

# Curriculum Vitae / Biographical Sketch

Simon DeDeo

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## I. EDUCATION & EXPERIENCE

- Omidyar Fellow of the Santa Fe Institute, Santa Fe, New Mexico, 2010 – [three year position]. Interdisciplinary research; focus on biological computation, social decision-making in human and animal systems, and collective phenomena in natural systems.
- Postdoctoral Fellow of the Institute for the Physics and Mathematics of the Universe, University of Tokyo, 2009. Focus on effective theories and statistical physics.
- Postdoctoral Fellow of the Kavli Institute for Cosmological Physics, University of Chicago, 2006 – 2009.
- Princeton University, Department of Astrophysical Sciences. Ph.D. thesis “Dark Energy : Theory and Observational Prospects,” defended 9 March 2006; official award date April 2006. Thesis advisor: David Spergel. NSF Graduate Fellow, 2000 – 2004.
- Cambridge University, Department of Applied Mathematics and Theoretical Physics. Part III of Mathematical Tripos (one year taught Masters) *Distinction* grade. 2000 – 2001. Thesis title: “Non-Gaussian Perturbations in the Cosmic Microwave Background.” Thesis Advisor: E. P. S. Shellard. King’s College Scholar, Cambridge University, 2001.
- Harvard University, Department of Astrophysics. A.B., *Magna cum laude*. 1996 – 2000. Thesis title: “General Relativistic Constraints on Anomalous X-ray Pulsar Emission Models.” Thesis Advisor: Ramesh Narayan.

## II. GRANTS

- **Awarded.** PI on NSF *Advancing Theory in Biology* Grant EF-1137929, “The Small-Number Limit of Biological Information Processing.” \$339,457 over three years (September 2011-2014.)
- **Awarded.** REU Supplement for R. Garduño (May 2012.) Amendment to NSF PHY-0706174, “A Broad Research Program in the Sciences of Complexity.” \$12,014.
- **Awarded.** TeraGrid Resource Allocation *The Landscape of Multiscale Computation*, TG-IBN110006. 200k Service Units over one year (April 2011-2012.) **In review:** 1.0M SU request, *Phase Transitions and Critical Phenomena in Boolean Circuits*. April 2012.
- **Awarded.** NSF Graduate Fellow, 2000 – 2004.

### III. COLLABORATORS, STUDENTS & ADVISORS

- **Collaborators.** David Krakauer, Jessica Flack (SFI, Theoretical Biology.) Cris Moore (SFI, Computer Science.) John Miller (Carnegie Mellon, Social & Decision Sciences.) David Wolpert (Los Alamos, Statistics & Information Theory.) Carina Curto, Vladimir Itskov (UNL, Mathematics, Neuroscience.) Jon Machta (UMass, Physics.) Stephan Mertens (Otto-von-Guericke, Computer Science.) Wayne Hu (University of Chicago, Physics.) David Spergel (Princeton, Astrophysics.) Dimitrios Psaltis (University of Arizona, Physics.)
- **Student-Collaborators.** Ronnie Garduño (University of New Mexico, Computer Science, undergraduate.) Laura Florescu (Los Alamos and Reed College, Mathematics, postgraduate.) Sara Klingenstein (University of Colorado, Boulder & St. John’s College, Linguistics and Mathematics, master’s.) Jay Garlapati (University of Chicago, Mathematics, undergraduate/REU.) Alan Cooney (University of Arizona, Physics, graduate.)
- **Graduate Advisors.** David Spergel (Princeton, Astrophysics.) Thesis committee: Jerry Ostriker (Princeton, Astrophysics), Paul Steinhardt (Princeton, Physics.)

### IV. PUBLICATIONS

#### A. Social Dynamics and Biology

- Evidence of strategic periodicities in collective conflict dynamics. Simon DeDeo, David Krakauer, Jessica Flack. *Journal of the Royal Society Interface* 8(62):1260 (2011)
- The Grammar of Behavioral Time-series. Jessica Flack, David Krakauer, Simon DeDeo & Ray Jackendoff. 2011, in prep.
- Inductive Game Theory and the Dynamics of Animal Conflict. Simon DeDeo, David Krakauer & Jessica Flack. *PLoS Computational Biology* 6(5): e1000782 (2010)

#### B. Computation, Cognition and Statistical Physics

- Effective Theories for Circuits and Automata. Simon DeDeo. *Chaos* 21, 037106 (2011)
- Dynamics and Processing in Finite Self-Similar Networks Simon DeDeo & David Krakauer. *Journal of the Royal Society Interface* (2012.) doi:10.1098/rsif.2010.0687
- Parallel Complexity of Random Boolean Circuits. Jon Machta, Simon DeDeo, Stephan Mertens & Cris Moore. *Journal of Statistical Mechanics* 4: P04015 (2011)
- Intelligent Data Analysis of Intelligent Systems. David Krakauer, Jessica Flack, Simon DeDeo, Doyme Farmer & Daniel Rockmore. *Advances in Intelligent Data Analysis IX*. 8-17 (2010)

### C. Effective Theories in Physics

- Neutron Stars in  $f(R)$  Gravity with Perturbative Constraints. Alan Cooney, Simon DeDeo & Dimitrios Psaltis. *Physical Review D* 82 064033 (2010).
- Gravity with Perturbative Constraints: Dark Energy Without New Degrees of Freedom. Alan Cooney, Simon DeDeo & Dimitrios Psaltis. *Physical Review D* 79 (2009) 044033.
- Macroscopic Objects in Theories with Energy-dependent Speeds of Light. Simon DeDeo & Chanda Prescod-Weinstein. arXiv:0811.1999 (2008.)
- Stable, Accelerating Universes in Modified Gravity. Simon DeDeo & Dimitrios Psaltis. *Physical Review D* 78 (2008) 064013.
- Particle Dark Energy. Simon DeDeo. *Physical Review D* 73 (2006) 043520.

### D. Observational Cosmology and Experimental Physics

- Finding the Missing Baryons Using the CMB as a Backlight. Shirley Ho, Simon DeDeo & David Spergel. 2008, in review, *Physical Review D*. arXiv:0903.2845
- Cluster Mass Estimators from CMB Temperature and Polarization Lensing. Wayne Hu, Simon DeDeo & Chris Vale. astro-ph/0701276. *New Journal of Physics*, Volume 9, Issue 12, pp. 441 (2007.)
- CH<sub>3</sub>CN Observations toward Southern Massive Star-forming Regions. Esteban Araya, Peter Hofner, Stan Kurtz, Leonardo Bronfman & Simon DeDeo. *Astrophysical Journal Supplement* (2005) 157(2).
- The kinetic Sunyaev-Zel'dovitch effect as a dark energy probe. Simon DeDeo, David N. Spergel & Hy Trac. astro-ph/0511060 (2005.)
- Testing Strong-field Gravity with Quasi-Periodic Oscillations. Simon DeDeo & Dimitrios Psaltis. astro-ph/0405067 (2004.)
- Towards New Tests of Strong-field Gravity with Measurements of Surface Atomic Line Redshifts from Neutron Stars. Simon DeDeo & Dimitrios Psaltis. *Physical Review Letters* 90 (2003) 141101.
- Effects of the Sound Speed of Quintessence on the Microwave Background and Large Scale Structure. Simon DeDeo, R. R. Caldwell & Paul J. Steinhardt. *Physical Review D* 67 (2003) 103509.
- Eternal time machine in (2+1)-dimensional anti-de Sitter space. Simon DeDeo, J. Richard Gott. *Physical Review D* 66 (2002) 084020.
- General Relativistic Constraints on Emission Models of Anomalous X-Ray Pulsars. Simon DeDeo, Dimitrios Psaltis, Ramesh Narayan. *Astrophysical Journal* 559 (2001) 346.

- Photon Propagation around Compact Objects and the Inferred Properties of Thermally Emitting Neutron Stars. Dimitrios Psaltis, Feryal Özel, Simon DeDeo. *Astrophysical Journal*, 544 (2000) 390.
- Improved frequency stability of the dual-noble-gas maser. D. Bear, T. E. Chupp, K. Cooper, S. DeDeo, M. Rosenberry, R. E. Stoner, & R. L. Walsworth. *Physical Review A* 57 (1998) 5006.

## V. SERVICE ACTIVITIES

- Referee for *Physical Review D* and *Physical Review Letters* (6/year); *Complexity, Entropy, Axioms, Advances in Complex Systems* and *Journal of Theoretical Biology* (1/year); *Columbia University Press* (Life Sciences book division.)
- Complex Systems Summer School, 2011. Two day module on Emergence (Effective Theories, Symmetry Breaking and Phase Transitions in Social and Biological Systems.) Complex Systems Summer School, 2010. “Physics of Reasoning” lectures (thermodynamics and information theory.)
- Internal talks organizer: Princeton Tunch, 2002 – 2003; Chicago Tunch, 2008; Tokyo Tubemasu, 2009; Santa Fe Blue Sky Series, 2010 –
- Lectures to advanced secondary-school students in astronomy and physics (2/year.) Public lectures on science as occasion arises (1/year.)
- Organizer of “Life Beyond the Gaussian” conference on new statistical tools in cosmological physics, University of Chicago, 2007.
- Contributing author to “Ask Astro,” a popular science column in *Astronomy Magazine* (largest U.S. circulation popular-astronomy magazine.) Contributing science-book reviewer to “Slashdot,” a popular technology-news website.
- Science consult for *Cosmology and the Evolution of the Universe*, Martin Ratcliffe (introductory college text in cosmology, Greenwood Publishing Group, 2009. ISBN 031334079X.)