AUSTIN BELL

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RESEARCH EXPERIENCE

- **Commutative Algebra in the South 2023 at University of Alabama**
  - Spring 2023: I gave a lightning talk on S-closure, an interpolation in commutative algebra between integral closure and tight closure.
- **48th Annual New York Graduate Math Conference at Syracuse University**
  - Spring 2023: I was scheduled to give a 25 minute talk on two new operators for monomial ideals of polynomial rings. Unfortunately due to weather/flight issues I was not able to attend.
- **Southwest Local Algebra Meeting 2023 at University of North Texas**
  - Spring 2023: I presented a poster entitled Interpolation between Closure Operators resulting from the reading and research course with Dr. Janet Vassilev.
- **UNM Algebra and Geometry Seminar**
  - Fall 2023 I gave two talks.
  - 12/6/23 I gave the final talk of the Fall 23 Semester entitled Galois Theory in the Differential Setting. I discussed the Fundamental Theorem of Galois Theory, then it's analogues in Picard-Vessiot and Kolchin Theory, while talking about how all are governed by Galois Connections and what this means from both an order theoretic perspective and a category theoretic perspective.
  - 9/6/23 I gave a talk entitled Interpolation Between Closure Operators in Commutative Algebra. The main topic was revisiting the results of Dr. William Taylor and then fleshing out a potential mixed characteristic analogue to the interpolation between Integral Closure and Tight Closure. I also talked about the potential role interpolation could play in closures from outside of commutative algebra, particularly in topology.
  - Fall 2022: I gave a talk entitled Categories, Closures and Completions, Oh My! The talk centered on the link between monads and closure operators, and gave several esoteric examples of monads and their respective translation into closure operators.

UNM Reading Seminars

- Fall 2023: Many of the new crop of graduate students (and a couple advanced undergraduates from DRP) were interested in learning Differential Algebra. I formed and lead the group in weekly presentations and problem sessions, in Spring 24 this group was formalized into a graduate seminar course I taught.
- Spring 2023: A fellow student, Rahul Dutta, and I approached one of our professors, Dr. Hongnian Huang, to formalize a reading seminar we had started earlier in the semester. We read portions of Dr. Allen Hatcher's Algebraic Topology. Dr. Huang also asked us to try to familiarize ourselves with a modern development in an adjacent area of mathematics. Still captivated by a topic I was introduced to at the 2021 Georgia Tech Topology Summer School I chose to look into The Disk Embedding Theorem and more broadly the Generalized Poincare Conjecture.

Directed Reading Program Founder/Program Director

UNM Department of Mathematics and Statistics

January 2021 – July 2023 (Director) / August 2023 – July 2024 (Codirector)

- In January 2021 I founded UNM's Directed Reading Program. In this role I planned and oversaw the running of several small to medium scale events/talks/etc. Each semester I would match interested undergrads with graduate students to learn math that interested them. For those sufficiently invested students we would hold semesterly presentations on their research. Following my masters I stayed on to help as the codirector while I was a part time instructor at UNM. During this time I got

EDUCATION

PhD in Mathematics Education

Texas State University

Fall 2024 - Present

- GPA -
- Advisor

Masters in Pure Mathematics

University of New Mexico (UNM)

Fall 2020 - Summer 2023

- GPA - 3.86
- Advisor Dr. Janet Vassilev

Bachelors in Mathematics

University of Texas at Austin (UT)

Fall 2016 - Spring 2020

- GPA - 3.24
- Minor in Philosophy

AWARDS

- 2022 - Susan Deese Roberts Outstanding Teaching Assistant Award by University of New Mexico Center for Teaching and Learning.
- 2022 - Lobo Leadership and Involvement Award by University of New Mexico Student Activities for starting the Directed Reading Program and my contributions to the mathematical community at UNM.
- 2020 - Graduate with Research Distinction by College of Natural Sciences at UT.
- 2019 - Summer Undergraduate Research Fellowship at UT focusing on a variant of Arithmetic Differential Equations under Dr. Alessadro Rezende De Macedo.
- 2018 - SURGe Student's Choice Award at the UT Undergraduate Research Symposium for my work on Arithmetic Differential Equations.
- 2017 - Summer Undergraduate Research Fellowship at UT investigating perfect numbers under Dr. Allison Miller.

SCHOLARLY ACTIVITIES

- Attended MAA Mathfest 2024 in Indianapolis with MathHappens.
- Attended Texas Algebraic Geometry Symposium: Syzygies over Texas! at Texas A&M
- Attended Southwest Local Algebra Meeting 2024 at University of Oklahoma
- Attended South Central Topology Conference III at New Mexico State 2023

the program partnered with the Undergraduate Research and Arts Design Network as well as helped plan and host the 13 speaker conference entitled "Math and More, Coffee and Talks: Opening Social."

- Projects I Sponsored:
  - Spring 2024: Two Projects,
    - A Crash Course in Galois Theory continued, various resources.
    - Dr. William Thurston's The Geometry and Topology of 3-manifolds.
    - Introduction to proofs, group of 3 students.
  - Fall 2023: Four projects,
    - Dr. Colin Adams' The Knot Book.
    - Dr. Colin Adams' The Tiling Book.
    - A Crash Course in Galois Theory, various resources.
    - Projective Geometry/Math Education, various resources.
  - Summer 2023: Two projects,
    - Dr. David Marker's Model Theory: An Introduction.
    - Dr. Peter Cromwell's Knots and Links.
  - Spring 2023: A continued crash course in the math leading to Lie Theory done via a compilation of resources.
  - Fall 2022: A crash course in the math leading to Lie Theory done via a compilation of resources.
  - Spring 2022: Dr. Emily Riehl's Category Theory in Context, group of 4 students.
  - Fall 2021: Dr. Charles Livingston's Knot Theory, resulted in a presentation by Kioshi Morosin entitled "An Overview of Seifert Surfaces."
  - Summer 2021: Dr. Lars Alfhor's Complex Analysis, resulted in a presentation by Franklin Dyer entitled "Convergence of Complex Power Series."
  - Spring 2021: Dr. Sheldon Axler's Linear Algebra Done Right.
- In Fall 2022, inspired by the work I had done for DRP, I was invited to assist with Dr. Dimiter Vassilev's Math 311, vector analysis, to help his students troubleshoot common early mathematical research pitfalls, such as learning latex, via a weekly office hour.

TEACHING EXPERIENCE

Instructor of Record

Texas State University Department of Mathematics

August 2024 – Present San Marcos, TX

- Fall 2024: I was the instructor of record for Math 1329, an introduction to calculus designed for business and economics students.

Honors Summer Math Camp Counselor

Mathworks

July 2024 San Marcos, TX

- I was the counselor to four high school students, assisting them (and others) daily with abstract algebra and real analysis.
- Due to my experience with the subjects I also assisted other counselors in preparing to assist their campers and gave much advice for those seeking careers in mathematics/adjacent fields.

Scholars Mentor/Labs Designer

Campersand (The CAMP for Algorithmic and Mathematical Play)

June 2024 Albuquerque, NM

- I mentored the elder participants of Campersand as they prepared presentations for the rest of the camps members and assisted in the cultivation of their mathematical community.
- In addition I designed and facilitated a variety of daily lab activities for all the Campersand participants.

- UNM McNair Scholars Research Conference Evaluator 2023
  - I evaluated two research poster sessions and five sessions of oral research presentations.
- Co-Organized "Open Chalk Night" a monthly event for UNM students interested in math to present an interesting theorem or proof and foster a greater mathematical community at UNM.
- Panelist at GetSet/ReSet Fall 2023 Conference put on by UNM'S Center for Teaching and Learning
  - Panel Entitled "Humanizing the Classroom: Preparing for Your First Day of Class as a Graduate Teaching Assistant."
- Organized for the UNM Department of Mathematics and Statistics to host a screening of "Secrets of the Surface: The Mathematical Vision of Maryam Mirzakhani" on May 12 2023 for International Women in Mathematics Day.
- Participant in a Math Teachers Circle hosted by UNM's Honors College April 2023
- Susan Deese Roberts Teaching Assistant Award Selection Committee Member 2023
- Conference Panelist at 2023 Spring Graduate Teaching Conference.
  - Two of my fellow mathematics grad students and I made a panel entitled "Humanity in Mathematics Education."
- UNM Undergraduate Research Opportunity Conference (U.R.O.C.) Evaluator Spring 2023
  - I evaluated three research poster sessions.
- URinspiration Undergraduate Research Online Conference Evaluator Spring 2023
  - URinspiration is a bilingual conference joint between Florida International University, University of Arizona, University of New Mexico, and Argentinian Universities.
  - I evaluated two sessions of oral research presentations.
- Conference Planner for the Spring 2023 Graduate Teaching Conference selected by the UNM Center for Teaching and Learning
- UNM U.R.O.C. Moderator Spring 2022
  - I moderated two sessions of oral research presentations.
- Attended Southwest Local Algebra Meeting 2022 at Baylor
- Attended Georgia Tech Topology Summer School 2021
- Attended Online Workshop on High-Dimensional Covariance Matrices, Networks and Concentration Inequalities Summer 2021 hosted by UNM
- UNM U.R.O.C. Evaluator Spring 2021
  - I evaluated five virtual research presentations.
- Attended AMS Fall Western Sectional 2021
- Attended UNM Algebra/Geometry Seminar Fall 2021-Spring 2024
- Attended UNM Analysis Seminar Fall 2022-Spring 2024

Part Time Instructor (PTI)

UNM Department of Mathematics and Statistics

Fall 2023 – Spring 2024 Albuquerque, NM

- Spring 24: I taught a load of 15 credit hours, one session of Math 1130, Survey of Mathematics, two sessions of Math 1215, Intermediate algebra, one session of Math 1250, Trigonometry and Precalculus and Math 551, A graduate seminar in Differential Algebra.
- Fall 23: I taught a load of 15 credit hours, three sessions of Math 1215 and two sessions of Math 1220.

Instructional Video Creator

UNM Department of Mathematics and Statistics

Summer 2023 Albuquerque, NM

- I was selected to develop instructional videos tailored to our Math 1215 course, that would go into a larger repository for students at UNM who are struggling with concepts that appear in the course.
- I also found other interested parties at UNM that would host the videos for their students so more students could find them.

Graduate Assistant at Math Learning Lab

UNM Department of Mathematics and Statistics

Summer 2023 Albuquerque, NM

- I assisted students with their summer Math 1215 course via daily individual tutoring.

Mathematics Coordinator/Intern

Math Happens, Explora Science Museum

April 2023 – Present Albuquerque, NM

- Every Saturday I would assist Explora museum goers as they interacted with math based exhibits provided via Math Happens.
- I was promoted to a coordinator where I then assisted with hiring and scheduling of the Mathematics Interns in Albuquerque at Explora.
- I represented the organization with other coordinators and staff members at MAA's Mathfest in 2024.

Instructor of Record

UNM Department of Mathematics and Statistics

June 2021 – May 2023 Albuquerque, NM

- Summer 2023: I had been selected to teach Math 1522, the standard calculus 2 course at UNM, but the course didn't make due to low enrollment.
- Spring 2023: I was the instructor of record for Math 1430, a calculus 1 course designed for biology and economics students.
- Fall 2022: I was instructor of record for both Math 1512, the standard calculus 1 course at UNM, and for ARSC 198 a course designed to help freshmen acclimate and transition to college.
- Summer 2022: I was instructor of record for Math 1440, a calculus 2 course designed for biology and economics students.
- Fall 2021: I was instructor of record for both Math 1512 and ARSC 198.
- Summer 2021: I had been selected to teach Math 1440, but the course didn't make due to low enrollment.

RELEVANT COURSEWORK

- Topics in Algebra: Toric Varieties with Dr. Janet Vassilev (Audited while PTI)
  - Toric Varieties by Dr. David Cox, Dr. John Little and Dr. Hal Schenk
- Fourier Analysis and Wavelets with Dr. Cristina Pereyra (Audited while PTI),
  - Harmonic Analysis: From Fourier to Wavelets by Dr. Cristina Pereyra and Dr. Lesley Ward
- Reading and Research Course with Dr. Janet Vassilev on S-closures and Interpolating between Closure Operations,
  - Integral Closure of Ideals, Rings, and Modules by Dr. Irena Swanson and Dr. Craig Huneke
  - https://arxiv.org/abs/2212.02696
  - https://arxiv.org/abs/2004.13190
- Reading Course with Dr. Hongnian Huang on Algebraic Topology thinking towards Exotic Spheres,
  - Algebraic Topology by Dr. Allen Hatcher,
  - The Disk Embedding Theorem.
- Topics in Analysis: Elliptic Differential Equations with Dr. Dimiter Vassilev,
  - Variety of papers.
- Reading Course with Dr. Terry Loring,
  - Algebraic K-Theory with Applications by Dr. Jonathon Rosenberg.
- Commutative Algebra with Dr. Janet Vassilev,
  - Commutative Ring Theory by Dr. Hideyuki Matsumura.
- Topics in Number Theory: Analogies between Numbers and Functions with Dr. Alexandru Buium,
  - https://math.unm.edu/ buium/analogies.pdf
- Reading Course with Dr. Terry Loring,
  - Matrix Analysis by Dr. Rajendra Batia.
- Morse Theory with Dr. Dimiter Vassilev (listed as Algebraic Topology 2),
  - Morse Theory by Dr. John Milnor.
- Problems Course with Dr. Janet Vassilev on Closure Operators in Commutative Algebra,
  - Basically Full Ideals in Local Rings by Dr. Willaim Heinzer, Dr. Louis Ratliff and Dr. David Rush,
  - Progress in Commutative Algebra 2.
- Riemannian Geometry with Dr. Dimiter Vassilev,
  - Riemannian Geometry by Dr. Manfredo Do Carmo.
- Reading Course with Dr. Alexandru Buium,
  - Algebraic Geometry by Dr. Robin Hartshorne.
- Homological Algebra with Dr. Janet Vassilev (listed as Algebraic Topology 1),
  - An Introduction to Homological Algebra by Dr. Joseph Rotman,
  - An Introduction to Homological Algebra by Dr. Charles Weibel.

Grader

University of New Mexico

Spring 2022 Albuquerque, NM

- Graded Math 327, a first course in Discrete Math for undergraduates taught by Dr. Matthew Blair.
- Graded Math 319, a first course in Number Theory for undergraduates taught by Dr. Alexandru Buium.

Teaching Assistant

University of New Mexico

August 2020 – May 2021 Albuquerque, NM

- Spring 2021: I was a Teaching Assistant for Math 1522 under Jurg Bolli.
- Fall 2020: I was a Teaching Assistant for Math 1512 under Jurg Bolli.

Engineering Intern and Invited Speaker

University of Texas, UTeach Outreach-UT Prep

Summer 2019, Summer 2018 Austin, TX

- As an Engineering Intern I assisted educators in teaching P.R.E.P summer camp students, sixth and seventh graders, basic principles of engineering and physics. We did many classical hands on projects such as building toothpick bridges.
- The following summer in 2019 I was invited back to speak to groups of students about what a career in mathematics could look like and how they could seek out opportunities for themselves to get involved if they were interested.

Assistant Discovery Leader

The DoSeum (Science Museum)

May 2015 - August 2015 San Antonio, TX

- The DoSeum is an activity and action focused stem childrens museum. They heavily partner with local organizations and schools to provide educational opportunities for many of San Antonio's youth.
- One of my summer jobs in high school was as an assistant discovery leader where I helped museum goers interact with the exhibits/toys in the Innovation Station, the STEM themed area of the DoSeum.

- Topics in Number Theory: Modular Forms with Dr. Alexandru Buium,
  - https://math.unm.edu/ buium/modforms.pdf
- Topology 2: Knot Theory (Undergrad Course) with Dr. Cameron Gordon,
  - Knots and Links by Dr. Peter Cromwell,
  - The Knot Book by Dr. Colin Adams.