

# Horacio Castillo

## *Curriculum Vitae*

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## Education:

- 1998: **University of Illinois at Urbana-Champaign** Ph.D. in Physics.  
Advisor: Paul M. Goldbart. Thesis topic: "Statistical Mechanics of the amorphous solid state of randomly crosslinked macromolecules".
- 1993: **University of Illinois at Urbana-Champaign** M.S. in Physics.
- 1986: **Universidad de Buenos Aires, Argentina** Licenciado en Física  
(roughly equivalent to a B.A. in Physics).

## Research Experience

- Sep 2002 - present: Assistant Professor at the Department of Physics and Astronomy, Ohio University, Athens, Ohio.
- 2000-2002: Postdoctoral researcher at the Department of Physics, Boston University.
- 1998-2000: Postdoctoral researcher at the LPT, École Normale Supérieure, Paris, France.
- 1992-1998: Thesis research in Condensed Matter Theory, U. of Illinois at Urbana-Champaign, USA.
- 1991: Research in Condensed Matter Theory. Centro Atómico Bariloche, National Atomic Energy Commission, Bariloche, Argentina.
- 1986-1990: Research in Condensed Matter Theory. Department of Physics, National Atomic Energy Commission, Buenos Aires, Argentina.
- 1986: Research in Theoretical Nuclear Physics. Department of Physics, Universidad de Buenos Aires, Buenos Aires, Argentina.

## Research Funding and Support

- 2006-present: Title: "Fluctuations in the dynamics of glasses". Sponsor: Department of Energy, Office of Basic Energy Sciences, Division of Materials Sciences and Engineering, Theoretical Condensed Matter Physics. Amount: \$254,987. Dates: from August 1 2006 to July 31 2009. PIs: Horacio E. Castillo
- 2005-present: Title: "Fluctuations in the non-equilibrium dynamics of structural glasses", Ohio Supercomputer Center, 100,000 CPU hours, awarded in September 2005. PIs: Horacio Castillo.

## Mentoring of graduate students

- November 2008 - present: Karina Avila, MSc student.
- April 2008 - present: Gcina Mavimbela, PhD student.
- April 2003 - present: Azita Parsaeian, PhD student. Degree completion expected for the current academic year.
- April 2004 - July 2005: Allen Dahili. Graduated with MSc degree.

## Teaching Experience

Sep 2002 - present: Assistant Professor at Ohio University, Athens. Teaching: undergraduate level algebra-based Physics, undergraduate level calculus-based Physics, undergraduate level calculus-based Honors Tutorials Physics, graduate level Mathematics Methods in Physics, graduate level Statistical Mechanics.

1992-1993: Teaching Assistant. University of Illinois at Urbana-Champaign, Physics Dept; Graduate level: Quantum Mechanics II, Complex Variables in Physics, Basics of Advanced Mechanics; Undergraduate Level: Introductory Relativity. My duties included grading of problem sets, hour exams and final exams, and answering individual questions in my office hours.

1986-1990: Teaching Assistant. Universidad de Buenos Aires, Physics Department. Advanced undergraduate Quantum Mechanics and undergraduate Electricity and Magnetism. I was responsible for recitation sessions, and shared responsibility for designing and grading hour exams and for designing homework sets.

1984-1986: Undergraduate Teaching Assistant. Universidad de Buenos Aires, Physics Department. Undergraduate Optics and Thermodynamics for Biology and Geology majors. I was responsible for recitation sessions, labs, and shared responsibility for designing and grading hour exams.

1984-1985: Universidad de Buenos Aires; Instructor at the School of Science admission courses and at the University admission courses: Mathematics, Physics. My duties included lecturing for groups of 30 to 170 students, leading problem sessions, grading hour and final exams, and answering individual questions.

## Service

From Fall 2008: Member of the Undergraduate Curriculum committee.

From Fall 2008: Member of two of the Department working groups for the transition of Quarters to Semesters: (i) for the calculus-based Elementary Physics sequence, and (ii) for the Undergraduate Majors courses.

Fall 2005 - present: Chair of the Department Colloquium committee.

(Volunteer) 2005 - 2008: Judge for District Science Day and Ohio Science Day (science fairs for middle school and high school students).

Winter 2007: Condensed Matter Experiment faculty search committee member.

(Volunteer) Fall 2005 - Spring 2006: Mentoring in the Templeton Program (an Ohio University program for talented undergraduate students from underrepresented minorities).

Fall 2003 - Summer 2005: Member of the Department Colloquium committee.

Spring 2004: Chair of the Colloquium for the Ohio University Condensed Matter and Surface Science Program (CMSS).

Member of two ad-hoc committees deciding on the adoption of textbooks for undergraduate classes.

Member of seven PhD and MSc thesis committees.

Grant proposal reviewer for U.S. DOE and for ANPCYT (Argentina).

Referee for: Europhysics Letters, Journal of Statistical Mechanics: Theory and Experiment, and Physical Review Letters.

## Invited talks:

- 2008: Indiana University - Purdue University Indianapolis, Department of Physics Colloquium: "Fluctuations In The Relaxation of Glassy Systems".
- 2007: Conference on "Mechanical Behavior of Glassy Systems", Pacific Institute of Theoretical Physics, University of British Columbia, Vancouver, Canada. Talk: "Fluctuations in the aging of structural glasses".
- 2007: Workshop on "Jamming", Aspen Center for Physics, Aspen, Colorado. Talk: "Crossover between aging and equilibrium in structural glasses".
- 2006: "Workshop on Stochastic Geometry and Field Theory" Kavli Institute for Theoretical Physics, University of California, Santa Barbara. Seminar: "Time reparametrization symmetry and fluctuations in glassy systems".
- 2005: 5<sup>th</sup> International Discussion Meeting on Relaxations in Complex Systems, Lille, France. Talk: "Fluctuations in the Aging of Glassy Systems".
- 2005: Workshop on "Dynamics, Structure and Correlations in Glasses", Aspen Center for Physics. Talk: "Fluctuations in the aging of structural glasses".
- 2004: Brandeis University, School of Physics, Condensed Matter Seminar: "Fluctuations in the Aging of Glassy Systems".
- 2004: Workshop on "Electronic Glasses", Institute for Advanced Studies, Hebrew University, Jerusalem, Israel. Tutorial: "Models for the out of equilibrium dynamics in glassy systems: a short introduction".
- 2004: University of Cincinnati, Department of Physics. Condensed Matter Seminar: "Fluctuations in the aging of glasses".
- 2004: University of Akron, Department of Physics. Department Colloquium: "Heterogeneous aging in glassy dynamics".
- 2003: KITP workshop: "Glassy States of Matter and Nonequilibrium Quantum Dynamics", Kavli Institute for Theoretical Physics, University of California, Santa Barbara. Seminar: "Spatially Heterogeneous Ages in Glassy Dynamics".
- 2002: Simon Fraser University, Burnaby, British Columbia, Canada. Department Colloquium: "Heterogeneous aging in short-range spin glasses".
- 2002: Iowa State University, Ames, Iowa, USA. Department Colloquium: "Heterogeneous aging in short-range spin glasses".
- 2002: Ohio University, Athens, Ohio, USA. Department Colloquium: "Heterogeneous aging in short-range spin glasses".
- 2001: Yale University, New Haven, Connecticut, USA. Yale Condensed Matter Physics Seminar: "Theory of aging in short range spin glasses".
- 2001: Cornell University, Ithaca, New York, USA. Laboratory of Atomic and Solid State Physics Seminar: "Dynamical transition in a low dimensional glassy system".
- 2001: Brandeis University, Waltham, Massachusetts, USA. Condensed Matter Seminar: "Freezing in disordered systems".
- 2000: Indiana University, Bloomington, Indiana, USA. Condensed Matter Seminar: "Freezing of dynamical exponents in low dimensional random media".
- 2000: Brown University, Providence, Rhode Island, USA. Condensed Matter Seminar: "Freezing of dynamical exponents in low dimensional random media".

1999: Service de Physique Théorique, CEA, Saclay, France. Statistical Physics Seminar: “The amorphous solid state of randomly crosslinked macromolecules”.

1999: LPTMS, Université de Paris Sud, Orsay, France. Seminar: “The amorphous solid state of randomly crosslinked macromolecules”.

1998: École Normale Supérieure, Paris, France. LPS-LPT joint Seminar: “The amorphous solid state of randomly crosslinked macromolecules”.

1995: University of Illinois at Urbana-Champaign, USA. Theoretical Physics Seminar: “Randomly crosslinked macromolecular networks”.

## Conferences, Workshops and Schools:

2008: Ohio University NQPI retreat. Talk: “Fluctuations in structural glasses” (with Azita Parsaeian).

2008: APS March Meeting, New Orleans, LA. Talk: “Fluctuations in the aging regime of a polymer glass” (with Azita Parsaeian, presented by Azita Parsaeian).

2007: APS March Meeting, Denver, CO. Talk: “Fluctuations in the crossover from aging to equilibrium of a structural glass” (with Azita Parsaeian, presented by Azita Parsaeian).

2006: “Second International Workshop on Dynamics in Viscous Liquids”, Mainz, Germany. Talk: “Fluctuations in the aging dynamics of structural glasses” (with Azita Parsaeian).

2006: APS March Meeting, Baltimore, MD. Talk: “Fluctuations and spatial correlations in the aging of a simple structural glass” (with Azita Parsaeian).

2005: APS March Meeting, Los Angeles, California, USA. Talk: “Time evolution of local fluctuations in the aging of a simple glass”.

2004: Workshop on “Electronic Glasses”, Institute for Advanced Studies, Hebrew University, Jerusalem, Israel. Talk: “Fluctuations in the Aging of Spin Glasses and Structural Glasses”.

2004: SPIE Second International Symposium on Fluctuations and Noise, Maspalomas, Gran Canaria, Spain. Talk: “Local fluctuations in the non-equilibrium dynamics of a Lennard-Jones glass” (with Parthapratim Biswas).

2004: Symposium “Understanding Complex Systems”, Department of Physics, University of Illinois at Urbana-Champaign. Talk: “Fluctuations in Glassy Dynamics”.

2004: APS March Meeting, Montreal, Quebec, Canada. Talk: “Scaling relations of local correlations during aging in a simple glass-forming liquid” (with Parthapratim Biswas).

2003: Participant in the workshop “Glassy States of Matter and Nonequilibrium Quantum Dynamics”, Kavli Institute for Theoretical Physics, University of California, Santa Barbara.

2003: SPIE First International Symposium on Fluctuations and Noise, Santa Fe, New Mexico, USA. Talk: “Spatial correlations in the nonequilibrium fluctuations of spin glasses” (with C. Chamon, L. Cugliandolo and M. Kennett).

2003: APS March Meeting, Austin, Texas, USA. Talk: “Correlated fluctuations in the aging dynamics of glassy systems” (with C. Chamon, L. Cugliandolo and M. Kennett).

2002: “50<sup>th</sup> Midwest Solid State Conference” and “Workshop on Solid State Quantum Computation”, University of Illinois at Urbana Champaign, Urbana, Illinois. Talk: “Heterogeneous aging in Spin Glasses” (with C. Chamon, L. Cugliandolo and M. Kennett).

2002: Participant in the “2002 Workshop on Opportunities in Materials Theory”, National Science Foundation, Arlington, VA, and Georgetown University, Washington, DC.

2002: Participant in the workshop “Collective Phenomena in Disordered Insulators and Glassy Systems”, Aspen Center for Physics, Aspen, Colorado.

2002: Participant in the 2002 “Boulder School for Condensed Matter and Materials Physics”, Boulder, Colorado.

2002: APS March Meeting, Indianapolis, Indiana, USA. Talk: “Constraints between local correlation and local response in the aging regime of a short range spin glass” (with C. Chamon, L. Cugliandolo and M. Kennett).

2001: Greater Boston Area Statistical Mechanics Meeting, Brandeis University, Waltham, Massachusetts, USA. Talk: “A local look at aging in short range spin glasses”

2001: APS March Meeting, Seattle, Washington, USA. Talk: “Nonequilibrium dynamics in a low dimensional glass model”

2000: Greater Boston Area Statistical Mechanics Meeting, Brandeis University, Waltham, Massachusetts, USA. Talk: “Freezing of dynamical exponents in low dimensional random media”.

2000: Fifth Claude Itzykson Meeting on “Dynamics of Nonequilibrium Systems”, Service de Physique Théorique, CEA, Saclay, France.

2000: APS March Meeting, Minneapolis, Minnesota, USA. Talks: “Dynamical transition for a particle in a random potential” and “Amorphous solidification and percolation in two dimensions”.

1999: Aspen Summer Workshop on “Modern Theories of Strongly Correlated Condensed Matter”, Aspen, Colorado, USA.

1999: Stig Lundqvist Research Conference on “Quantum Phases in Electron Systems of Low Dimensions”, ICTP, Trieste, Italy.

1999: XI Workshop on “Strongly Correlated Electron Systems”, ICTP, Trieste, Italy.

1999: Jerusalem Winter School on Theoretical Physics, Jerusalem, Israel. Poster: “Critical Wave Function of Dirac Fermions in a Random Magnetic Field”.

1998: Summer School on “Topological Aspects of Low Dimensional Systems”, Les Houches, France. Talk: “Multifractal Wave Function of Dirac Fermions in a Random Magnetic Field”

1998: Conference on “Critical problems in Disordered Metals”, UCLA, Los Angeles, California, USA.

1998: APS March Meeting, Los Angeles, California, USA. Talks: “Elasticity near the vulcanization transition” and “Multifractal Exponents of the Critical Wave Function of Dirac Fermions in a Random Magnetic Field”.

1998: Winter Conference on Condensed Matter “Defects in Soft Condensed Matter”, Aspen, Colorado, USA.

1997: Summer College in Condensed Matter on “Statistical Physics of Frustrated Systems”. International Centre for Theoretical Physics, Trieste, Italy.

1996: APS March Meeting, Saint Louis, Missouri, USA. Talk: “Exact mean field theory for the amorphous solid state of vulcanized macromolecular matter.”

1994: APS March Meeting, Pittsburgh, Pennsylvania, USA. Talk: “Distribution of localization lengths in randomly crosslinked macromolecular networks.”

## Professional Associations

Member of the American Physical Society (APS).

Member of the American Association for the Advancement of Science (AAAS).

## Papers in preparation and work in progress

- “Diffusion in the energy domain and slow dynamics of glassy models”, Gcina Mavimbela, Horacio E. Castillo and Claudio Chamon, work in progress.
- “Goldstone theorem in the aging dynamics of spin glasses”, Horacio E. Castillo and Claudio Chamon, work in progress.
- “Fluctuations in the relaxation of strong glasses”, Azita Parsaeian, Horacio E. Castillo and Katharina Vollmayr-Lee, work in progress.
- “Triangular correlations and aging fluctuations in structural glasses”, Karina E. Avila and Horacio E. Castillo, work in progress.

## Publications

- “Universal fluctuations in the relaxation of structural glasses”, Azita Parsaeian and Horacio E. Castillo, submitted to Phys. Rev. Lett. ([arXiv:0811.3190](https://arxiv.org/abs/0811.3190)).
- “Equilibrium and non-equilibrium fluctuations in a glass-forming liquid”, Azita Parsaeian and Horacio E. Castillo, Phys. Rev. Lett. *in press* ([arXiv:0802.2560](https://arxiv.org/abs/0802.2560)).
- “Time reparametrization symmetry in spin glass models”, Horacio E. Castillo, Phys. Rev. B **78**, 214430 (2008) ([arXiv:0801.0014](https://arxiv.org/abs/0801.0014)).
- “Growth of spatial correlations in the aging of a simple structural glass”, Azita Parsaeian and Horacio E. Castillo, Phys. Rev. E **78**, 060105(R) (2008) ([arXiv:cond-mat/0610789](https://arxiv.org/abs/cond-mat/0610789)).
- “Local fluctuations in the ageing of a simple structural glass”, Horacio E. Castillo and Azita Parsaeian, Nature Physics, **3**, 26 (2007) ([arXiv:cond-mat/0610857](https://arxiv.org/abs/cond-mat/0610857)).
- “Local fluctuations in the non-equilibrium dynamics of a Lennard-Jones Glass”, Horacio E. Castillo and Parthapratim Biswas, in *Fluctuations and Noise in Materials*, Proceedings of SPIE, Volume 5469, edited by D. Popović, M. B. Weissman, and Z. A. Rácz, (SPIE, Bellingham WA, 2004).
- “Spatially heterogeneous ages in glassy dynamics”, Horacio E. Castillo, Claudio Chamon, Leticia F. Cugliandolo, Jose Luis Iguain, and Malcolm P. Kennett, Phys. Rev. B, **68** 134442 (2003) ([arXiv:cond-mat/0211558](https://arxiv.org/abs/cond-mat/0211558)).
- “Separation of time-scales and reparametrization invariance for aging systems”, Claudio Chamon, Malcolm P. Kennett, Horacio E. Castillo, and Leticia F. Cugliandolo, Phys. Rev. Lett. **89**, 217201 (2002) ([arXiv:cond-mat/0109150](https://arxiv.org/abs/cond-mat/0109150)).
- “Heterogeneous aging in spin glasses”, Horacio E. Castillo, Claudio Chamon, Leticia F. Cugliandolo, and Malcolm P. Kennett, Phys. Rev. Lett. **88**, 237201 (2002) ([arXiv:cond-mat/0112272](https://arxiv.org/abs/cond-mat/0112272)).
- “Freezing of dynamical exponents in low dimensional random media”, Horacio E. Castillo and Pierre Le Doussal, Phys. Rev. Lett. **86**, 4859 (2001) ([arXiv:cond-mat/0006373](https://arxiv.org/abs/cond-mat/0006373)).
- “Extensive eigenvalues in spin-spin correlations: a tool for counting pure states in Ising spin glasses”, Jairo Sinova, Geoff Canright, Horacio E. Castillo, Allan H. MacDonald, Phys. Rev. B **63**, 104427 (2001) ([arXiv:cond-mat/0010302](https://arxiv.org/abs/cond-mat/0010302)).

- “Semi-microscopic theory of elasticity near the vulcanization transition”, Horacio E. Castillo and Paul M. Goldbart, Phys. Rev. E **62**, 8159 (2000) ([arXiv:cond-mat/9909054](https://arxiv.org/abs/cond-mat/9909054)).
- “Amorphous solid state: A locally stable thermodynamic phase of randomly constrained systems”, Horacio E. Castillo, Paul M. Goldbart, and Annette Zippelius, Phys. Rev. B **60**, 14702 (1999) ([arXiv:cond-mat/9905326](https://arxiv.org/abs/cond-mat/9905326)).
- “Elasticity near the vulcanization transition”, Horacio E. Castillo and Paul M. Goldbart, Phys. Rev. E **58**, R24-R27 (1998) ([arXiv:cond-mat/9712050](https://arxiv.org/abs/cond-mat/9712050)).
- “Universality and its Origins at the Amorphous Solidification Transition”, Weiqun Peng, Horacio E. Castillo, Paul M. Goldbart, and Annette Zippelius, Phys. Rev. B **57**, 839 (1998) ([arXiv:cond-mat/9709250](https://arxiv.org/abs/cond-mat/9709250)).
- “Exact calculation of multifractal exponents of the critical wave function of Dirac fermions in a random magnetic field”, Horacio E. Castillo, Claudio de C. Chamon, Eduardo Fradkin, Paul M. Goldbart, and Christopher Mudry, Phys. Rev. B **56**, 10668 (1997) ([arXiv:cond-mat/9706084](https://arxiv.org/abs/cond-mat/9706084)).
- “Randomly crosslinked macromolecular systems: vulcanization transition to and properties of the amorphous solid state”, Paul M. Goldbart, Horacio E. Castillo, and Annette Zippelius, Adv. Phys. **45**, 393 (1996) ([arXiv:cond-mat/9604062](https://arxiv.org/abs/cond-mat/9604062)).
- “Distribution of localisation lengths in randomly crosslinked macromolecular networks”, H. E. Castillo, P. M. Goldbart, and A. Zippelius, Europhys. Lett. **28**, 519 (1994).
- “Ground-state and excitation spectra of the negative-U Hubbard model”, H. E. Castillo and C. A. Balseiro, Phys. Rev. B **45**, 10549 (1992).
- “Collective excitations in superconductors: from Bardeen-Cooper-Schrieffer theory to Bose condensation”, J. O. Sofo, C. A. Balseiro, and H. E. Castillo, Phys. Rev. B **45**, 9860 (1992).
- “Hall conductivity and Fermi surface in highly correlated systems”, H. E. Castillo and C. A. Balseiro, Phys. Rev. Lett. **68**, 121 (1992).
- “Three-band charge fluctuation model for electron pairing: a many-body calculation”, H. Castillo, C. Balseiro, B. Alascio, and H. Ceva, Phys. Rev. B **40**, 224 (1989).
- “On the interplay between particle-hole and  $\Delta$ -hole phonons”, H. Castillo and F. Krmpotic, Nucl. Phys. A **A469**, 637 (1987).