

Curriculum Vitae

Cristián Huepe, PhD

**922 W 18th Place,
Chicago IL 60608, USA**

+1(312)213-7417

cristian@labolabs.com

cristian@northwestern.edu

EDUCATION

<i>University of Paris 7, École Normale Supérieure, Paris, France</i> Ph.D. in Physics Dissertation: 'Bifurcations and instabilities in Bose-Einstein Condensates and Superfluid Flows' Honors: <i>Summa cum laude</i> (with congratulations from the jury)	1999
<i>University of Paris 7, Observatoire de Paris, France</i> Diplôme d'Etudes Approfondies (DEA) in Astrophysics	1995
<i>Universidad de Chile, Santiago, Chile</i> Licenciatura (B.Sc.) in Physics Honors: <i>Cum laude</i>	1993
<i>Private classes with Jazz bass player Carlos de Santiago, Chile</i> Bass guitar and musical theory	1990 – 1993

RESEARCH EXPERIENCE

<i>CHuepe Labs Inc., Chicago IL, USA</i> Founder / President / Research Scientist	2005 – Present
<i>Applied Mathematics Department (ESAM), Northwestern University, Evanston IL, USA</i> Adjunct Professor	2014 – Present
<i>Northwestern Institute on Complex Systems (NICO), Northwestern University, Evanston IL, USA</i> Visiting Scholar / External Faculty	2011 – Present
<i>Howard Hughes Medical Institute & Amaral Lab, Northwestern University, Evanston IL, USA</i> Scientific Consultant / Research Scientist Project: 'A system-level approach for predicting growth rates of microbial organisms'	2014 – Present
<i>Humboldt University & Robert Koch Institute, Berlin, Germany</i> Visiting Professor Alexander Von Humboldt Foundation's CONNECT Program Project: 'Modeling multi-scale dynamics in biological and artificial systems'	Oct-Nov, 2014
<i>Kavli Institute for Theoretical Physics – UCSB, Santa Barbara CA, USA</i> Invited program participant KITP Program: 'Active Matter: Cytoskeleton, Cells, Tissues & Flocks'	Feb-Mar, 2014
<i>NSF Project: Experimental and theoretical analysis of collective dynamics in swarming systems</i> PI - Research Scientist – NSF Grantee (PHY-0848755)	2009 – 2014

Co-Principal Investigator (with Prof. I. Couzin, Princeton U): Theoretical & experimental study of collective motion dynamics. Supervised three PhD students & five postdoctoral researchers

Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

Advanced Study Group Member **Sep-Oct, 2011 / Jun-Jul, 2012 / May-Jun, 2013**

MPIPKS Program: 'Statistical Physics of Collective Motion'

Supervised one PhD student and one postdoctoral researcher

Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

Guest Scientist

May-Jun, 2011

Project: 'Adaptive Networks, Opinion Formation, & Swarm Dynamics' with Prof. Thilo Gross. Supervised two PhD students and two postdoctoral researchers.

ESAM, Northwestern University, Evanston IL, USA

Visiting Scholar

2005 - 2011

Collaborated with Prof. Mary Silber. Co-advised PhD student and undergrad student.

Co-supervised the Interdisciplinary Nonlinear Dynamics IGERT 499 Study Group:

'Swarming, Flocking, and Applications to Multi-Robot Systems'

NSF Project: Collective behavior of complex systems with long-range effective interactions: a network approach

PI - Research Scientist – NSF Grantee (DMS-0507745)

2005 – 2008

Principal Investigator in theoretical analysis of complex network dynamics & swarming systems. Co-supervised three PhD students and one postdoctoral researcher.

City University of Hong Kong, Kowloon, Hong Kong

Visiting Research Scientist

Jan-Feb, 2008

Worked with Prof. Felipe Cucker at the Dept. of Mathematics on the project:

'Flocking with informed agents'.

ESAM, Northwestern University, Evanston IL, USA

Postdoctoral Fellow

2002 - 2005

Worked with Profs. Mary Silber and Hermann Riecke at Dpt. of Eng. Sci. &

Appl. Math. on spatio-temporal chaos, Ginzburg-Landau equation,

XY model, Faraday patterns and swarms.

James Franck Institute, University of Chicago, Chicago IL, USA

Postdoctoral Research Associate

2000 - 2002

Worked with Prof. Leo Kadanoff on finite time singularities & network/swarm dynamics.

Responsible for running the *Computations in Science* weekly seminar.

MUSIC AND ART/SCIENCE EXPERIENCE

- Jan. 2015: Invited musician in crowdfunded international collaborative album: *Bridges a Musical Journey* (with participation by musicians from 21 countries – Produced by Igor Ledermann)
- May 2014: Released single Tributaries of a Father [a Frankie Knuckles tribute] with *Makers of Sense*
- 2013-2014: Soundtrack for Ingress Report videos (augmented reality multiplayer online game)
- Oct. 2014: Video and production of new *Makers of Sense* multimedia live electronic music performance
- Jun.-Aug. 2014: Regional tour with *Makers of Sense*, including multiple shows in Chicago & Evanston IL, Milwaukee WI, Detroit & Holland MI, and Cincinnati OH
- Aug.-Oct. 2013: Soundtrack for French experimental film *Sur le Rocher* by filmmaker Sandrine Rouxel (funded by G.R.E.C. – Groupe de Recherches et d'Essais Cinématographiques)
- Jan.-Aug. 2013: Released "Making Sense of the Makers of Sense" – a three-part YouTube documentary on *Makers of Sense's* approach to electronic music production and new live show

- June 2013: Live solo performance series at "Atelier Schwartz – Kulturtreffpunkt" (Dresden, Germany)
- May 2013: Released video "Po Boy Dunn Lost his Way" by *Makers of Sense* (Official Music Video)
- Jun. 2012: Local organizer and roundtable participant at the *Arts, Humanities, and Complex Networks – 3rd Leonardo Satellite Symposium* at NetSci 2012 (Evanston, IL)
- Feb. 2013: iTunes release of EP album "To the Warehouse – Part II [Special Remixes Edition]"
- July 2012: iTunes release of EP album "To the Warehouse – Part I [Special Remixes Edition]"
- June 2012: Presentation of paper *Generating Music from Flocking Dynamics* and accompanying performance for *Flock Logic* dance (American Control Conf. – Montréal, Canada)
- 2011: Developed interface to generate music from flock-simulations with Prof. R. Cádiz (Center for Research in Audio Technologies, Instituto de Música, PUC de Chile)
- Aug. 2011: Roundtable participant at the symposium *Electronic Music & Multimedia Art Based on Communities* (National Museum of Mexican Art, Chicago, IL)
- Mar. 2011: Workshop Organizer *Networks and Nonlinearities in the Musical Experience: From Perception to Appreciation* – ZiF Center for Interdisciplinary Research, Bielefeld Univ. (Bielefeld, Germany)
- Jan. 2011: Released album *Out of the Box*. Wrote, performed, recorded and produced the album as member of duo *Makers of Sense*
- Oct. 2010: Released *Repack the Box* EP (Ponk Records, NY) with *Makers of Sense*
- Jul. 2009: Outreach invited speaker on *The Physics of Music* at Chicago Public Schools Teachers Workshop, organized by The Science Institute (Columbia College Chicago).
- Mar. 2009: Roundtable organizer and speaker at the *Ars Scientia: Conversations and Salons on Art and Science* series organized by the Chicago Cultural Center.
Salon Title: '*Waves, Beats and Grooves: The Physics of Music*'.
- Nov. 2006: Released second solo album *Blue Line*. Wrote, performed, recorded and produced all songs
- 2002: Appeared as guest musician in album by L'Altra: *In the Afternoon* (Aesthetics - 2002)
- 2001: Released first solo album *eclectise* (Musicopre Studios, France) Wrote and produced all songs
- 2000: Composed and produced music on command for the art magazine *9/9 Revue d'Art Pratique* (featured in the Pro-Zak exhibit at the Modern Art Museum in Paris, France)

OTHER RECENT PROFESSIONAL AND OUTREACH EXPERIENCE

- Feb 2010 – Today: Founder and CEO of *Cristian Huepe Labs Inc.*, an Illinois S-Corporation for Scientific Research and Development Services (Chicago, IL, USA).
- Jan 2013 – Today: Review Editor for *Frontiers in Physics*, Computational Physics
- Aug 2009 – Today: Scientific consultant for *eduMedia*, <http://www.edumedia-sciences.com/en/>, a database of science educational interactive resources and videos for teachers, students, and the general public.
- July 2014: Program Committee member for *ALIFE 14: International Conference on the Synthesis and Simulation of Living Systems* (SUNY, New York, USA)
- May 2007: Minisymposium organizer at the 2007 SIAM *Conference on Applications of Dynamical Systems*.
- Refereeing for: Phys Rev Lett; Phys Rev A, B, and E; Physica A and D; Automatica; PLoS ONE; European Physical Journal; New Journal of Phys; SIAM J on Appl Dyn Sys; Chaos; Nonlinearity; J of the Royal Society Interface; J Stat Phys.; Bioinspiration & Biomimetics; J. Theo. Bio, Nature Sci Reports; Nature Comm., etc.
- Peer-Reviewing for funding agencies: US National Science Foundation (NSF) panel member; French Natl. Research Agency (ANR) project evaluation; Fondecyt (Chilean science & technology development fund) project evaluation; Netherlands Organization for Scientific Research (NWO) project evaluation.

AWARDS

- Awarded *Alexander von Humboldt Foundation* CONNECT Residence Program **2014**
- Paper selected for 'Highlights of 2011' issue by the *New Journal of Physics* **2012**
- Highlighted among *URB Magazine's* Next 1000 upcoming musicians **2009**
- Selected as Critics' Pick by *Time Out Chicago* **2009**
- Awarded *Chicago Reader's* "Best Experimental Act" prize for *Makers of Sense* **2008**
- Prize winner at the *Artist Forum's* Electronic Music Competition **2007**
- Awarder Chicago CAAP Arts Assistance Grant **2006**
- Paper selected as *Frontier Research* by the *Virtual Journal of Nanoscale Science & Technology* **2004**
- French Government PhD Scholarship for foreign students **1994 – 1999**

PEER-REVIEWED PUBLICATIONS

1. C. Huepe, E. Ferrante, T. Wenseleers, and A. E. Turgut. *Scale-free correlations in flocking systems with position-based interactions*. J Stat Phys. **158**(3) 549-562 (2015)
 2. E. Ferrante, A. E. Turgut, T. Wenseleers, and C. Huepe. *Scale-free correlations in collective motion with position-based interactions*. Proceedings of the 14th International Conference on the Synthesis and Simulation of Living Systems (Alife 2014)
 3. C. Huepe, M. Colasso, and R. F. Cadiz. *Generating Music from Flocking Dynamics*. Book chapter in "Controls and Art: Inquiries at the Intersection of the Subjective and the Objective". A. Lavier, M. Egerstedt (Eds.). Springer (2014)
 4. E. Ferrante, A. E. Turgut, M. Dorigo, and C. Huepe. *Elasticity-Based Mechanism for the Collective Motion of Self-Propelled Particles with Springlike Interactions: A Model System for Natural and Artificial Swarms*. Phys. Rev. Lett. **111**, 268302 (2013)
 5. E. Ferrante, A. E. Turgut, M. Dorigo, and C. Huepe. *Collective Motion Dynamics of Active Solids and Active Crystals*. New J. Phys. **15** 095011 (2013)
 6. K. Tunstrøm, Y. Katz, C. C. Ioannou, C. Huepe, M. J. Lutz, and I. D. Couzin. *Collective States, Multistability and Transitional Behavior in Schooling Fish*. PLoS Comput Biol **9**(2): e1002915 (2013)
 7. Eliseo Ferrante, Ali Emre Turgut, Cristián Huepe, Alessandro Stranieri, Carlo Pinciroli, Marco Dorigo. *Self-organized flocking with a mobile robot swarm: a novel motion control method*. Adaptive Behavior, **20**(6) 460-477 (2012)
 8. E. Ferrante, A. E. Turgut, C. Huepe, M. Birattari, M. Dorigo, and T. Wensellers. *Implicit and explicit directional information transfer in collective motion*. Proceedings of the 13th International Conference on the Synthesis and Simulation of Living Systems (Alife 2012)
 9. C. Huepe, R. F. Cadiz, and M. Colasso. *Generating music from flocking dynamics*. American Control Conference (ACC), 4339-4344 (2012)
 10. S. Mishra, K. Tunstrøm, I. D. Couzin, and C. Huepe. *Collective dynamics of self-propelled particles with variable speed*. Phys. Rev. E **86**, 011901 (2012)
 11. J. G. Zschaler, G. A. Bohme, M. SeiBinger, C. Huepe, and T. Gross. *Early fragmentation in the adaptive voter model on directed networks*. Phys. Rev. E **85** 046107 (2012).
 12. Y. Katz, K. Tunstrøm, C. C. Ioannou, C. Huepe, and I. D. Couzin. *Inferring the structure and dynamics of interactions in schooling fish*. PNAS, doi: 10.1073, 1107583108 (2011)
 13. C. Huepe, G. Zschaler, A.-L. Do, and T. Gross. *Adaptive network models of swarm dynamics*. New Journal of Physics, **13**, 073022 (2011).
 14. C. Huepe and M. Aldana. *New tools for characterizing swarming systems: A comparison of minimal models*. Physica A **387** (12) 2809-2822 (2008).
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15. J.A. Pimentel, M. Aldana, C. Huepe, and H. Larralde. *Intrinsic and extrinsic noise effects on phase transitions of network models with applications to swarming systems*. Phys. Rev. E **77** 061138 (2008).
 16. F. Cucker and C. Huepe. *Flocking with informed agents*. MathematicS in Action **1** 1-25 (2008).
 17. A. E. Turgut, C. Huepe, H. Celikkanat, F. Gokce, and E. Sahin. *Modeling phase transitions in self-organized mobile robot flocks*. In "Ant Colony Optimization and Swarm Intelligence", Lecture Notes in Computer Science 5217, 108-119 (2008).
 18. M. Aldana, V. Dossetti, C. Huepe, V. M. Kenkre, and H. Larralde. *Phase Transitions in Systems of Self-Propelled Agents and Related Network Models*. Phys. Rev. Lett. **98** 095702 (2007).
 19. C. Huepe, Y. Ding, P. Umbanhowar and M. Silber. *Forcing function control of Faraday wave instabilities in viscous shallow fluids*. Phys. Rev. E **73** (1) 016310 (2006).
 20. C. Huepe, H. Riecke, K. Daniels and E. Bodenschatz. *Statistics of Defect Trajectories in Spatio-Temporal Chaos in Inclined Layer Convection and the Complex Ginzburg-Landau Equation*. Chaos **14** (3) 864-874 (2004).
 21. C. Huepe and M. Aldana. *Intermittency and clustering in a system of self-driven particles*. Phys. Rev. Lett. **92** (16) Art. No. 168701 (2004).
 22. L.S. Tuckerman, C. Huepe and M.-E. Brachet. *Numerical methods for bifurcation problems*. In "Instabilities and non-equilibrium structures IX", O. Descalzi, J. Martinez, and S. Rica (Eds.) Nonlin. Phen. and Cmplx. Syst. **9**, 75-86, Springer-Kluwer, (2004).
 23. M. Abid, C. Huepe, S. Metens, C. Nore, C.T. Pham, L.S. Tuckerman and M.-E. Brachet. *Gross-Pitaevskii dynamics of Bose-Einstein condensates and superfluid turbulence*. Fluid Dynamics Research **33** (5-6) 509-544 (2003).
 24. C. Huepe, L.S. Tuckerman, S. Metens and M.E. Brachet. *Stability and decay rates in nonisotropic attractive Bose-Einstein condensates*. Phys. Rev. A **68** (2) Art. No. 023609 (2003).
 25. M. Aldana and C. Huepe. *Phase transitions in self-driven many-particle systems and related non-equilibrium models: A network approach*. J Stat Phys **112** (1-2), 135-153 (2003).
 26. C. Huepe and M. Aldana. *Dynamical phase transition in a neural network model with noise: An exact solution*. J Stat Phys **108** (3-4), 527-540 (2002).
 27. C. Huepe. *Dynamics of the convergence towards a self-similar blowup solution in a simplified model of aggregation*. Nonlinearity **15**(5), 1699-1715 (2002).
 28. C. Huepe, C. Nore and M.-E. Brachet. *Transition to dissipation in two and three dimensional superflows*. In "Quantized Vortex Dynamics and Superfluid Turbulence", C.F. Barenghi, R.J. Donnelly and W.F. Vinen (Eds.) Lecture Notes in Physics **571**, 279-304, Springer-Verlag (2001).
 29. C. Nore, C. Huepe, M.-E. Brachet. *Subcritical Dissipation in Three-Dimensional Superflows*. Phys. Rev. Lett. **84**, 2191 (2000).
 30. C. Huepe, M.-E. Brachet and F. Debbasch. *Generic inflationary and noninflationary behavior in toy-cosmology*. Physica D **144** (2000) 20-36.
 31. C. Huepe and M.-E. Brachet. *Scaling laws for vortical nucleation solutions in a model of superflow*. Physica D **140** (2000) 126-140.
 32. C. Huepe, C. Nore and M.-E Brachet. *Bifurcations in Attractive Bose-Einstein Condensates and Superfluid Helium*. In "Instabilities and non-equilibrium structures VII and VIII", O. Descalzi, J. Martinez and E. Tirapegui (Eds.) Nonlin. Phen. and Cmplx. Syst.**8**, 43-68, Springer-Kluwer (2003).
 33. C. Huepe, S. Metens, G. Dewel, P. Borckmans and M.-E. Brachet. *Decay Rates in Attractive Bose-Einstein Condensates*. Phys. Rev. Lett. **82**, 1616 (1999).
 34. C. Huepe and M.-E. Brachet. *Vortical Nucleation Solutions in a Model of Super-flow*. C.R. Acad. Sci. Paris, t. **325**, Serie Iib, 195-202, (1997).
 35. C. Huepe, F. Debbasch & M.-E. Brachet. *Hydrodynamical Interpretation of Relativistic Charged Scalar Field Dynamics*. In "Topological defects in cosmology", World Scientific (1996).
 36. F. Barra, M. Clerc, C. Huepe and E. Tirapegui. *Detailed Balance and Reversed Process for Macroscopic Systems*. In Nonlinear Phenomena and Complex Systems **1**, Springer-Kluwer (1996).
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SELECTED RECENT INVITED TALKS

- **May 2015:** Invited speaker at the *Conference on Physics of Active Matter* (Suzhou, China)
- **Jul 2014:** Invited speaker at the workshop *Criticality in Natural and Social Complex Systems* (Cuernavaca, Mexico)
- **Dec 2013:** Invited speaker at the *14th Workshop on Instabilities and Nonequilibrium Structures* (Viña del Mar, Chile)
- **Sep 2013:** Invited speaker at the *4th IFAC Workshop on Distributed Estimation and Control in Networked Systems* (Koblenz, Germany)
- **Apr 2013:** Invited speaker at the National Academy of Engineering's *2013 German-American Frontiers of Engineering Symposium* (Irvine CA, USA)
- **Jun 2012:** Invited speaker at the *Swarming, Collective Behavior, & Pattern Formation* session of the *Canadian Applied and Industrial Mathematics Annual Meeting, CAIMS 2012* (Toronto, Canada)
- **Sep 2011:** Invited speaker at the workshop *Collective Dynamics and Pattern Formation in Active Matter Systems* (MPIPKS, Dresden, Germany)
- **Jul 2011:** Invited speaker at the conference *Foundations of Computational Mathematics* (Budapest, Hungary)
- **Jun 2011:** Invited colloquium speaker at the Max Planck Institute for the Physics of Complex Systems (Dresden, Germany)
- **Jun 2011:** Invited speaker at the workshop *Fluctuations and Response in Active Materials: From Driven Granular Systems to Swarming Bacteria* (Lorentz Center, Leiden Netherlands)
- **Mar 2011:** Invited speaker at the workshop *Insect Self-organization and Swarming* (Mathematical Biosciences Institute, Ohio, USA)
- **Dec 2010:** Invited speaker at workshop *Disorder and Heterogeneity in Physics* (Santiago, Chile)
- **Jan 2010:** Invited speaker at the *XXXIX Winter Meeting on Statistical Physics* (Taxco, Mexico)

MEMBERSHIPS

- Member of the American Physical Society (APS)
- Member of the Society for Industrial and Applied Mathematics (SIAM)
- Member of BMI (Broadcast Music Inc.) performing rights organization
- Honorary member of the ACHAYA (Chilean association for amateur astronomy)

LANGUAGES

- Spanish – native speaker
- English and French – fluently spoken, read and written
- German, Italian and Portuguese – basic understanding