

# COURTNEY GIBBONS

Assistant Professor of Mathematics

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## Degrees

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- Ph.D. Mathematics**, University of Nebraska–Lincoln August 2013  
Thesis Advisors: Luchezar Avramov and Roger Wiegand  
Thesis Title: Decompositions of Betti Diagrams
- M.S. Mathematics**, University of Nebraska–Lincoln May 2009
- B.A. Mathematics**, Colorado College May 2006  
Graduated *Summa Cum Laude* with Distinction in Mathematics

## Research Interests

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Commutative algebra; in particular, properties of infinite free resolutions and Betti diagrams

## Awards and Fellowships

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- Project NExT Fellow** Academic Year 2013-2014
- Outstanding Graduate Teaching Assistant** U. of Nebraska–Lincoln, 2011  
A university-wide award given to two graduate teaching assistants each year
- Emeritus Faculty Fellow** U. of Nebraska–Lincoln, 2010  
Given each academic year by the department to top doctoral students
- Graduate Fellowship** U. of Nebraska–Lincoln, 2009  
Awarded by the UNL Graduate Fellowship Committee in recognition of outstanding academic performance and scholarly potential
- Outstanding Qualifying Exams** U. of Nebraska–Lincoln, 2008  
Given each academic year by the department to the student who produces the most outstanding qualifying exams the previous spring
- Florian Cajori Prize in Mathematics** Colorado College, 2006  
Awarded most years by the Colorado College Mathematics Department as its top award for mathematical prowess

## Publications

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*Critical Pebbling Numbers of Graphs*, with J. D. Laison and E. J. Paul  
Submitted.

*Non-simplicial decompositions of Betti diagrams of complete intersections*, with J. Jeffries, S. Mayes, C. Raicu, B. Stone, and B. White  
To appear, *Journal of Commutative Algebra*. [arXiv:1301.3441](https://arxiv.org/abs/1301.3441)

*The cone of Betti diagrams over a hypersurface ring of low embedding dimension*, with C. Berkesch, J. Burke, and D. Erman  
*Journal of Pure and Applied Algebra*, Volume 216, Issue 10, October 2012, Pages 2256–2268

*Fixing numbers of graphs and groups*, with J. D. Laison  
*Electronic Journal of Combinatorics*, Volume 16, Issue 1, 2009, R39

## Code

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*BoijSoederberg.m2*, package reviser; in preparation for submission.

*NCAAlgebraV2.m2*, package author; ongoing project.

## Talks, Posters, and Presentations

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### Hamilton College

**Sigma Xi Colloquium** *Syzygy: Understanding Relationships among Polynomials*

Invited by Professor Wei-Jen Chang

February 2014

### Invited Talks

#### 1092nd AMS Meeting

*Non-simplicial decompositions of Betti diagrams of complete intersections*

University of Louisville, Louisville, KY

October 2013

#### 1085th AMS Meeting

*Modules over short Gorenstein rings*

University of Arizona, Tucson, Tucson, AZ

October 2012

#### 1074th AMS Meeting

*New directions in Boij–Söderberg theory*

University of Nebraska–Lincoln, Lincoln, NE

October 2011

### Contributed Talks

#### Joint Mathematics Meetings: AMS Contributed Papers Session

*Modules over short Gorenstein rings*

January 2013

### Seminar Talks

#### Other Universities

##### University of Utah algebra seminar

*Decomposition of Betti diagrams over a quadric hypersurface*

March 2012

##### University of Texas at Arlington algebra seminar

*Betti diagrams over a small hypersurface*

March 2012

#### University of Nebraska–Lincoln

##### Commutative algebra seminar

*Boij–Söderberg Theory I: Betti diagrams over polynomial rings*

September 2010

*Boij–Söderberg Theory II: Betti diagrams over  $k[x, y]/(x^2)$*

September 2010

##### Graduate commutative algebra reading seminar (CARS)

Students take turns presenting papers. I have given roughly one talk each semester for four years, and I co-organized the seminar for two years.

##### Graduate student seminar

All doctoral students attend this seminar, wherein talks are typically aimed at first- and second-year graduate students. I have given six talks over four years.

*For Young Mathematicians***Hampshire College HCiSSM “Prime Time”***A variety of ways to solve a problem (in an ideal world)*

August 2013

**Bard College mathematics seminar***Fun and (sudoku) games with polynomials*

November 2012

**William Jewell College Pi Mu Epsilon colloquium***The German Tank Problem: statistics and the war effort*

November 2012

**Colorado College mathematics seminar***The determinant trick*

April 2010

*Posters***Joint Mathematics Meetings 2013: AWM Workshop poster session***Decompositions of modules over short Gorenstein rings*

January 2013

**Joint Mathematics Meetings 2007: Undergraduate research poster session***Fixing numbers of graphs and groups*

January 2007

*Other presentations***Joint Mathematics Meetings 2014: Mathematically Bent Theater**

Actor for the Möbiusbandaid Players

January 2014

**Teaching Experience**

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*Hamilton College*

Course	Name (# sections)	Description
Math 113	Calculus I	introductory calculus course
Math 224W	Linear Algebra	manipulating systems of linear equations; introduction to proof writing

*Students advised*

Peter Talpey; senior project, Spring 2014. “The Hilbert-Serre Theorem for Modules.”

*University of Nebraska-Lincoln as principal lecturer*

MA101	College Algebra (2)	calculus preparation course
MA203	Contemporary Math (3)	quantitative reasoning course emphasizing modern mathematics
MA300	Math Matters (1)	foundational elementary education course emphasizing number & operation

*Unique experiences***“Super TA” for Math 106 (Calculus I) and Math 107 (Calculus II)**

Fall 2011

The “Super TA” acts as a resource for first time recitation instructors. Throughout the fall semester, I observed these instructors, provided constructive feedback to each, and made follow-up visits upon request.

**Course Design for Contemporary Mathematics**

Summer 2010

Redesign of the course curriculum and content for the UNL “math for non-majors” course after a change in textbook.

**Math Department Graduate Student Orientation Leader**

2010, 2011

Part of a two-person team to organize orientation for incoming mathematics graduate students, including running several panels and social events.

**Paraprofessional, Colorado College**

August 2006-May 2007

Teaching assistant and tutor for all undergraduate math courses, with emphasis on first- and second-year sequences. The paraprofessional also manages social activities for the department.

## Grant-supported Activity

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**NSF Grant #DMS-1303248; co-PI – KUMUNUjr**

(<http://www.math.unl.edu/~s-acroll1/KUMUNUjr/2013/>)

Spring 2013

KUMUNUjr is a conference for graduate students and post-docs studying commutative algebra in the Midwest; it is modeled after KUMUNU. It grew out of the UNL graduate commutative algebra reading seminar.

**NSF Grant #DMS-1103176 (Advisor’s grant)**

Spring 2012

**Graduate Assistantships in Areas of National Need (GAANN)**

Summer–Fall 2010

**NebraskaMATH**

Fall 2012

NebraskaMATH is an NSF-funded math-science partnership designed to offer Nebraska math teachers intellectually rich graduate coursework and professional development opportunities.

As a research assistant for the NebraskaMATH Noyce program, I participated in research activity designed to help strengthen curriculum for teachers in traditionally under-served schools, including group peer-review of research papers. I also acted as a mathematical resource for Nebraska teachers preparing “Dinner and a Math Problem” events for their colleagues.

As a graduate teaching assistant for NebraskaMATH, I worked closely with practicing K-12 teachers while they completed problem sets and group work. My primary function was to facilitate discussions among the teachers and usher them gently toward a solution. I also led some class sessions and facilitated distance learning video conferences.

**GTA for Course:**

Functions for Precalculus Teachers  
 Number Theory & Cryptology for Teachers  
 Discrete Math for Teachers

**Course Description:**

distance-learning course focusing on applications of precalculus  
 elementary theory required to understand RSA encryption  
 graduate combinatorics for mid-level mathematics teachers

**Resident scientist for Project Fulcrum**

Fall 2009–Spring 2010

Project Fulcrum was an NSF-funded K-12 outreach program, placing UNL graduate students in classrooms through the Lincoln, NE area. I served as an in-class resource for Mickle Middle School science teacher Joe Rousseau. My duties included creating original classroom content, leading laboratory experiments, and facilitating teamwork among the seventh graders.

**Mentoring Through Critical Transition Points (MCTP) Trainee**

2007

These traineeships fully fund the first year of graduate school. MCTP Fellows also serve as TAs for the Intensive Mathematics: a Mentoring, Education, and Research Summer Experience (IMMERSE) program for students transitioning from undergraduate to graduate school.

## Workshops and Summer Schools

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**Macaulay2 Workshop**, Mathematical Sciences Research Institute

January 2014

**Joint Introductory Workshop: Cluster Algebras and Commutative Algebra**

Mathematical Sciences Research Institute

August 2012

**Summer Graduate School on Commutative Algebra**

Mathematical Sciences Research Institute

June 2011

**Macaulay2 Workshop**, Colorado College

August 2010

**Mathematics Research Community (Commutative Algebra)**, Snowbird, Utah

July 2010

**School on Commutative Algebra and Interactions with Algebraic Geometry and Combinatorics**

The Abdus Salam International Center for Theoretic Physics, Trieste, Italy

June 2010

## Service

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Hamilton College

**Postmodern Spain**

*General Relativity in a Relatively Small Nutshell*

Guest lecture in HSPST-370-01 at the request of Professor Paul Norberg

October 2013

**Mathletics**

Coach for the Putnam team with Dr. Andrew Dykstra

Fall 2013

Elsewhere

**KUMUNUjr**

Co-founder, Co-organizer, Co-PI

U. of Nebraska–Lincoln, 2012–2013

**Nebraska Conference for Undergraduate Women in Mathematics**

Invited Graduate Student and Panelist, “Choosing a Graduate School”

2012

Registration, Table Host

2010–2013

**Campus-wide Workshop for Graduate TAs**

Breakout Session leader, Math and Statistics GTA breakout session

2012

Panelist, “Tips from the Trenches: Talking with Experienced TAs”

2011

**Annual Math Day volunteer**

U. of Nebraska–Lincoln, 2007–2012

**Graduate Student Advisory Board representative**

U. of Nebraska–Lincoln, 2007–2009

**Saturday Science volunteer**, U. of Nebraska–Lincoln,

February 2010

**Pfizer–Novartis–LPS Science Fair judge**

2010, 2012

## Professional Memberships and Honor Societies

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American Mathematical Society

Association for Women in Mathematics

Mathematics Association of America

Society for Industrial and Applied Mathematics

Phi Beta Kappa