

## C. Jess Riedel

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CONTACT INFORMATION	NTT Research Inc. Physics & Informatics Laboratories 1950 University Ave, #600 East Palo Alto, CA 94303	<i>Email:</i> jessriedel@gmail.com <i>Webpage:</i> jessriedel.com <i>Cell:</i> (609) 240-1196
EDUCATION	<b>University of California, Santa Barbara</b> , Santa Barbara, California USA Ph.D., Physics, September 2012. <ul style="list-style-type: none"><li>· Dissertation: “Redundant Information and the Quantum-Classical Transition”.</li><li>· Advisor: Wojciech Zurek (acting), Mark Srednicki (formal).</li></ul> M.S., Physics, December 2010.  <b>Princeton University</b> , Princeton, New Jersey USA B.A., Physics, June 2007. <ul style="list-style-type: none"><li>· Thesis: “Muon-Flavored Pure Leptonic Decay of the Charged B Meson at the BaBar Experiment”.</li><li>· Advisor: James Olsen.</li></ul>	
APPOINTMENTS	<b>NTT Research Inc.</b> , East Palo Alto, California, USA <i>Senior Research Scientist</i>	<b>Oct 2019 - current</b>
	<b>Perimeter Institute for Theoretical Physics</b> , Waterloo, Ontario, Canada <i>Postdoctoral researcher</i>	<b>Sept 2014 - Aug 2019</b>
	<b>IBM Research</b> , Yorktown Heights, New York. USA <i>Postdoctoral researcher</i> <ul style="list-style-type: none"><li>· Collaboration with Charles Bennett</li></ul>	<b>Sept 2012 - Sept 2014</b>
	<b>Los Alamos National Laboratory</b> , Los Alamos, New Mexico, USA <i>Graduate Research Assistant</i> <ul style="list-style-type: none"><li>· Ph.D. research, under Wojciech Zurek.</li></ul>	<b>June 2009 - Aug 2012</b>
	<b>University of California, Santa Barbara</b> , California, USA <i>Graduate Teaching Assistant</i> <ul style="list-style-type: none"><li>· Phys 3L, Fall 2007.</li><li>· Phys 4L, Winter 2008.</li><li>· Phys 2, Spring 2008.</li><li>· Phys 115C, Fall 2008.</li><li>· Phys 1, Winter 2009.</li><li>· Phys 2, Spring 2009.</li></ul>	<b>Sept 2007 - June 2009</b>
	<i>Graduate Research Assistant</i> <ul style="list-style-type: none"><li>· Missing transverse energy analysis for the Compact Muon Solenoid experiment under Joseph Incandela at the Large Hadron Collider (LHC).</li></ul>	<b>June, 2008 - Aug 2008</b>
	<i>Graduate Research Assistant</i> <ul style="list-style-type: none"><li>· Muon data verification for the Compact Muon Solenoid experiment under Jeffrey Richman.</li></ul>	<b>June, 2007 - Aug 2007</b>

## REFERENCES

**Charles Bennett** ..... chdbennett@gmail.com  
IBM Fellow, IBM Watson Research Center

**Wojciech Zurek** ..... whzurek@gmail.com  
Laboratory Fellow, Theoretical Division, Los Alamos National Laboratory

**Itay Yavin** ..... yavin.itay@gmail.com  
Process Driven Trading Partners, New York City  
Former faculty, Perimeter Institute for Theoretical Physics

## PUBLICATIONS

C. H. Bennett, R. Hanson, **CJR**. “Comment on ‘The aestivation hypothesis for resolving Fermi’s paradox’.” *Foundations of Physics*, **49**, 820–829 (2019).

E. Nelson, **CJR**. “Classical Entanglement Structure in the Wavefunction of Inflationary Fluctuations.” *International Journal of Modern Physics D* **26**, 1743006 (2017).<sup>§</sup>

**CJR**, I. Yavin. “Decoherence as a way to measure extremely soft collisions with Dark Matter.” *Physical Review D*, **96**, 023007 (2017).

**CJR**. “Classical branch structure from spatial redundancy in a many-body wavefunction.” *Physical Review Letters*, **118**, 120402 (2017).<sup>†</sup>

M. Zwolak, **CJR**, W. H. Zurek. “Amplification, Decoherence, and the Acquisition of Information by Spin Environments.” *Scientific Reports*, **6**, 25277 (2016).

**CJR**, M. Zwolak, W. H. Zurek. “The objective past of a quantum universe: Redundant records of consistent histories.” *Physical Review A*, **93**, 032126 (2016).

R. Kaltenbaek, M. Aspelmeyer, P. F. Barker, A. Bassi, J. Bateman, K. Bongs, S. Bose, C. Braxmaier, Č. Brukner, B. Christophe, M. Chwalla, P. Cohadon, A. M. Cruise, C. Curceanu, K. Dholakia, L. Diósi, K. Döringshoff, W. Ertmer, J. Gieseler, N. Gührlebeck, G. Hechenblaikner, A. Heidmann, S. Herrmann, S. Hossenfelder, U. Johann, N. Kiesel, M. Kim, C. Lämmerzahl, A. Lambrecht, M. Mazilu, G. J. Milburn, H. Müller, L. Novotny, M. Paternostro, A. Peters, I. Pikovski, A. P. Zanzi, E. M. Rasel, S. Reynaud, **CJR**, M. Rodrigues, L. Rondin, A. Roura, W. P. Schleich, J. Schmiedmayer, T. Schuldt, K. C. Schwab, M. Tajmar, G. M. Tino, H. Ulbricht, R. Ursin and V. Vedral. “Macroscopic quantum resonators (MAQRO): 2015 Update.” *EPJ Quantum Technology*, **3**, 5 (2016).

**CJR**. “Quantum Brownian motion as an iterated entanglement-breaking measurement by the environment.” *Physical Review A*, **93**, 012107 (2016).

**CJR**. “Decoherence from classically undetectable sources: Standard quantum limit for diffusion.” *Physical Review A*, **92**, 010101(R) (2015).

M. Zwolak, **CJR**, W. H. Zurek. “Amplification, Redundancy, and the Quantum Chernoff Information.” *Physical Review Letters*, **112**, 140406 (2014).

**CJR**. “Direct Detection of Classically Undetectable Dark Matter through Quantum Decoherence.” *Physical Review D*, **88**, 116005 (2013).

**CJR**, W. H. Zurek, M. Zwolak, “The Rise and Fall of Redundancy in Decoherence and Quantum Darwinism.” *New Journal of Physics*, **14**, 083010 (2012).

<sup>§</sup>Selected for *Honorable Mention* in the 2017 Gravity Research Foundation essay competition.

<sup>†</sup>Featured on the cover of *Physical Review Letters* Volume 118, Issue 12.

**CJR**, W. H. Zurek. “Redundant Information from Thermal Illumination: Quantum Darwinism in Scattered Photons.” *New Journal of Physics*, **13**, 073038 (2011).

**CJR**, W. H. Zurek. “Quantum Darwinism in an Everyday Environment: Huge Redundancy in Scattered Photons.” *Physical Review Letters*, **105**, 020404 (2010).

R. J. Thornton, P. A. R. Ade, C. Allen, M. Amiri, J. W. Appel, E. S. Battistelli, B. Burger, J. A. Chervenak, M. J. Devlin, S. R. Dicker, W. B. Doriese, T. Essinger-Hileman, R.P. Fisher, J. W. Fowler, M. Halpern, P. C. Hargrave, M. Hasselfield, G. C. Hilton, A. D. Hincks, K. D. Irwin, N. Jarosik, M. Kaul, J. Klein, J. M. Lau, M. Limon, T. A. Marriage, K. L. Martocci, P. Mauskopf, S. H. Moseley, M. D. Niemack, L. Page, L. P. Parker, **JR**, C. D. Reintsema, S. T. Staggs, O. R. Stryzak, D. S. Swetz, E. R. Switzer, C. Tucker, E. J. Wollack, Y. Zhao. “Opto-mechanical design and performance of a compact three-frequency camera for the Millimeter Bolometer Array Camera on the Atacama Cosmology Telescope.” *Proc. SPIE 7020*, Millimeter and Submillimeter Detectors and Instrumentation for Astronomy IV, 70201R (2008).

S. Calvin, **CJR**, E. E. Carpenter, S. A. Morrison, R. M. Stroud and V. G. Harris. “Estimating Crystallite Size in Polydispersed Samples using EXAFS.” *Physica Scripta*, **T115**, 744748, (2005).

M. H. Hammond, **CJR**, S. L. Rose-Pehrsson, F. W. Williams. “Training Set Optimization Methods for a Probabilistic Neural Network.” *Chemometrics and Intelligent Laboratory Systems*, **71**, 7378 (2004).

CONFERENCE  
PROCEEDINGS

S. Calvin, E. A. Carpenter, **CJR**, and V. G. Harris. “Characterization of Core/Shell Nanoparticles by X-Ray Absorption Spectroscopy.” *Proceedings of the NanoScience and Technology Institute 2003 Nanotechnology Conference & Trade Show*. San Francisco, California, February 23-27, (2003).

PREPRINTS

E. Nelson, **CJR**. “Classical Branches and Entanglement Structure in the Wavefunction of Cosmological Fluctuations.” *arXiv:1711.05719* (2017).

**CJR**. “Evidence for Gravitons from Decoherence by Bremsstrahlung.” *arXiv:1310.6347* (2013).

**CJR**. “Local Records and Global Entanglement: A Unique Multi-Partite Generalization of the Schmidt Decomposition.” *arXiv:1310.4473* (2013).

**CJR**. “Decoherence and the Quantum Detection of Classically Undetectable Phenomena.” *arXiv:1205.3195*. (2013).

C. H. Bennett, **CJR**. “On the security of key distribution based on Johnson-Nyquist noise.” *arXiv:1303.7435* (2013).

INVITED TALKS

“Toward a precise definition of branches in a many-body wavefunction.”

- Physics Department, Chapman University. 22 March 2019
- Theoretical Physics Department, Fermilab. 14 March 2019
- Theoretical Division, Los Alamos National Laboratory. 24 January 2019

Slides and video  
available at  
jessriedel.com

“Wavefunctions branches as a foundation for probabilistic reasoning”

- Simons Program on Quantum Information in Cosmology, Niels Bohr Institute, Copenhagen. 8 April 2018

“Identifying wavefunction branches”

- Kavli Institute for Theoretical Physics, University of California, Santa Barbara. 17 October 2017

“Branching of the Wavefunction of the Universe During Inflation”

- Department of Physics & Astronomy, York University. 21 February 2017

“Decoherence as a way to measure extremely soft collisions with low-mass dark matter”

- Theory Division, Lawrence Berkeley National Laboratory. 1 February 2017
- Burke Institute for Theoretical Physics, California Institute of Technology. 28 March 2016
- Pacific Institute for Theoretical Physics, University of British Columbia. 23 March 2016

“Where are the branches in a many-body wavefunction?”

- National Quantum Information Centre, University of Gdańsk. 21 September 2016
- Department of Physics, University of Southern California. 1 April 2016
- Institute for Quantum Information and Matter, California Institute of Technology. 29 March 2016

“Negligible momentum transfers and anomalous decoherence: Dark matter detection with nanomechanical resonators?”

- École de Physique des Houches. 10 August 2015
- Gordon Research Conference: Mechanical Systems in the Quantum Regime. 7 March 2016

“Decoherence Detection: Dark Matter to Micromechanical Resonators.”

- Department of Physics, Yale University. 17 February 2015

“Toward an Objective Principle for Decomposing the Wavefunction into Classical Branches.”

- Center for Theoretical Physics, Massachusetts Institute of Technology. 5 December 2014

“Dephasing Channels for Overcomplete Bases.”

- Theoretical Division, Los Alamos National Laboratory. 24 July 2014

“Negligible-Momentum Particle Detection through Decoherence.”

- The MAQRO satellite consortium, University of Vienna. 1 January 2014

“Direct Detection of Classically Undetectable Dark Matter Through Quantum Decoherence.”

- Department of Physics, Oregon State University. 13 January 2013.
- Perimeter Institute for Theoretical Physics. 4 December 2013.
- Department of Physics, University of Vienna. 21 November 2013.
- Stanford Institute for Theoretical Physics, Stanford University. 18 January 2013.

“The Objective History of a Quantum Universe: Redundant Records of Consistent Histories”

- Quantum Physics and the Nature of Reality Conference. Internationale Akademie Traunkirchen. 23 November 2013.
- Stanford Institute for Theoretical Physics, Stanford University. 30 September 2013.

“Local Records and Global Entanglement: A Unique Multi-Partite Generalization of the Schmidt Decomposition.”

- UCL-Paris Quantum Connection conference. Department of Physics and Astronomy / Department of Computer Science, University College London. 5 November 2013.

“Redundancy and the Quantum-Classical Transition.”

- Institut für Quantenphysik, Universität Ulm. 10 September 2013.
- Stanford Institute for Theoretical Physics, Stanford University. 10 May 2012.

“Decoherence and the Quantum Detection of Classically Undetectable Phenomena.”

- Theoretical Division, Los Alamos National Laboratory. 20 June 2013
- Decoherence and Friends conference. Institute for Quantum Computing, University of Waterloo. 23 May 2013.

“Quantum Darwinism – An Everyday Environment and Future Directions.”

- Quantum Physics and the Nature of Reality Conference. Internationale Akademie Traunkirchen. 5 July 2011.

“Quantum Darwinism in an Everyday Environment.”

- Quantum Coherence and Decoherence conference. Centro de Ciencias de Benasque Pedro Pascual. 14 September 2010.

CONFERENCE  
ORGANIZATION

M. Geiller, A. Milsted, **CJR**, M. Smerlak, E. Schnetter, B. Vaitla. *Open Research: Rethinking Academic Collaboration*. Perimeter Institute, Waterloo, Ontario, March 26–28, (2018).

C. H. Bennett, **CJR**. *Quantum Foundations of a Classical Universe*. IBM Watson Research Center, Yorktown Heights, New York, April 11–14, (2014).

PANEL  
DISCUSSIONS

**CJR** (moderator), C. H. Bennett, A. Brown, S. Maguire, K. Temme. *Quantum Computing: Revolutionizing Problem Solving and Information Processing*. Stanford University course “Frontier Technology: Understanding and Preparing for Technology in the Next Economy”, Remote Video Lecture, April 28, (2020).