

# Taylor Dupuy, PhD

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web: <https://tdupu.github.io>  
YouTube: [youtube.com/agexplained](https://youtube.com/agexplained)  
Github: [github.com/tdupu](https://github.com/tdupu)

## Appointments

Assistant Professor	University of Vermont	2022 –
Graduate Program Director	University of Vermont	2021
Assistant Professor	University of Vermont	2018–2021
Visiting Assistant Professor	University of Vermont	2016–2018
Postdoctoral Fellow	The Hebrew University	2014–2016
Postdoctoral Fellow	Mathematical Sciences Research Institute	2014
Adjunct Assistant Professor	UCLA	2013–2014

## Education

University of Tulsa	Mathematics	2003–2004
University of Arizona, BS	Mathematics	2004–2007
University of New Mexico, PhD	Mathematics	2007–2013

## Research Activities

### Publications

17. Taylor Dupuy, Kiran S Kedlaya, and David Zureick-Brown. Angle ranks of abelian varieties. *Mathematische Annalen*, pages 1–17, 2023
16. Taylor Dupuy, Kiran Kedlaya, David Roe, and Christelle Vincent. Isogeny Classes of Abelian Varieties over Finite Fields in the LMFDB. In Jennifer Balakrishnan, Noam Elkies, Brendan Hassett, Bjorn Poonen, Andrew Sutherland, and John Voight, editors, *Arithmetic geometry, number theory, and computation*, Simons Symposia. Springer, 2022
15. Taylor Dupuy, Kiran Kedlaya, David Roe, and Christelle Vincent. Counterexamples to a Conjecture of Ahmadi and Shparlinski. *Experimental Mathematics*, pages 1–5, 2021
14. Taylor Dupuy and David Zureick-Brown. Deligne-Illusie classes as arithmetic Kodaira-Spencer classes. *J. Théor. Nombres Bordeaux*, 31(2):371–383, 2019
13. Taylor Dupuy, Eric Katz, Joseph Rabinoff, and David Zureick-Brown. Total  $p$ -differentials on schemes over  $\mathbf{Z}/p^2$ . *J. Algebra*, 524:110–123, 2019
12. Taylor Dupuy. Examples of geometric Bombieri-Lang-Noguchi outside Mordell-Lang: nonrigid varieties with ample but not globally generated cotangent bundle. *J. Number Theory*, 175:158–166, 2017
11. Alexandru Buium and Taylor Dupuy. Arithmetic differential equations on  $GL_n$ , III Galois groups. *Selecta Math. (N.S.)*, 22(2):529–552, 2016
10. Alexandru Buium and Taylor Dupuy. Arithmetic differential equations on  $GL_n$ , II: arithmetic Lie-Cartan theory. *Selecta Math. (N.S.)*, 22(2):447–528, 2016
9. Alexandru Buium and Taylor Dupuy. Arithmetic differential equations on  $GL_n$ , I: Differential cocycles. *J. Algebra*, 454:273–291, 2016
8. Taylor Dupuy and David E. Weirich. Bits of  $3^n$  in binary, Wieferich primes and a conjecture of Erdos. *J. Number Theory*, 158:268–280, 2016
7. Taylor Dupuy. Positivity and lifts of the Frobenius. *Math. Res. Lett.*, 21(2):289–295, 2014
6. Taylor Dupuy. *Arithmetic Deformation Theory*. ProQuest LLC, Ann Arbor, MI, 2013. Thesis (Ph.D.)–The University of New Mexico

## Preprints

5. Taylor Dupuy and Ehud Hrushovski. The theory of the entire algebraic functions. *arXiv preprint arXiv:2305.12226*, 2023
4. Taylor Dupuy and Joe Rabinoff. A rigid analytic proof that the Abel-Jacobi map extends to compact-type models. *arXiv:1705.03034*, 2017
3. Taylor Dupuy and James Freitag. Order one differential equations on nonisotrivial algebraic curves. *arXiv:2309.02327*, 2023

## ABC Conjecture Preprints

2. Taylor Dupuy and Anton Hilado. Probabilistic Szpiro, Baby Szpiro, and Explicit Szpiro from Mochizuki’s Corollary 3.12. *arXiv:2004.13108*, 2020
1. Taylor Dupuy and Anton Hilado. The Statement of Mochizuki’s Corollary 3.12, Initial Theta data, and the First Two Indeterminacies. *arXiv:2004.13228*, 2020

## Honors and Awards

1. “Witt vectors, deformations, and absolute geometry” (DMS-1802012, \$39938), PI, 2018
2. “Arithmetic and algebraic differentiation: Witt vectors, number theory, and differential algebra” (DMS-1502219), organizer on conference grant, Fall 2015
3. MSRI Postdoctoral Fellow (DMS-0932078), Spring 2014
4. New Mexico MCTP Summer Award (DMS-1148801), Summer 2013
5. New Mexico Efroymsen Summer Award, Summer 2013
6. New Mexico MCTP Summer Award (DMS-1148801), Summer 2012

## Selected Invited Talks<sup>1</sup>

1. *TBD*, Tokyo
2. *TBD*, Clemson Algebra and Number Theory Seminar
3. *In Introduction to The p-Adic Numbers*, Young Scholar’s Program, University of Illinois Chicago, Summer 2023
4. *The Theory of the Integers In  $\mathbb{C}(t)^{alg}$  Interprets  $\mathbb{Z}$* , Berkeley Model Theory Seminar, Spring 2023
5. *Some Computational Facts About Abelian Varieties For Nonspecialists*, Colloquium, TIMC, Fall 2022
6. *Angle Ranks of Abelian Varieties over Finite Fields*, Algebra Seminar, Carleton, Fall 2022
7. *Algebraic Relations Between Solutions of Order One Differential Equations on Curves*, Algebra Seminar, Emory, Summer 2022
8. *What Are the p-Adic Numbers?*, Young Scholar’s Program, University of Illinois Chicago, Summer 2022
9. Panelist: “Red Card to Green Light: How to be a Responsible Referee.”, Lunch in The Time of COVID, online, Spring 2022
10. *What is the ABC Conjecture?*, Mathematics and Statistics Colloquium, University of Vermont, Spring 2022
11. *Abelian Varieties in the LMFDB*, Geometry Seminar, University of New Mexico, Fall 2021

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<sup>1</sup>for a complete list visit <http://tdupu.github.io>

12. *Angle Ranks of Abelian Varieties over Finite Fields*, The 3rd Kyoto-Hefei Workshop on Arithmetic Geometry, Kyoto University, Fall 2021
13. *What is this? Have you seen this thing?*, Algebra and Number Theory Seminar, Dartmouth College, Spring 2021
14. *New and Old Results in Wittferential Algebraic Geometry*, AMS Special Session on Branching Out: Ramification Invariants in Algebra and Geometry, Spring 2021
15. *Isogeny Class of Abelian Varieties in the LMFDB*, Stanford Algebraic Geometry Seminar, Stanford, Fall 2020
16. *The Meaning of Mochizuki's Inequality*, Geometry and Number Theory Seminar, University of Leiden, Fall 2020
17. *Sphere Packings in Hyperbolic Space*, Africa Math Seminar, Fall 2020
18. *Isogeny Classes of Abelian Varieties in the LMFDB*, Number Theory Seminar, Dartmouth College, Spring 2020
19. *How to work with Mochizuki's Inequality* (two parts), Algebraic Geometry and Number Theory Seminar, University of Arizona, Fall 2019
20. *Isogeny Classes of Abelian Varieties over Finite Fields*, Number Theory Seminar, Arizona State University, Fall 2019
21. *A Guide of Isogeny Classes in the LMFDB*, LMFDB as a Telescope, American Institute of Mathematics, Fall 2019
22. *Barrett Lectures A User's Guide to Mochizuki's Inequality*, Barrett Lectures (Plenary Speaker), University of Tennessee Knoxville, Spring 2019
23. *Explicit Computations in IUT*, AGNT Seminar, Rice, Spring 2019
24. *Deligne Modules*, ICERM, Abelian Varieties over Finite Fields Workshop, Spring 2019
25. *The Wittfinitesimal Torelli Problem*, Tufts, Algebra Seminar, Fall 2018
26. *Mochizuki's Inequalities*, University of Connecticut, CTNT, Summer 2018
27. *Deligne-Illusie Classes as Arithmetic Kodaira-Spencer Classes*, Number Theory Seminar, Boston College, Fall 2017
28. *The Theory of  $\mathbf{C}[t]^{alg}$  interprets  $\mathbf{Z}$* , Number Theory Seminar, University of Virginia, Fall 2017
29. *Indeterminacies in IUT*, Automorphic Forms Seminar, Purdue University, Spring 2017
30. *The Wittfinitesimal Torelli Problem*, Number Theory Seminar, University of Rochester, Spring 2017
31. *Deforming Derivatives*, Differential Algebra Special Session, AMS Eastern Sectional Meeting, Spring 2017
32. *The Wittfinitesimal Torelli Problem*, QVNTS, McGill University, Spring 2017
33. *The Theory of  $\mathbf{C}[t]^{alg}$  interprets  $\mathbf{Z}$* , Number Theory Seminar, Harvard University, Spring 2017
34. *Arithmetic Kodaira Spencer Classes in the Sense of Buium*, DART 7, City University of New York, Fall 2016
35. *Introduction to IUT2*, IUT Summit, RIMS Kyoto, Summer 2016.
36. *Multiradiality*, IUT Summit, RIMS Kyoto, Summer 2016.

37. *Some Constructions Used in Mochizuki's IUT*, Number Theory Seminar, University of Copenhagen, Spring 2016
38. *Kolchin Irreducibility*, Algebra Seminar, Emory University, Spring 2016
39. *Effective Bounds for Manin-Mumford for Certain Bad Reduction Curves* (with E. Katz, J. Rabinoff and D. Zureick-Brown), Kolchin Seminar Workshop, Spring 2016
40. *Toward Mazur's Conjecture on Uniform Manin-Mumford* (with E. Katz, J. Rabinoff and D. Zureick-Brown), Linfoot Seminar, Bristol University, Spring 2016
41. *Examples of Lang-Bombieri-Noguchi outside of Mordell-Lang.* (with D. Litt), Quebec Maine Number Theory Seminar, Maine University, Fall 2015
42. *Strongly Minimal Sets in DCF<sub>0</sub>*, Logic and Set Theoretic Topology Seminar, Ben Gurion University, Summer 2015 (with J. Freitag and A. Royer)
43. *Examples of Lang-Bombieri-Noguchi Outside of Mordell-Lang*, Séminaire de Géométrie Algébrique, Champs et Homotopie, Toulouse University, Spring 2015
44. *Derived Categories Meets Differential Algebra*, Model Theory and Applications Special Session, AMS-MAA Joint Mathematics Meetings 2015
45. *The Wittfinitesimal Torelli Problem* (3 parts), Model Theory Seminar, The Hebrew University, Fall 2014
46. *Kolchin Irreducibility* (with J. Freitag and L. E. Miller), Québec-Maine Number Theory Conference, Fall 2014
47. *Jet Spaces and Diophantine Geometry*, Kolchin Seminar, CUNY, Spring 2014
48. *Arithmetic Picard-Vessiot Theory* (with A. Buium), Differential Galois Theory Special Session, Spring Central Sectional Meeting of the AMS 2014
49. *Arithmetic Kolchin Irreducibility* (with J. Freitag and L. E. Miller), Arithmetic and Differential Algebraic Special Session, Spring Western Sectional Meeting of the AMS 2014
50. *Arithmetic Kolchin Irreducibility* (with J. Freitag and L. E. Miller), UC-Berkeley Model Theory Seminar, Spring 2014
51. *The Meaning of "Linearity" in Arithmetic Differential Equations*, UC-San Diego Number Theory Seminar, Fall 2013
52. *Arithmetic Kodaira-Spencer Classes*, Séminaire d'Arithmétique et Géométrie Algébrique, University of Strasbourg, Fall 2013
53. *Absolute Geometry and Arithmetic Kodaira-Spencer Classes*, UCLA Number Theory Seminar, Fall 2013
54. *Linear Wittferential Equations*, (with A. Buium), Model Theory Seminar, UC-Berkeley, Spring 2013

## Other Academic Products

1. YouTube: 293.3K views, 15.7K hours viewed, 3.89K subscribers

<https://www.youtube.com/channel/UCHWnZ1NtJ4WvE5AHmNVXziw/>

2. LMFDB contributor: database of isogeny classes of abelian varieties over finite fields.

<http://lmfdb.xyz/Variety/Abelian/Fq/>

3. Sage contributor.

## Organization of Conferences/Meetings/Workshops

1. co-organizer, “Arithmetic Geometry”, Western Sectional Meeting of the AMS, October 2021
2. Shepard (co-organizer), AGITTOC (Algebraic Geometry in The Time of COVID), Algebraic Geometry Lecture Series, Summer 2020
3. co-organizer, Abelian Varieties in the LMFDB. Funded by the University of Vermont CEMS PRSE. March 2019
4. PI, “Witt Vectors, Deformations, and Absolute Geometry”, Burlington, VT, July 2018 (DMS-1802012)
5. co-organizer, “Sage Days 87:  $p$ -adics and LMFDB”, Burlington, July 2017
6. co-organizer, “Kummer Classes and Anabelian Geometry”, (DMS-1519977 — From Arithmetic Statistics to Zeta Elements II), Burlington, September 2016
7. co-organizer, “Algebraic Theory of Differential and Functional Equations,” AMS-MAA Joint Mathematics Meetings, Atlanta, January 2016
8. co-organizer, “Arithmetic and Algebraic Differentiation,” (DMS-1502219), <https://math.berkeley.edu/~scanlon/aad15.html>, Berkeley, May 2015
9. co-organizer, “Arithmetic and Differential Algebraic Geometry”, Western Sectional Meeting of the AMS, Albuquerque, Spring, January 2014
10. co-organizer, “Witt Vectors Lifting and Descent,” AMS-MAA Joint Mathematics Meetings, San Diego, January 2013

## Courses Taught

1. Exploring Modern Mathematics (Vermont: Spring 2023, Fall 2023)
2. Precalculus (New Mexico: Summer 2008)
3. Business Calculus (New Mexico: Spring 2009)
4. Calculus 1 (New Mexico: Spring 2008, Fall 2008)
5. Calculus 2 (New Mexico: Fall 2012; UCLA: Fall 2013)
6. Vector Calculus (New Mexico: Spring 2009, Fall 2009, Fall 2010; Vermont: Fall 2016)
7. Fundamentals of Mathematics (Vermont: Fall 2017, Spring 2018, Spring 2023)<sup>2</sup>
8. Undergraduate Complex Analysis (Vermont: Fall 2021)
9. Partial Differential Equations (Vermont: Spring 2018)<sup>3</sup>
10. Abstract Algebra I (Vermont: Fall 2019, Fall 2020)<sup>4</sup>
11. Abstract Algebra II (Vermont: Spring 2020)<sup>5</sup>
12. Abstract Algebra IV (Vermont: Spring 2019, Spring 2020, Spring 2022)<sup>6</sup>
13. Graduate Complex Analysis (Vermont: Spring 2017)

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<sup>2</sup>YouTube: <https://www.youtube.com/watch?v=10dNfGJ7HGg&list=PLJmflFpx10edcIUn5nSCZQEJrLusB5Y&index=28>

<sup>3</sup>YouTube: <https://www.youtube.com/watch?v=3RY38s10qow&list=PLJmflFpx10efkqxaCJxSP-eUMpeK1MnZp&index=6>

<sup>4</sup>YouTube: <https://www.youtube.com/watch?v=hYSaEyPK5MQ&t=9s>

<sup>5</sup>YouTube: <https://www.youtube.com/watch?v=0E2zMWYVvu4&list=PLJmflFpx10edBKujcBibRpj1aVf10mWVZ&index=3>

<sup>6</sup>YouTube: <https://www.youtube.com/watch?v=QFB3ZY4c5k>

14. Algebraic Topology (Vermont: Fall 2018, Fall 2020)<sup>7</sup>
15. Algebraic Theory of Differential Equations (Vermont: Fall 2022)<sup>8</sup>
16. Algebraic Curves and Surfaces (Vermont: Fall 2021)<sup>9</sup>

## University and Professional Service

### Seminars and Other Departmental Activities

1. Major advising (UVM): Fall 2018 –
2. Algebra Qualifying Exam Committee (UVM): Fall 2018 – Spring 2023
3. Colloquium Committee Chair (UVM): Fall 2022 –
4. Hiring Committee (UVM): Member, Spring 2020
5. Graduate Committee (UVM): Member Fall 2017–Spring 2020; Associate Chair Fall 2020 – Spring 2021, Graduate Program Director Fall 2021, Member Spring 2022 –
6. Graduate Admissions (UVM): Spring 2017–Spring 2022
7. unQVNTS (Algebra and Number Theory) Seminar (UVM): Organizer 2016–
8. Algebraic Geometry Learning Seminar (UVM): Organizer 2018–2021
9. Putnam Competition Committee (UVM): Chair Fall 2019– Spring 2020; member Fall 2020– Spring 2021
10. Undergraduate Curriculum Committee (UVM): Fall 2016–Spring 2017
11. Special Curricular Activities (UVM): proposed and executed changes to the qualifying exams and first year sequence in 2020.
12. Mathematics Library Committee: Chair Fall 2019 – Spring 2020

### Editorial and Review Activities

Journal Refereeing: *Algebra and Number Theory*, *International Journal of Number Theory*, *Journal of Number Theory*, *Math Reviews*, *Bulletin of the London Mathematical Society*, *Journal für die reine und angewandte Mathematik (Crelle's Journal)*, *Journal of Commutative Algebra*, *International Mathematics Research Notices*, *Manuscripta Mathematica*,

## Advising/Mentoring

1. PhD theses: Anton Hilado 2018–, Jesse Franklin 2019–
2. Undergraduate Research Advisee: Veronika Potter 2020 – 2022
3. Undergraduate Academic Advising (UVM): 2018–
4. Graduate Academic Advising (UVM): 2018–
5. AGITTOC (Algebraic Geometry in the Time of COVID) Shepherd: 2020 – ; I help manage and organizer a learning seminar which at peak viewing had near 2000 concurrent viewers. The principal organizer for this is Ravi Vakil at Stanford.

<https://www.youtube.com/channel/UCy3u23mZE4TyW88yr6JLx9A>

6. Arizona Winter School: problem session leader (Colliot-Thélène group), 2015

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<sup>7</sup>YouTube: [https://www.youtube.com/watch?v=qYb\\_YmsQLlk](https://www.youtube.com/watch?v=qYb_YmsQLlk)

<sup>8</sup>Course Notes: <https://tdupu.github.io/diff-alg-public/diff-alg.pdf>

<sup>9</sup>Course Notes: <https://tdupu.github.io/algebraic-geometry/curves-and-surfaces.pdf>

## References

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