

# KAĆA BRADONJIĆ

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**Research Interests**      General Relativity · Foundations of Physics · Philosophy of Physics

**Education**      BOSTON UNIVERSITY      May 2012  
Ph.D. in Physics  
Dissertation: “Unimodular Conformal and Projective Relativity”  
Advisor: John Stachel

NORTHEASTERN UNIVERSITY      June 2004  
B.S. in Physics and Philosophy

## Employment

ASSOCIATE PROFESSOR OF PHYSICS, HAMPSHIRE COLLEGE      Starting AY 2025

ASSISTANT PROFESSOR OF PHYSICS, HAMPSHIRE COLLEGE      2021 – 2025

VISITING ASSISTANT PROFESSOR OF PHYSICS, HAMPSHIRE COLLEGE      2016 – 2021

VISITING LECTURER OF PHYSICS, WELLESLEY COLLEGE      2012 – 2016

WRITING INSTRUCTOR, BOSTON UNIVERSITY      2009–2012  
Designed and taught science-focused interdisciplinary writing seminars in the Writing Program.

TEACHING FELLOW IN PHYSICS, BOSTON UNIVERSITY      2005–2010  
Taught discussion sections and laboratories for the introductory physics courses for scientists, engineers, and non-science majors.

RESEARCH ASSISTANT, BOSTON UNIVERSITY      2006  
Supervisor: Glynn Holt  
Carried out experimental work on sonoluminescence.

RESEARCH ASSISTANT, NORTHEASTERN UNIVERSITY      2004–2005  
Supervisors: Ronald Aaron and Carl Shiffman  
Studied the effects of age on the electrical impedance myography of human muscle, organized and analyzed data, ran computer simulations using RC circuits as models of muscle tissue.

**Publications**      BEYOND THE DICHOTOMY OF LITERAL AND METAPHORICAL LANGUAGE IN THE CONTEXT OF CONTEMPORARY PHYSICS  
**Bradonjić, K.** *Open Philosophy*, 7(1), 20240050 **2024**. DOI: <https://doi.org/10.1515/opphil-2024-0050>

THE PHENOMENAL ATLASES OF CONTEMPORARY PHYSICS: KNOWING THE IMPERCEPTIBLE  
**Bradonjić, K.** *Leonardo*, 56(6), 586–591 **2023**. DOI: [10.1162/leon\\_a.02424](https://doi.org/10.1162/leon_a.02424)

QUANTUM GRAVITY: MEANING AND MEASUREMENT  
Stachel, J. and **Bradonjić, K.**, *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, 46, 209-216, **2014**. [arXiv:1302.2285]

UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY: AN ILLUSTRATED INTRODUCTION  
**Bradonjić, K.**, In: Sidharth, B., Micheleni, M., Santi, L. (eds) *Frontiers of Fundamental Physics and Physics Education Research: Springer Proceedings in Physics*, 145, 197-203, **2014**.

QUANTUM MEASUREMENT AND THE AHARONOV-BOHM EFFECT WITH SUPERPOSED  
 MAGNETIC FLUXES **Bradonjić, K.** and Swain, J., *Quantum Information Processing*, 13(2), 323-331, **2013**. [arXiv:1103.1607]

UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY  
**Bradonjić, K.** and Stachel, J., *Europhysics Letters*, 97(1), 10001, **2011**. [arXiv:1110.2159]

ON SPACETIME GEOMETRY ABOVE THE ELECTROWEAK SYMMETRY BREAKING SCALE.  
**Bradonjić, K.**, Preprint. **2011**. [arXiv:1103.5164]

THE CASIMIR EFFECT IN BIOLOGY: THE ROLE OF MOLECULAR QUANTUM  
 ELECTRODYNAMICS IN LINEAR AGGREGATIONS OF RED BLOOD CELLS  
**Bradonjić, K.**, Swain, J. D., Widom, A. and Srivastava, Y., *Journal of Physics: Conference Series*, 161 012035, **2009**. [http://m.iopscience.iop.org]

RELATIVITY OF MUSICAL MOOD  
**Bradonjić, K.**, Preprint. **2008**. [arXiv.org:0807.2493]

EFFECTS OF AGE ON MUSCLE AS MEASURED BY ELECTRICAL IMPEDANCE MYOGRAPHY  
 Aaron, R., Shiffman, C. A., Esper, G. J., **Bradonjić, K.**, Lee, K. S., Rutkove, S. B. *Physiological Measurement*, 10(2), 953-959, **2006**.

#### Invited Talks

BEYOND REACH: ON UNDERSTANDING IN PHYSICS” IN CONVERSATION WITH DAVID KAISER  
 AND TRACY SLATYER  
*Catalyst Conversations*, MIT List Visual Arts Center, Cambridge, MA. November 1, **2023**.

THE PHENOMENAL ATLASES OF PHYSICS  
*Physics Department Colloquium*, Bard College, Annandale-On-Hudson, NY. November 11, **2022**.

RETURN TO THE PHENOMENAL: AN EXPLORATION OF THE SUBJECTIVE, INTERNAL REPRESENTATIONS OF THE KNOWLEDGE OF FUNDAMENTAL PHYSICS AND THEIR RELATIONS TO THE COLLECTIVE PURSUITS OF KNOWLEDGE  
*Internal Discussion Seminar*, Institute for Artificial Intelligence and Fundamental Interactions, MIT, Cambridge, MA. October 21, **2022**.

MATH AS THE LANGUAGE OF PHYSICS: WHAT IS LOST IN TRANSLATION?  
*Physics Department Colloquium*, Mount Holyoke College, South Hadley, MA. November 7, **2017**.

MATH AS THE LANGUAGE OF PHYSICS: WHAT IS LOST IN TRANSLATION?  
*Physics Department Colloquium*, Amherst College, Amherst, MA. October 24, **2017**.

FLASH TALK ON PERSPECTIVE  
*Teaching Visuality in the 21<sup>st</sup> Century*, a symposium organized by the Five College Blended Learning project, Hampshire College, Amherst, MA. March 23-24, **2017**.

LESS IS MORE: THE ADVANTAGES OF UNIMODULAR INVARIANCE  
*Gravity and Geometry: Centenary Perspectives on General Relativity*, Rotman Institute of Philosophy, Western University, London, ON. June 6-7, **2015**.

MEANING AND UTILITY OF UNIMODULAR INVARIANCE  
*Seminar talk*. Department of Physics, Dartmouth College. Hanover, NH. January 20, **2014**.

UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY  
*Geometry and Physics: International Fall Workshop*, Paris, France. November 28-29, **2013**.

TO QUANTIZE OR NOT TO QUANTIZE: UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY LETS US PICK AND CHOOSE.

*An Intellectual Life across Disciplines: Colloquium in Honour of John Stachel's 85<sup>th</sup> Birthday*, Max Planck Institute for the History of Science, Berlin, Germany. September 12-13, **2013**.

UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY AND THE COMPATIBILITY OF CAUSAL AND DYNAMICAL STRUCTURES

*The 40<sup>th</sup> Anniversary of the First Osgood Hill Conference on Quantum Gravity*, Boston, MA. October 15, **2012**.

### Contributed Talks

BEYOND THE LITERAL/METAPHORICAL DICHOTOMY IN PHYSICAL SCIENCES

Science:between literal and metaphorical meanings, University of Lisbon, Lisbon, Portugal. April 20-21, **2023**.

ON UNIMODULAR INVARIANCE

20<sup>th</sup> Eastern Gravity Meeting, Penn State, State College, PA June 9-10, **2017**.

DIFFERENTIAL FORMS AS A SUPPLEMENTARY FRAMEWORK FOR TEACHING UPPER-LEVEL ELECTRICITY AND MAGNETISM

AAPT Winter Meeting, New Orleans, LA. January 9-12, **2016**.

UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY

7<sup>th</sup> Texas Symposium on Relativistic Astrophysics, Dallas, TX. December 8-13, **2013**.

UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY IN THE MASSLESS REGIME

15<sup>th</sup> Annual East Coast Gravity Meeting, Syracuse, New York. April 21, **2012**.

UNIMODULAR CONFORMAL AND PROJECTIVE RELATIVITY.

Twelfth International Symposium: Frontiers of Fundamental Physics (FFP12), Udine, Italy. November 23, **2011**.

### Teaching

#### Hampshire College

##### Physics

·NS-0338, THERMAL PHYSICS

·NS-0206, MODERN PHYSICS

·NS-0205, PHYSICS II: FUNDAMENTALS OF ELECTRICITY AND MAGNETISM WITH LAB

·NS-0204, PHYSICS I: QUANTUM AND CLASSICAL MECHANICS WITH LAB

·NS-0183/NS-0383, BASIC PHYSICS: QUANTUM MECHANICS FOR THE MYRIAD

·NS-0103, THE SCIENCE OF SPACE AND TIME

·LCSEM-0119/NS-0325, ENERGY AND ITS MANIFESTATIONS

##### Interdisciplinary

·NS-0270, TRANSDISCIPLINARY APPROACHES TO UNDERSTANDING OF SCIENTIFIC UNDERSTANDING

·NS/HACU-0243, ON WHAT THERE IS: PHYSICS AND METAPHYSICS(co-taught with Christoph Cox)

·NS-0208, SCIENCE IN A CULTURAL CONTEXT

·NS-0113, PHYSICS OF COLOR (IN THE CONTEXT OF THE VISUAL ARTS)

##### Math

·NS-0274, LINEAR ALGEBRA

·NS-0213, SYMMETRIES OF NATURE: AN INTRODUCTION TO GROUP THEORY

##### Independent Studies

·NS-0203, INDEPENDENT STUDY: PHILOSOPHY OF PHYSICS

- NS-0300, INDEPENDENT STUDY: LINEAR ALGEBRA
- NS-0300, INDEPENDENT STUDY: USING MATHEMATICA FOR TENSORIAL CALCULATIONS IN GENERAL RELATIVITY
- NS-0200-24, INDEPENDENT STUDY: ORCHESTRATED OBJECTIVE REDUCTION CO-ADVISED WITH JOHN CASTORINO
- NS-0200-13, INDEPENDENT STUDY: GROUP THEORY

### **Wellesley College**

- PHYSICS 101, EINSTEIN'S CENTURY: PHYSICS IN THE LAST 100 YEARS
- PHYSICS 250H, INDEPENDENT STUDY IN GENERAL RELATIVITY
- PHYSICS 302, QUANTUM MECHANICS
- PHYSICS 108, PRINCIPLES AND APPLICATIONS OF ELECTRICITY, MAGNETISM, AND OPTICS LAB
- PHYSICS 106, FUNDAMENTALS OF ELECTRICITY, MAGNETISM, & OPTICS LECTURE AND LAB
- PHYSICS 104, FUNDAMENTALS OF MECHANICS, LECTURE AND LAB

### **Boston University**

- WR100, WRITING SEMINAR, SPACE AND TIME: COMMON SENSE AND BEYOND
- WR150, WRITING AND RESEARCH SEMINAR

### **Student Projects**

#### **Hampshire College**

##### **Committee Chair**

- LEO GIANNINI, CANCER BIOCHEMISTRY THROUGH LABORATORY AND ART STUDIO PRACTICE. 2025. (CO-CHAIRING WITH JOHN CASTORINO).
- ABDUL RAFFEY SHAKOOR, UNDERSTANDING THE NATURE OF RADIO EMISSION IN JWST SELECTED GALAXIES. 2024. (CO-CHAIRING WITH MIN YUN, UMASS AMHERST).
- RUPERT TAWIAH-QUASHIE, DEMOCRATIZING CONTEXTUAL REASONING: INVESTIGATING KNOWLEDGE DISTILLATION AND MODEL COMPRESSION FOR A NANO GPT-BASED MATHEMATICAL FRAMEWORK. 2024. (CO-CHAIRING WITH JAIME DAVILA, UMASS AMHERST).
- TIMOTHY MATTHIAS, HEAT ENGINE BEHAVIOR OF CHARGED AND SPINNING BLACK HOLES IN DE SITTER SPACE. 2022.
- SCOUT CHAPLIN-LOEBELL, PHOTOGRAPHY FROM SCRATCH. 2022.
- DANIEL SCHMIDT, STRUCTURES OF WATER: CREATIVE NON-FICTION INVESTIGATIONS OF ECONOMICS, BIOLOGY AND LANGUAGE. 2022.
- ISABEL ROWLAND, MODERN ALICE: A BLOG ADDRESSING COMMON MISCONCEPTIONS IN INTRODUCTORY PHYSICS. 2022.
- REED COHEN, MCCP TESTING FOR THE NEXO EXPERIMENT 2021. (CO-CHAIRING WITH ANDREA POCAR, UMASS AMHERST).
- JOHARI RHETT, THE EFFECT OF ENVIRONMENT ON STAR FORMATION RATES AMONG LOW SURFACE BRIGHTNESS GALAXIES. 2021. (CO-CHAIRING WITH JASON YOUNG, MOUNT HOLYOKE COLLEGE).
- MICHAEL GARCIA, EVOLUTION OF AUTONOMOUS NAVIGATION POLICIES FOR TENSEGRITY ROBOTS. 2021. (COMMITTEE MEMBER: LEE SPECTOR, AMHERST COLLEGE).

·CARLOS SEVILLA, ANALOG QUANTUM SIMULATION WITH HYPERBOLIC OPTICAL LATTICES. 2020. (WORK SUPERVISED BY PROF. ARKA MAJUMDAR, UW)

·LUCY PROPPER, SITUATING SCIENCE: IN SEARCH OF A JUST PRODUCTION AND DISSEMINATION OF SCIENTIFIC KNOWLEDGE. 2020. (CO-CHAIRER WITH HERB BERNSTEIN).

·MAX ADAMS, LEARNING THROUGH OPTICAL INTERFERENCE ON A BUDGET; BUILDING A MACH-ZEHNDER INTERFEROMETER. 2019.

·ANDY COHN, VARIABILITY OF LOW MASS STARS. 2019. (CO-CHAIRER WITH JASON YOUNG, MOUNT HOLYOKE COLLEGE).

·ARIEL KANE-ERSIG, TEACHING PHYSICS. 2019.

### **Committee Member**

· RAFAEL BOCCUNI-GODFREY, EXPLORING MUSICAL REPRESENTATIONS OF ALGORITHMS BY ROBOTICALLY INTERFACING WITH AN ELECTRIC GUITAR. 2023.

·MADLINE AN, STORY, 5+0RY, "STORY?": BLURRING THE LINES BETWEEN AUTHOR AND AUDIENCE. 2022.

·TOM NICHOLSON, GAME DESIGN, DEVELOPMENT, AND PROGRAMMING. 2022

·JOSEF DOYLE, CONTEXT AND QUANTIFICATION IN NATURAL LANGUAGE DISCOURSE. 2021.

·KUNGA CHONYI, STRESS-INDUCED CATATONIA: A CASE STUDY. 2021.

·SOPHIA CAPPELLO, AN EXAMINATION OF EMERGENCY RELIEF EFFORTS MADE BY THE AMERICAN RED CROSS & INTERNATIONAL MEDICAL CORP: HAITI 2010. 2021.

·LYLE BROUGHTON, 50 FUNDAMENTAL CHAIN REACTION MECHANISMS. 2021.

·LYLE BAMER, ACETAMINOPHEN ADVANTAGES AND ADVERSE AFTERMATHS. 2021.

·AMY LOWE, THE PATHOPHYSIOLOGY OF MIGRAINE: PITUITARY ADENYLATE CYCLASE-ACTIVATING PEPTIDE AND P815 CELLS. 2021.

·ELAINE ROBINSON, MOLECULAR CHARACTERIZATION OF PLURIPOTENT STEM CELLS: WHEN SCIENCE IS PERSONAL. 2020.

·LUCAS MAY, OUT OF THE EARTH, INTO THE FIRE. 2020. (POTTERY AND PRINTMAKING)

·ALISON LIMA, HOW 2020 STATE LAWS CAN AFFECT ABORTION ACCESS. 2020.

·CONRAD WURZBURG, DEVELOPMENT OF A CELLULOSE-ACTIVATED CARBON OIL SORBENT MEMBRANE. 2020.

·CHRISTIAN LEE, ACCESSIBLE FOREST MANAGEMENT IN NEW ENGLAND. 2020.

·JONATHAN KAY, BEATY SEQUENCES, STURMIAN WORDS, SUBTRACTION GAMES, AND INFINITE SUMS. 2020.

·SARITA SHERA, TJ TIGER AND THE QUANTUM MECHANICS. 2019.

·ANDREW DAVIS, FOOD NEOPHOBIA AND DISGUST. 2019.

·DOMA GHALE, EVALUATING FAIRNESS AND TRANSPARENCY IN DECISION MODELS FOR PREDICTING RECIDIVISM. 2018.

·JEREMY KIRN, TOPOLOGY AND LOGIC. 2017.

·VICTORIA DELANO, NEUROCARDIOLOGY, BIOFIELD PHYSIOLOGY AND THE PINEAL GLAND;  
UNDERSTANDING ENERGY MEDICINE. 2017.

### Wellesley College, Independent Projects

·APPLICATIONS OF DIFFERENTIAL FORMS TO TEACHING ELECTRICITY AND MAGNETISM  
DOMINIQUE MCKENZIE '17 SUMMER 2015, FALL 2015  
JELENA BEGOVIĆ '17 SUMMER 2015

·SONIFICATION OF DATA AND MATHEMATICAL FUNCTIONS IN MATHEMATICA  
DOMINIQUE MCKENZIE '17, VICKY NGAN '18, AND NIXIA CHEN '18 Spring 2015

·GEOMETRIC REPRESENTATION OF LORENTZ INVARIANCE OF MAXWELL'S EQUATIONS  
IRENE ROMAN, '13 Spring 2013

### Leadership & Service

DIRECTOR OF ASSESSMENT Starting AY 2025

FACULTY MEMBER OF THE EXECUTIVE COMMITTEE OF THE FACULTY AY 2024-Present

FACULTY MEMBER OF THE BOARD OF TRUSTEES ENROLLMENT COMMITTEE AY 2023-25

FACULTY CLUSTER SEARCH IN SUSTAINABILITY AND ENVIRONMENT, MEMBER AY 2024

SEARCH COMMITTEE FOR THE ASSISTANT DEAN OF ADVISING AY 2024

JAMES BALDWIN SCHOLARS ADMISSIONS COMMITTEE AY 2022, 2024

FACULTY COORDINATOR (DIRECTOR) OF THE LEARNING COLLABORATIVES NETWORK  
AY 2022

ACADEMIC CONTINUITY COMMITTEE March-July 2020

AAUP WORKLOAD WORKING GROUP June 2020

NON-TENURE-TRACK FACULTY CAUCUS Spring 2020

FACULTY ADVISER  
Math & Physical Sciences Student Interest Group, Hampshire College AY 2017-2019  
Society of Physics Students, Wellesley College AY 2016

SCIENCE CENTER SUMMER RESEARCH COMMITTEE, WELLESLEY COLLEGE AY 2016

PHYSICS GRE REVIEW FOR MAJORS, WELLESLEY COLLEGE AY 2013

VICE-PRESIDENT, BOSTON UNIVERSITY WOMEN IN PHYSICS  
STUDENT ORGANIZATION AY 2010

ORGANIZING CHAIR, NEW ENGLAND PHYSICS TEACHING ASSISTANTS' FORUM 2006  
Organized an AAPT-sponsored regional conference on teaching physics.

### Awards

PHYSICS TEACHING FELLOW OF THE YEAR, BOSTON UNIVERSITY 2007

<b>Outreach</b>	GUEST SPEAKER AT HAMPSHIRE COLLEGE SCIENCE CLUB	4/17/2024
	GUEST SPEAKER IN COURSE “ON IMAGES,” UNIVERSITY OF CHICAGO Marine Biology Laboratory, Woods Hole, MA	4/4/2024
	“WHAT DOES PHYSICS TELL US ABOUT TIME?” SciTech Café, Northampton, MA	2/25/2019
	PANELIST, APS CONFERENCES FOR UNDERGRADUATE WOMEN IN PHYSICS UMass Amherst, MA	1/19/2019
	“THE PHYSICS OF COLOR” WORKSHOP, GALLERY 263 Designed and facilitated a hands-on workshop on physics of color for the general public as part of the <i>ArtWeek</i> festival and with the assistance of artist Mirela Kulović.	5/5/2018
	GUEST, CAMBRIDGE-HARVARD SUMMER ACADEMY Talked to high school students about pursuing careers in science.	8/6/2015
	PROJECT MANAGER FOR SCIENCE, MONKS, AND TECHNOLOGY PROGRAM Mentored Tibetan students in India who worked on projects that improve science and math education in their school, including a survey of middle-school students on their attitudes toward mathematics.	2013–2015

**Art & Illustration**

My artistic work explores the intersection of physics and art in an attempt to understand the role of symbolic representation and metaphor in these pursuits. I also illustrate texts on physics and astronomy.

GALLERY AFFILIATIONS: Gallery 263, Cambridge, MA 2013 – 2017

## ARTIST RESIDENCIES

- Institute for Artificial Intelligence and Fundamental Interactions, MIT, Cambridge, MA, October 2022 – February 2023
- Conference “Regular Black Holes in Quantum Gravity and Beyond: from Theory to Shadow Observations,” Virtual, October 18–21, 2021
- Perimeter Institute, June 5-7, 2018
- Boston University, Center for Philosophy and History of Science, 2018–2021

## PUBLISHED ARTWORK

## BOOK COVERS

- Gordon Belot. *Accelerated Expansion: Philosophy and Physics with a Positive Cosmological Constant*. Oxford University Press. 2023.
- Dean Rickles. *Covered with Deep Mist: The Development of Quantum Gravity (1916-1956)*. Oxford University Press. 2020.
- *Why Trust a Theory? Epistemology of Fundamental Physics*, Ed. R. Dardashti, R. Dawid, and K. Thébault. Cambridge University Press. 2019.

## BOOK ILLUSTRATIONS

- Lee Smolin, *Einstein’s Unfinished Revolution: The Search for What Lies Beyond the Quantum*. Penguin Press. 2019.
- Kenneth R. Lang, *Life and Death of Stars*. Cambridge University Press. 2013.
- Kenneth R. Lang, *Essential Astrophysics: Undergraduate Lecture Notes in Physics*. Springer Verlag. 2013.

- Gunther Leon, *The Physics of Music and Color*. Springer. 2012.

ARTWORK IN THE PRESS

- “Colorful Primordial Black Holes,” Mateo Rini, *Physics* **17**, s69.
- “Exotic black holes could be a byproduct of dark matter,” Jennifer Chu, *MIT News*, June 6, 2024.
- “Projections: Mapping the Interior,” *Inside the Perimeter*, Fall/Winter 2018/2019.

EXHIBITS

- *And From My Brief Dream The Eternal Sun*. Solo show curated by Arlinda Shtuni for the Coro Dante Art Song Salon, Dante Alighieri Society, Cambridge, MA. 2018.
- *Members’ Show*. Group exhibition. Gallery 263, Cambridge, MA. 2016.
- *Members’ Show*. Group exhibition. Gallery 263, Cambridge, MA. 2015.
- *Works on Paper*. National Show juried by Al Miner. South Shore Art Center, Cohasset, MA, 2014.
- *Magic Without Tricks*. Group exhibition juried by Arlinda Shtuni. The Nave Gallery Annex, Somerville, MA. 2014.
- *Folk*. Group exhibition juried by Kate McNamara. Gallery 263, Cambridge, MA. 2014.
- *Massachusetts*. Group exhibition juried by Dina Deitsch. Gallery 263, Cambridge, MA. 2014.
- *Art/Identity*. Group exhibition juried by Group exhibition juried by Susan Sills and Geoff Hargadon. Gallery 263, Cambridge, MA. 2013.

COLLECTIONS

Perimeter Institute, Waterloo, ON, Canada

**Languages** English, Bosnian/Croatian/Serbian