

Curriculum Vitae - Miguel Fuentes

- CONTACT INFORMATION @ SFI
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- RESEARCH Non local stochastic calculus; Emergence of diversity; Philosophy of Science: Complexity and Theory–Change; Applied Statistical Physics.
- AFFILIATIONS **Santa Fe Institute**, USA. External Professor. 1399 Hyde Park Road Santa Fe, NM 87501.
SADAF (Argentine Society of Philosophical Analysis). Bulnes 642, Buenos Aires, Argentina.
Universidad San Sebastian. Research Director. Santiago, Chile.
- EDUCATION **Santa Fe Institute**, USA, Omidyar Fellow.
Center for Non Linear Studies, Los Alamos Nat. Lab., USA, PostDoctoral Residency.
Institut Non Linéaire de Nice, France, Ph.D Student (Co-Directed).
Master Sc. in Physics, Instituto Balseiro, Argentine Atomic Energy Commission, San Carlos de Bariloche, Río Negro, Argentina.
Instituto Balseiro, Argentina, Undergraduate & Master Student.
- PUBLISHED - *Shannon Information and Kolmogorov Complexity*. Miguel Fuentes Guest Editor. Entropy. 2019.
- *Non-equilibrium evolution of volatility in origination and extinction explains fat-tailed fluctuations in Phanerozoic biodiversity*. Andrew J. Rominger, Miguel A. Fuentes and Pablo A. Marquet. Science Advances. 2019.
- *Public Policy Modeling and Applications: state-of-the-art and perspectives*. Furtado, B. A., Fuentes, M. A., and Tessone, C. J. Complexity. 2019.
Marquet1, 4, 5, 6, 7. Complexity. 2019.
- *Non-Linear Diffusion and Power Law Properties of Heterogeneous Systems: Application to Financial Time Series*. Miguel Fuentes. Entropy 2018, 20(9), 649.
- *Public Policy Modeling and Applications*. Lead Editor, Special Issue. Complexity. 2018.
- *Social Crises. A Network Model Approach*. Miguel Fuentes, Gerardo Vidal, Carolina Urbina, Gaston Olivares, Juan Pablo Cardenas. Physica D. 2018.
- *Signatures of complexity in a fast-growing economy*. Juan Pablo Cardenas, Gerardo Vidal, Carolina Urbina, Gaston Olivares, Pablo Rodrigo and Miguel Fuentes. Complexity. 2018.
- *Social Network Plasticity in Children*. Miguel Fuentes. Trans. Review: Vol XXVI, No. 25. 2018.
- *Environmental Fluctuations and Their Consequences for the Evolution of Phenotypic Diversity*. Fuentes, M. A., and Ferrada, E. (2017). Frontiers in Physics, 5, 16.
- *Fairy circles and their non-local stochastic instability*. Miguel Fuentes and Manuel Cceres. Eur. Phys. J. Special Topics 226, 443?453, 2017.

- *Dynamic landscapes to model communication and learning.* Miguel Fuentes y Hernn Miguel. Scienti studia, So Paulo, v. 14, n. 1, p. 65-94, 2016.
- *Attraction Basins and Unlimited Semiosis.* Miguel Fuentes. Revista de Humanidades de Valparaso. 2016.
- *Cities and Methods from Complexity Science.* Beatriz Balmaceda and Miguel Angel Fuentes. Journal of Systems Science and Complexity. DOI: 10.1007/s11424-016-6084-2. 2016.
- *Does network complexity help organize Babel's library?* Juan Pablo Crdenas, Ivn Gonzlez, Gerardo Vidal and Miguel Angel Fuentes. doi:10.1016/j.physa.2015.12.031, 2016.
- *Stochastic Path Perturbation Approach Applied to Non-Local Non-Linear Equations in Population Dynamics.* Miguel Angel Fuentes and Manuel O. Caceres. Math. Model. Nat. Phenom. Vol. 10, No. 6, 2015, pp. 48-60. 2015.
- *The Underlying Social Dynamics of Paradigm Shifts.* Carlos Rodriguez-Sickert, Francisco Claro, Diego Cosmelli and Miguel Angel Fuentes. PLoSOne, DOI: 10.1371/journal.pone.0138172, 2015.
- *First-passage times for pattern formation in nonlocal partial differential equations.* Manuel O. Caceres and Miguel Angel Fuentes. Phys. Rev. E 92, 042122.
- *Methods and Methodologies of Complex Systems.* Miguel Angel Fuentes. Chapter Book. In: Modeling complex systems for public policies. Furtado, B. A., Sakowski, P. A., and Tvoli, M. H. 2015.
- *Scaling of distributions of sums of positions for chaotic dynamics at band-splitting points.* Alvaro Diaz-Ruelas, Miguel Angel Fuentes and Alberto Robledo. European Physical Letters. 2014.
- *Stochastic model predicts evolving preferences in the Iowa gambling task.* Miguel Angel Fuentes, Claudio Lavn, Sebastin Contreras-Huerta, Hernan Miguel and Eduardo Rosales Jubal. Frontier in Computational Neuroscience. 2014.
- *Complexity and the Emergence of Physical Properties.* Miguel Angel Fuentes. Entropy, 16(8), 4489-4496; doi:10.3390/e16084489, 2014.
- *Sums of variables at the onset of chaos.* Miguel Angel Fuentes and Alberto Robledo. European Physical Journal, 2014.
- *Emergencia.* Miguel Angel Fuentes. Book chapter: Causacin, explicacin y contrafticos. Ed. Hernn Miguel. Editorial Prometeo, 2014.
- *Sistemas Complejos y Emergencia.* Miguel Angel Fuentes. Book chapter: Las rutas de la complejidad. Eds. E. Bustos, P. Marquet and A. Palacios. Instituto de Sistemas Complejos de Valparaso, 2014.
- *El boicot a Elsevier y sus implicaciones respecto del acceso de publicaciones cientficas.* Miguel Angel Fuentes. Book chapter: El conocimiento como prtica. Investigacin, valoracin, ciencia y difusin. Eds. M. C. Di Gregori, L. Rueda and L. Mattarollo. Facultad de Humanidades y Ciencias de la Educacin, Universidad Nacional de La Plata. 2014.
- *First Passage Time on Pattern Formation in a Non-Local Dynamics.* Central European Journal of Physics July 2013. Miguel Angel Fuentes and Manuel O. Caceres.
- *Self Generated Dynamic Landscape.* Miguel Angel Fuentes and Hernan Miguel. Physica A 392, 2013.
- *Diversity Emerging: From Competitive Exclusion to Neutral Coexistence in Ecosystems,* Juan E. Keymer, Miguel A. Fuentes and Pablo A. Marquet. Journal of Theoretical Ecology, DOI 10.1007/s12080-011-0138-9, 2012.
- *Non-Gaussian Price Dynamics.* Contemporary Studies in Economic and Financial Analysis; Vol 94; Derivative Securities Pricing and Modelling; edited by Jonathan A. Batten and Niklas F. Wagner; ISBN: 978-1-78052-616-4, 2012. Miguel Angel Fuentes, Austin Gerig and Javier Vicente.

- *Sensitivity to Initial Conditions, Entropy Production, and Escape Rate at the Onset of Chaos*, Miguel Angel Fuentes, Yuzuru Sato and Constantino Tsallis. *Physics Letters A*, doi:10.1016/j.physleta.2011.06.039, 2011.
- *Beneficial effects of human altruism*, Mariana Lozada, Paola D'Adamo and Miguel Angel Fuentes. *Journal of Theoretical Biology*, 289, 1216, 2011.
- *Vegetation Pattern Formation in a Fog-Dependent Ecosystem*, Ana Inés Borthagaray, Miguel Angel Fuentes and Pablo A. Marquet. *Journal of Theoretical Biology*, doi:10.1016/j.jtbi.2010.04.020, 2010.
- *Stationary distributions of sums of marginally chaotic variables as renormalization group fixed points*, Miguel A. Fuentes and Alberto Robledo. *Journal of Physics*, 201, 2010.
- *Renormalization Group Structure for Sum of Variables Generated by Incipiently Chaotic Maps*, Miguel A. Fuentes and Alberto Robledo. *Journal of Statistical Mechanics*, doi:10.1088/1742-5468/2010/01/P01001, 2010.
- *Universal Behavior of Extreme Price Movements in Stock Markets*, Miguel A. Fuentes, Austin Gerig and Javier Vicente. *PLoS ONE*, 4, 12, e8243, 2009.
- *Model for non-Gaussian intraday stock returns*, Austin Gerig, Javier Vicente and Miguel Angel Fuentes. *PRE RC*, 80, 065102, 2009.
- *Developmental Autonomy and Somatic Niche Construction*, Anya K. Bershad, Miguel A. Fuentes and David C. Krakauer. *Journal of Theoretical Biology* 254 (2008) 408–416.
- *Computing the Non-Linear Anomalous Diffusion Equation from First Principles*, Miguel A. Fuentes and Manuel O. Cáceres. *Physics Letters A* 372, 2008, 1236–1239, doi:10.1016/j.physleta.2007.09.020.
- *Effects of the Noises' Statistics and Spectrum on Noise-Induced Phase Transitions*, Roberto R. Deza, Horacio S. Wio and Miguel A. Fuentes. *Proc. Icnf, Tokyo, AIP Conf. Proc.*, M. Nakao, Ed. 2007.
- *Distinguishing Noise from Chaos*, O. A. Rosso, H. A. Larrondo, M. T. Martin, A. Plastino and M. A. Fuentes. *Physical Review Letters* 99, 154102, 2007, doi: 10.1103/PhysRevLett.99.154102.
- *The Evolution of Developmental Patterning Under Genetic Duplication Constraints*, Miguel A. Fuentes and David C. Krakauer. *J. R. Soc. Interface*, 2007, doi:10.1098/rsif.2007.1074.
- *Influence of Global Correlations on Central Limit Theorems*, John A. Marsh, Miguel A. Fuentes, Luis G. Moyano and Constantino Tsallis. *Physica A*, 372, 2006.
- *Living in an Irrational Society: Wealth Distribution with Correlations Between Risk and Expected Profits*, Miguel A. Fuentes, M. Kuperman and J. R. Iglesias. *Physica A*, 371, 2006.
- *Noise-Induced Phase Transitions: Effects of the Noises' Statistics and Spectrum*, R. R. Deza, H. S. Wio and M. A. Fuentes. *Nonequilibrium Statistical Mechanics and Nonlinear Physics*, Proc. Medyfinol, O. Descalzi, O. Rosso and H. Larrondo, Eds, 2006.
- *Stochastic Resonance: Influence of a f^{-k} Noise Spectrum*, Miguel A. Fuentes and Horacio S. Wio. *European Physical Journal B*, Volume 52, Number 2, 2005.
- *Multiple Peaked Polaron in Soft Potentials*, M. A. Fuentes, G. Kalosakas, Ø. Rasmussen, A. R. Bishop, V. M. Kenkre and Y. B. Gaididei. *Phys. Rev. E* 70, 025601R, Rapid communications, 2004.
- *Analytical Considerations in the Study of Spatial Patterns Arising from Nonlocal Interaction Effects*, M. A. Fuentes, M. N. Kuperman and V. M. Kenkre. *J. Phys. Chem. B*, 108, 10505-10508, 2004.
- *Nonlocal Interaction Effects on Pattern Formation in Population Dynamics*, M. A. Fuentes, M. N. Kuperman and V. M. Kenkre. *Physical Review Letters* Vol. 91, 15, 1581041, 2003.
- *Stochastic Resonance in Bistable and Excitable Systems: Effect of Non-Gaussian Noises*,

M. A. Fuentes, Claudio Tessone, Horacio S. Wio and R. Toral. Fluctuation and Noise Letters, L365, 2003.

- *Dynamical effects induced by long range activation in a nonequilibrium reaction–diffusion system*, M. A. Fuentes, M. N. Kuperman, J. Boissonade, E. Dulos, F. Gauffre and P. De Kepper. Physical Review E 66 056205, 2002.

- *Effective Markovian Approximation for Non Gaussian Noises: a Path Integral Approach*, M. A. Fuentes, Raúl Toral and Horacio S. Wio. Phys. A. 303, 91-104, 2002.

- *Interaction of Charged Particles with Surface Plasmons in Cylindrical Channels in Solids*, Nestor R. Arista and Miguel A. Fuentes. Phys. Rev. B, 63, 16, 2001.

- *Experimental Evidence of Stochastic Resonance Without Tuning Due to Non Gaussian Noises*, F. J. Castro, M. N. Kuperman, M. A. Fuentes and H. S. Wio. Phys. Rev. E, vol. 64, 2001.

- *Propagation and Interaction of Cellular Fronts in a Closed System*, Miguel A. Fuentes, Marcelo N. Kuperman and P. De Kepper. J. Phys. Chem. A, 105, 27, 2001.

- *Enhancement of Stochastic Resonance: the Role of Non-Gaussian Noises*, Miguel A. Fuentes, Raul Toral and Horacio S. Wio. Phys. A. 295, 2001.

- *Wenckebach Rhythms in a FitzHugh Model with Defects*, Miguel A. Fuentes and Horacio S. Wio. Phys. A, 286, 2000.

- *Stochastic Escape Processes from a Non-Symmetric Potential Normal Form III: Extended Explosive Systems*, Miguel A. Fuentes and Manuel O. Cáceres. J. Phys. A: Math. Gen. Vol 32, 1999.

- *Cellular Automata and Epidemiological Models with Spatial Dependence*, Miguel A. Fuentes and Marcelo N. Kuperman. Phys. A, 267, 1999.

- *Convergence in Reaction–Diffusion Systems: an Information Theory Approach*, Miguel A. Fuentes, Marcelo N. Kuperman and Horacio S. Wio. Phys. A. 272, 1999.

- *Stochastic Escape Processes from a Non-Symmetric Potential Normal Form II: the Marginal Case*, Manuel O. Cáceres, Miguel A. Fuentes and Carlos E. Budde. J. Phys. A: Math. Gen. Vol 30, 1997.

- *Relaxation in Saddle-Node type Bifurcations for Scalar Fields*, master thesis under the direction of Dr. M. O. Cáceres.

- *Reaction Diffusion Systems and Stochastic Resonance*, Ph. D. thesis under the direction of Dr. V. Krinsky (Institut Non Linéaire de Nice , France), and Dr. H. Wio (Centro Atómico Bariloche, Argentina).

APPOINTMENTS - 2006-2010, Santa Fe Institute, Omidyar Fellow, USA.

- 2003, Los Alamos National Laboratory, New Mexico, USA: Center for Non Linear Studies. Under the direction of Dr. A. Bishop (Director Theoretical Division at Los Alamos National Laboratory).

- 2002, Consortium of Americas for Interdisciplinary Sciences, New Mexico, USA: *Pattern formation: analytical techniques*. Under the direction of Dr. V. M. Kenkre (Director of Consortium of Americas for Interdisciplinary Sciences).

- 2001, Centre de Recherche Paul Pascal, Bordeaux, France: *Propagation and interaction of fronts in closed systems*. Under the direction of Dr. Patrick De Kepper (Directeur de recherche CNRS).

- 2000-2001, Institut Non Linéaire de Nice, Nice, France: *Patterns in cultured brain capillary endothelial cells, signals propagation in 2D cultures of cardiac cells*. Under the direction of Dr. Valentin Krinsky.

- 1999, Laboratoire d'analyse numérique, Université Lyon I, France: *Study of Dissipative Structures in Catalytic Systems*. Under the direction of Dr. Vitaly A. Volpert.

- 1999, Université Pierre et Marie Curie. Paris, France.

TEACHING

- **2009, Co-Director, First Latin America Santa Fe Institute Complex System School, with the participation of Murray Gell–Mann (Nobel Prize in Physics, 1969).**
- 2009, *Spatial Patterns & the Emergence of Diversity*, Pamela Martinez, REU, Santa Fe Institute and Master Student. Accomplished.
- 2010–2011, Co–Advisor M. Thesis: *Emergencia de Diversidad en Colonias Bacterianas*, Pamela Martinez. Universidad de Chile. Accomplished.
- 2008–2011, Co–Advisor Ph. D. Thesis: *Regular Bio-Structures in the Atacama Desert*, Ana Bortagaray. Center for Advances Studies in Ecology & Biodiversity, PUC, Chile. Accomplished.
- 2008–2012, Co–Advisor Ph. D. Thesis: *Universal properties of price dynamics*, Javier Vicente. Universidad Carlos III, España.
- 2006–present, Several taught courses on *Pattern Formation* and *Stochastic Calculus* given as visitor professor in Argentina (CAB) and Chile (ISCV).
- 2008, *Anomalous Transport and Correlated Variables*, Benjamin Good, REU, Santa Fe Institute.
- 2007, *Developmental Autonomy and Somatic Niche Construction*, Anya K. Bershad, REU, Santa Fe Institute.
- **2013, Director, First Santa Fe Institute Complex System School Chile.**
- 2016, Director, *Winter School, Sadaf, Buenos Aires.*
- 2019, *School on Causation and Complex Systems, Universidad Nacional de La Plata, Argentina.*

CONFERENCES

- 2018, Complexity in Biological Systems, ISCV, Valparaiso, Chile.
- 2017, New trends in Philosophy of Science, Universidad Católica, Buenos Aires, Argentina.
- 2015, Conference on Stochastic Calculus and Application, Universidad Católica de Chile, Pucón, Chile.
- 2014, III Congress on Philosophy of Knowledge, Universidad Nacional de La Plata, Argentina.
- 2014, Santa Fe Institute Complex Systems Summer School.
- 2014, Methods and Methodologies of Complex Systems, The Institute for Applied Economic Research.
- 2012, VIII Encuentro de filosofía e historia de la ciencia del Cono Sur, Chile.
- 2011, Latin American Workshop on Nonlinear Phenomena, Mexico.
- 2011, Interrelaciones entre Filosofía, Física y Química, SADAf, Argentina.
- 2010, Complex systems summer school, Instituto de Sistemas Complejos de Valparaiso, Chile.

2010, Lenguaje and cognition, Concepcion, Chile.

2009, Fluctuation and noise in living organisms, Riken, Tokyo, Japan.

2009, Mathematical aspects of generalized entropies and their applications, Rims, Kyoto, Japan.

2008, SFI Complex systems summer school, Bariloche, Argentina.

2007, Complex systems summer school, ISCV, Chile.

2006, Systems at the edge of chaos, Universidad Nacional Autónoma de Mexico, Mexico.

2005, Complex systems: new trends and applications, Universidad de Cantabria, Spain.

2004, PASI (Pan American Advanced Studies Institute), New Mexico, USA.

2004, Science Meeting, Consortium of the Americas for Interdisciplinary Science, University of New Mexico, USA.

2003, VIII Latin American Workshop on Nonlinear Phenomena, Salvador, Bahia, Brazil.

2002, Population Dynamics in Biology: Epidemics, Bacteria, Vegetation and Sundries, UNM, USA.

2001, VI Latin American Workshop on Non-Linear Phenomena and XII National Meeting on Nonequilibrium Statistical Mechanics and Non-Linear Physics.

1999, Workshop in Reaction Front, Lyon, France.

1997, Workshop in Inestabilities and Non-Equilibrium Structures, Valparaiso, Chile.

APPLICATIONS Mathematica, Origin, $\text{T}_\text{E}\text{X}$, $\text{L}^{\text{A}}\text{T}_\text{E}\text{X}$, $\text{BIB}\text{T}_\text{E}\text{X}$, Microsoft Office, and other common productivity packages for Windows, OS X, and Linux platforms

PROGRAMMING

LANGUAGES Fortran, C, C++, Mathematica, MatLab.

LANGUAGES Spanish (first language), English (PostDoc in USA), French (PhD student in France).