

# Jaron Kent-Dobias

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I work on explaining emergent collective behavior in statistical physics using renormalization group ideas and computational modeling. Current work focuses on exploring the breadth of universality, scaling theories for disordered fracture, and developing more efficient simulations of lattice models.

## Education

**PhD Candidate, Physics** — Cornell University, Ithaca, NY. *Expected 2019–2020*

**Master of Science, Physics** — Cornell University, Ithaca, NY. *February 2017*

**Bachelor of Science, Physics** — Harvey Mudd College (HMC), Claremont, CA. *May 2014*

→ Total GPA of 3.779, major GPA of 4.000.

→ Graduated with high distinction and honors in physics.

→ Thesis: Energy driven pattern formation in planar dipole–dipole systems.

**High School Diploma** — Skyline High School, Sammamish, WA. *May 2010*

## Publications

*Essential singularities in universal scaling functions at the Ising coexistence line*, Jaron Kent-Dobias & James P Sethna, [arXiv:1707.03791](https://arxiv.org/abs/1707.03791) [`cond-mat.stat-mech`], submitted.

*Renormalization group and normal form theory*, Archishman Raju, Colin B Clement, Lorien X Hayden, Jaron Kent-Dobias, Danilo B Liarte, D Zeb Rocklin & James P Sethna, [arXiv:1706.00137](https://arxiv.org/abs/1706.00137) [`cond-mat.stat-mech`], submitted.

*Cluster representations and the Wolff algorithm in arbitrary external fields*, Jaron Kent-Dobias & James P Sethna, *Physical Review E* **98**, 063306 (2018) · [arXiv:1805.04019](https://arxiv.org/abs/1805.04019) [`cond-mat.stat-mech`].

*Deformation of crystals: connections with statistical physics*, James P Sethna, Matthew K Bierbaum, Karin A Dahmen, Carl P Goodrich, Julia R Greer, Lorien X Hayden, Jaron Kent-Dobias, Edward D Lee, Danilo B Liarte, Xiaoyue Ni, Katherine N Quinn, Archishman Raju, D Zeb Rocklin, Ashivni Shekhawat & Stefano Zapperi, *Annual Review of Materials Research* **47**, 217 (2017) · [arXiv:1609.05838](https://arxiv.org/abs/1609.05838) [`cond-mat.mtrl-sci`].

*Energy driven pattern formation in planar dipole–dipole systems in the presence of weak noise*, Jaron Kent-Dobias & Andrew J Bernoff, *Physical Review E* **91**, 032919 (2015) · [arXiv:1406.3749](https://arxiv.org/abs/1406.3749) [`cond-mat.soft`].

*Rock · Paper · Book*, Brendan Gillett, Anastasia Patterson, Lily Stewart, Gretchen Allen, Garrett Wong, Kate MacDonnell, Carrie Latimer, Jaron Kent-Dobias, Siyao Xie, Jay Jonsson, Jacob Bandes-Storch, Rob O'Neill, Jack Ma, Chelsea Carlson, Kitty Maryatt, *Scripps College Press* (2013).

## Honors & Awards

**Finalist, LeRoy Apker Award** — American Physical Society. *August 2014*

An undergraduate physics achievement award to recognize outstanding achievements in physics by undergraduate students, and thereby provide encouragement to young physicists who have demonstrated great potential for future scientific accomplishment.

**Thomas B. Brown Memorial Award** — Department of Physics, HMC. *May 2014*

The Thomas B. Brown Memorial award for senior research in physics is awarded for research results, originality in conception or in execution of research, diligence, and clarity of oral and written reports.

**The Chavin Prize** — Department of Mathematics, HMC. *May 2014*

The Chavin Prize is awarded for outstanding senior theses in the mathematical sciences.

**Eagle Scout** — Troop 636, Sammamish, WA. *March 2008*

**Second Degree Black Belt** — True Martial Arts, Sammamish, WA. *December 2008*

## Research Experience.....

**With Prof James P Sethna** — Department of Physics, Cornell. *May 2014 – Present*

- ⇒ Examined the plausibility of imaging defect structure in metals using coherent x-ray diffraction.
- ⇒ Developed scaling theories of stress and damage near the tip of cracks in disordered brittle materials.
- ⇒ Examined novel nonlinear RG flow equations associated with Kosterlitz–Thouless critical points.
- ⇒ Studied the impact of first-order transitions on universality.
- ⇒ Developed an efficient extension of cluster Monte Carlo algorithms.

**With Prof Andrew J Bernoff** — Department of Mathematics, HMC. *January 2013 – February 2015*

- ⇒ Studied the shape and stability of modulated phases in two-dimensional magnetic fluids using asymptotic analysis & computational modeling.

**With Prof Sharon Gerbode** — Department of Physics, HMC. *January 2012 – September 2012*

- ⇒ Developed experimental and computational tools to study the behavior of impurities during phase changes in colloidal crystals.

## Teaching Experience.....

**Teaching Assistant** — Physics Department, Cornell University. *August 2014 – Present*

⇒ **Physics 1116 – Physics I: Mechanics & Special Relativity**

→ Recitation, Lab, & Grading: Fall 2014 & Fall 2017.

⇒ **Physics 6562 – Statistical Physics I**

→ Flipped classroom facilitation: Spring 2016, Spring 2017 & Spring 2018.

→ Grading: Spring 2017.

⇒ **Physics 7653 – Statistical Physics II**

→ Grading: Fall 2015, Fall 2016, Fall 2017 & Fall 2018.

**Academic Excellence Facilitator** — Academic Excellence Program, HMC. *April 2012 – May 2014*

- ⇒ Tutored students taking core courses in mechanics, electromagnetism, and special relativity.
- ⇒ Worked closely with faculty to improve both tutoring and lecturing.

**CCMS\* Lab Mentor** — Department of Mathematics, CGU.† *January 2012 – May 2014*

- ⇒ Provided support for MATLAB, Mathematica, L<sup>A</sup>T<sub>E</sub>X, and Python for students and faculty throughout the Claremont Consortium.

**Physics Grader** — Department of Physics, HMC. *January 2012 – May 2014*

- ⇒ Graded assignments for the Mechanics, Theoretical Mechanics, Electromagnetic Fields, and Fourier Series & Boundary Value Problems courses.

**Physics 18 Tutor** — Department of Physics, HMC. *January 2013 – May 2013*

- ⇒ Tutored students enrolled in mechanics who have a poor background in or difficulty with physics.

**Math Grader** — Department of Mathematics, HMC. *January 2012 – May 2012*

- ⇒ Graded assignments for the Linear Algebra and Differential Equations courses.

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\* Claremont Center for the Mathematical Sciences

† Claremont Graduate University

## Other Experience.....

**Systems Administrator** — Department of Computer Science, HMC. *May 2011 – May 2014*

- ↳ Administered Linux and Mac OS servers and managed a large network of codependent systems.
- ↳ Created and modified scripts written in Perl, Bash, and Python for a variety of system tasks.
- ↳ Designed, set up and administered a large cluster for use by other researchers.

**Systems Consultant** — Department of Computer Science, HMC. *September 2010 – May 2011*

- ↳ Wrote documentation and provided on-site user support for desktop and server systems.
- ↳ Led educational sessions on topics related to Unix administration and advanced usage.

## Skills.....

### Mathematics

- ↳ Course training in the abstract algebra of groups, rings, fields, modules & algebras, including applications to physics and efficient algorithms for harmonic analysis.
- ↳ Course training in real and complex analysis, including foundational measure theory and differential manifolds.

### Computational

- ↳ Experienced programming in the following languages (listed in order of proficiency):  
*Mathematica*, C, C++, L<sup>A</sup>T<sub>E</sub>X, T<sub>E</sub>X, Python, Haskell, Gnuplot, Igor Pro, MATLAB, Perl, CUDA, Bash.
- ↳ Experienced in the use and administration of many Unix variants, especially Arch Linux, Gentoo, Ubuntu, and Mac OS.
- ↳ Experienced administrator of file servers, mail servers, networked storage, version control systems, databases, web servers, the Linux networking stack, firewalls, and virtual private networks.