.edu</p> <p><b>Józef Dodziuk</b> (Teaching) Visiting Professor of the Hebrew University of Jerusalem Professor of Mathematics Emeritus at CUNY Graduate Center jdodziuk@gmail.com</p> <p><b>Martin Bendersky</b> Professor of Mathematics CUNY Graduate Center and Hunter College mbendersky1@gmail.com</p>	

**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  
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**Jae-Suk Park**

Professor of Mathematics  
Pohang University of Science and Technology  
jaesuk@postech.ac.kr

**DATE**

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