

# 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

**Noncommutative differential  $K$ -theory**, with Arthur Parzygnat, Corbett Redden, and Augusto Stoffel, to appear in *J. Geom. Phys.* arXiv:2106.12073.

**A note on Venice lemma in differential  $K$ -theory**, to appear in *Arch. Math.*

**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

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

<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>SELECTED PRESENTATIONS</b>	<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	
	<b>Research Seminar</b> The Bronx Community College, CUNY, Bronx NY USA <i>Aspects of equivariant gerbes with connection</i> Host: Cormac O'Sullivan February 2017	
	<b>Algebraic Topology Seminar</b> Princeton University, Princeton NJ USA <i>A geometric model of twisted differential <math>K</math>-theory</i> Host: Tony Bahri and Martin Bendersky February 2017	

***K*-theory Seminar**

Hausdorff Research Institute for Mathematics, Bonn, Germany  
*Models of differential K-theory and comparison problems*  
 Host: Kristian Jonsson Moi

November 2016

**Higher Differential Geometry Seminar**

Max Planck Institute for Mathematics, Bonn, Germany  
*A geometric model of twisted differential K-theory*  
 Host: Christian Blohmann

November 2016

**Geometry and Physics (GAP) Seminar**

Pennsylvania State University, University Park, PA USA  
*A geometric model of twisted differential K-theory*  
 Host: Ping Xu and Mathieu Stiénon

September 2016

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

University of Sheffield, Sheffield, UK  
*A geometric model of twisted differential K-theory*  
 Poster presentation

August 2016

**Deformation Theory Seminar**

University of Pennsylvania, Philadelphia PA USA  
*A geometric model of twisted differential K-theory*  
 Host: James Stasheff

June 2016

**2016 Lehigh University Geometry and Topology Conference**

Lehigh University, Bethlehem PA USA  
*A geometric model of twisted differential K-theory*

May 2016

**GRANTS****Basic Research Program in Science and Engineering**

The National Research Foundation of Korea (NRF)  
 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

March 2020–February 2023

**Research Grant for New Faculty**

Chungbuk National University  
 Project title: Geometry and topology of directed graphs  
 Research Director. Amount KRW 17,000,000 (equivalent to \$15,111)

September 2019–August 2020

**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  
 Research Director. 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**

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 referee for tenure-track faculty hiring process. June 2020 – Present  
 Assessed major suitability and scholarly excellence for short-listed candidates for 2 national universities and 3 private universities in Korea.  
 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)**

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)**

Member of the 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

### At Chungbuk National University

Foundation of Mathematics II (A graduate course on differential geometry)  
 Foundation of Mathematics I (A graduate course on non-Euclidean geometry) – taught in English  
 Topics in Geometry I (2 semesters; A graduate course on differential geometry)  
 Geometry and Education (Undergraduate topics course on teaching topics in geometry, 2 semesters)  
 Differential Geometry II (3 semesters; incl. Fall 2021)  
 Differential Geometry I (2 semesters)  
 Complex Analysis II (Currently teaching in Fall 2021)  
 Complex Analysis I  
 Geometry for Teachers II (2 semesters; Introduction to Euclidean, non-Euclidean, and projective geometries)  
 Geometry for Teachers I (2 semesters; a through overview on analytic geometry)

### 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.

## 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

<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 accomodation 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

**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.

<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 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).  <b>Eduard Čech Institute for Algebra, Geometry and Physics</b> , Prague, The Czech Republic 16-month postdoctoral position (Offer declined) April 2017 In the research group of Branislav Jurčo and Martin Markl
<b>REFERENCES</b>	<b>Mahmoud Zeinalian</b> (Doctoral advisor) Professor of Mathematics CUNY Graduate Center and Lehman College mzeinalian@gc.cuny.edu  <b>Józef Dodziuk</b> (Teaching) Visiting Professor of the Hebrew University of Jerusalem Professor of Mathematics Emeritus at CUNY Graduate Center jdodziuk@gmail.com  <b>Martin Bendersky</b> Professor of Mathematics CUNY Graduate Center and Hunter College mbendersky1@gmail.com  <b>James Stasheff</b> Visiting Faculty at University of Pennsylvania Professor of Mathematics Emeritus at University of North Carolina at Chapel Hill jds@math.upenn.edu  <b>Corbett Redden</b> Associate Professor of Mathematics Long Island University C. W. Post Campus Corbett.Redden@liu.edu  <b>Thomas Tradler</b> Professor of Mathematics CUNY Graduate Center and New York City College of Technology ttradler@citytech.cuny.edu  <b>Jae-Suk Park</b> Professor of Mathematics Pohang University of Science and Technology jaesuk@postech.ac.kr
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