CURRICULUM VITAE
of Susanna Manrubia

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1 Personal Data

Family name: Manrubia Cuevas **First name:** Susanna

Date of birth: 22nd April 1969 **Birthplace:** Barcelona, Spain

Nationality: Spanish

Current address: Centro Nacional de Biotecnología (CSIC)
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28049 Madrid, Spain

Current position: Full Researcher (*Científico Titular de Organismos Públicos de Investigación*) since 01/2009.

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2 Education

B.S. degree in Physics, Universitat de Barcelona, June 1992.

Ph.D. degree in Physics, *cum laude*, Universitat Politècnica de Catalunya, December 1996. Extraordinary PhD prize of the Universitat Politècnica de Catalunya, September 1999.

PhD Thesis: *Self-Organized Criticality in Ecology and Evolution.*

Faculty advisor: Dr. Ricard Solé, currently at Universitat Pompeu Fabra, Barcelona

LANGUAGES

Mother tongue: both **Catalan** and **Spanish**.

French: Diplôme de Langue of the Lycée Fran cais, June 1984.

English: Proficiency level.

German: Oberstuffe Deutsch level (advanced).

Italian: Fluently spoken, correctly written.

3 Research Experience

September 1992-June 1997. Research assistant in the *Complex Systems Research Group*, Dept. de Física i Enginyeria Nuclear, UPC.

April-May 1996. Research assistant in the *Brookhaven National Laboratory*, Upton, Long Island, New York. Invitation of Prof. Per Bak.

February-March 1997. Research assistant with fellowship CIRIT 1996BEAI200363 in the *Fritz-Haber-Institut der Max-Planck-Gesellschaft*, under supervision of Prof. Alexander S. Mikhailov.

June 1997. Guest researcher of the Smithsonian Tropical Research Institute in the field station of Barro Colorado Island, Panama. Collaboration with Prof. Joe Wright.

July-December 1997. Gastwissenschaftlerin (guest researcher) of the Max-Planck-Gesellschaft in the *Fritz-Haber-Institut*, under supervision of Prof. A.S. Mikhailov.

January-April 1998. Research fellow in the *Fritz-Haber-Institut der MPG* with fellowship of the Spanish Ministry of Science and Education, EX 97377745617.

May 1998-December 1999. Humboldt fellow of the Alexander von Humboldt Society, IV SPA 1053775 in the Fritz-Haber-Institut der MPG.

June-July 1998. Guest researcher of the Centro Atómico Bariloche, San Carlos de Bariloche, Argentina, with support of the Fundación Antorchas.

January 2000-February 2001. Postdoc fellow in the *Max-Planck-Institut für Kolloid- und Grenzflächenforschung*, in Potsdam (Germany).

March-December 2001. Postdoc fellow in the *Centro de Astrobiología*, CSIC-INTA, in Madrid (Spain).

May-June 2003. Visiting scientist at the *Fritz-Haber-Institut der MPG.*

January 2002-December 2006. Tenure-track position (Ramón y Cajal contract) at the *Centro de Astrobiología*, CSIC-INTA, in Madrid (Spain).

January 2007-January 2009. Research scientist hired by INSA (*Ingeniería y Servicios Aeroespaciales S.A.*) and destination at the *Centro de Astrobiología*, CSIC-INTA, in Madrid (Spain).

March 2001-May 2014. Affiliated to the Centro de Astrobiología (INTA-CSIC), Madrid, Spain.

3.1 Financed projects

Title: *Phase transitions and chaos in complex systems*, CICYT PB94-1195
IP: Ricard V. Solé (U. Politècnica de Catalunya)
Financing entity: Spanish Ministry of Science
Budget: 2.000.000 pesetas
Duration: 1994-1997

Title: *Emergence and selection of networks of catalytic species.*
IP: Prof. Peter F. Stadler (U. of Leipzig)
Financing entity: European Union
Budget: Cost D27 working group
Duration: 2003-2007

Title: *Evolution and organization of heterogeneous molecular populations*, FIS6414-2004
IP: Susanna C. Manrubia
Financing entity: Spanish Ministry of Science and Education (MEC)
Budget: 33.500 Euro
Duration: 2005-2007

Title: *Evolution and organization of heterogeneous populations and their re-*

lationship with the environment.
IP: Susanna C. Manrubia
Financing entity: Spanish Ministry of Science and Technology (MICyT)
Budget: 69.938 Euro
Duration: 2008-2011

Title: *International Workshop on 150 years after Darwin*
IP: Susanna C. Manrubia, Alan McKane, and José A. Cuesta
Financing entity: Institute for Cross-Disciplinary Physics and Complex Systems (IFISC) and Max Planck Institute for the Physics of Complex Systems (MPIPKS).
Budget: 13.500 Euro
Duration: 2009

Title: *Acción Complementaria* supporting the organization of Scientific Meetings, FIS2008-05369-E/FIS
IP: José A. Cuesta
Financing entity: Spanish Ministry of Science and Innovation (MICIIN)
Budget: 6.000 Euro
Duration: 2009

Title: I3 Programm,
IP: Susanna C. Manrubia
Financing entity: Spanish Ministry of Science and Innovation (MICIIN)
Budget: 60.000 Euro
Duration: 2010-2011

Title: *Modelización y simulación de sistemas complejos.*, P2009/ESP-1691
IP: Enrique Lomba García (CSIC) (of CAB node: Susanna C. Manrubia)
Financing entity: Comunidad de Madrid
Budget: 816.500 Euro
Duration: 2010-2013

Title: *Red Española de Biofísica de Virus.* Acción complementaria
IP: David Reguera (U. de Barcelona)
Financing entity: Spanish Ministry of Science and Innovation (MICIIN)
Budget: 12.000 Euro
Duration: 2011. Renewed for 2012.

Title: *Evolution of heterogeneous populations. Mechanisms of diversity generation and effect of the environment in adaptation*, FIS27569-2011
IP: Susanna C. Manrubia
Financing entity: Spanish Ministry of Science and Innovation (MICIIN) and Spanish Ministry of Economy and Competitivity (MINECO)
Budget: 220.220 Euro
Duration: 2012-2015

3.2 Patents

- *Tratamiento Antiviral.*
  Patent number P200930482, 20th July 2009 (first application)
  Applicants: Consejo Superior de Investigaciones Científicas (CSIC), Instituto Nacional de Técnica Aeroespacial (INTA), Universidad Complutense de Madrid, Centro de Investigación Biomédica en Red: Enfermedades Hepáticas y Digestivas.

- *Moléculas inhibidoras del virus de la inmunodeficiencia humana tipo 1 (VIH-1) obtenidas por la combinación de procesos de selección* in vitro *y modelización* in silico *de ácidos nucleicos.*
  Patent number P201231819, 23rd November 2012 (first application)
  International application: PCT/ES2013/070809, 22nd Novembre 2013.
  Applicants: Instituto de Parasitologa y Biomedicina "López-Neyra" (CSIC), Granada; Centro de Astrobiología (CSIC-INTA). Alfredo Berzal-Herranz, Carlos Briones, Susanna Cuevas Manrubia, Francisco José Sánchez-Luque, Michael Stich.

4 Others

4.1 Memberships

- Member of the Spanish Royal Society of Physics (*Real Sociedad Española de Física*, RSEF), since October 2003.
- Member of the Spanish Society of Evolutionary Biology (*Sociedad Española de Biología Evolutiva*, SESBE), since January 2013. Member of the Directive Board, serving as Treasurer since November 2013.

4.2 Referee for Evaluation Institutions

- Serving since 2005 as projects evaluator in the *Agència de Gestió d'Ajuts Universitaris i de Recerca* (AGAUR) of the Department of Universities, Research, and Society of Information of the Generalitat de Catalunya.
- Serving since 2003 as projects evaluator for the National Agency of Evaluation and Prospective (*Agencia Nacional de Evaluación y Prospectiva*, ANEP) in the areas of "Physics and Space Sciences" and "Plant and Animal Biology and Ecology". Additional participation in panels evaluation Ramón y Cajal and Juan de la Cierva Programs (2006, 2008, 2010), bilateral actions (2007), and stages abroad (2009).
- Member of the evaluation panel of the Spanish Ministry of Innovation and Technology (MICINN, 2009) and Spanish Ministry of Economy and Competitivity (MINECO, 2012), within the Plan Nacional, area of Physics. Evaluator of EXPLORA projects (2014).
- Projects evaluator for the Agency for Quality of the Universitary System in Castilla and Leon (*Agencia para la Calidad del Sistema Universitario de Castilla y León*, ACSUCYL).
- Evaluator of proposals for the European Union, FP7-PEOPLE-2013-IEF-IIF-IOF programs; evaluator and member of the panel of experts for the ERAnet Systems Biology Applications (ERASysApp-2014) program.

- Projects evaluator for the Israel Science Foundation (ISF), for the Swiss Federal Institute of Technology (ETH Zürich), for the Netherlands Organisation for Scientific Research (NWO), and for the French National Research Agency (ANR).

4.3 Editor for Journals

Associate Editor of the journal *Viral Evolution*, to be launched in spring 2015. Associate Editor (2010-2012) and Section Editor (2012-2015, section *Theory and Models*) of *BMC Evolutionary Biology*. Review Editor for *Frontiers in Microbiology* (since 2011).

4.4 Referee for Journals

Referee of *Science*, *Proceedings of the National Academy of Sciences*, *Physical Review Letters*, *Advances in Complex Systems*, *American Naturalist*, *Biophysical Journal*, *BMC Evolutionary Biology*, *BMC Systems Biology*, *Chaos*, *Ecological Modelling*, *European Physical Journal B*, *Europhysics Letters*, *Evolution*, *Evolution: Education and Outreach*, *Journal of Ecology*, *Journal of Molecular Evolution*, *Journal of Statistical Mechanics*, *Journal of Systems Chemistry*, *Journal of the Royal Society Interface*, *Journal of Theoretical Biology*, *Molecular Biology and Evolution*, *Nature Communications Oikos*, *Origins of Life and Evolution of the Biosphere*, *Philosophical Transactions of the Royal Society B*, *Physica D*, *Physical Review E*, *Physics Letters A*, *Physics of Life Reviews PLoS Computational Biology*, *PLoS ONE*, *Proceedings of the Royal Society B*, and *Theory in Biosciences*.

4.5 Referee in PhD defenses and scientific selection committees

- Jordi Delgado, "On collective computation".
  Software Dept., Univ. Politècnica de Catalunya, December 1997. PhD supervisor: Dr. Ricard V. Solé

- Bartolomé Luque, "Phase transitions and complexity in random boolean networks".

Dept. of physics and nuclear engineering, Univ. Politècnica de Catalunya, January 1999. PhD supervisor: Dr. Ricard V. Solé

- David Alonso, "Scaling and biodiversity in multispecies communities". Univ. Pompeu Fabra, January 2004. PhD supervisor: Dr. Ricard V. Solé

- Jacob Bock Axelsen, "Aspects of Life: stress, evolution, hierarchies and modularity".
  Univ. of Copenhaguen, Denmark, April 2006. PhD supervisor: Prof. Kim Sneppen

- Lucas Lacasa, "Complexity in physical, living, and mathematical systems".
  Univ. Politécnica de Madrid, Madrid, February 2009. PhD supervisor: Dr. Bartolomé Luque

- José A. Capitán, "Self-organization in biology: from quasispecies to ecosystems".
  Universidad Carlos III de Madrid, Madrid, December 2010. PhD supervisor: Dr. José A. Cuesta

- Diego Prada, "Paisajes de energía libre en modelos de biomoléculas". Universidad de Zaragoza, Zaragoza, January 2011. PhD supervisor: Prof. Fernando Falo

- E. Alejandro Herrada, "A complex network approach to phylogenetic trees: From genes to the Tree of Life".
  Universitat de les Illes Balears, Palma de Mallorca, February 2011. PhD supervisors: Prof. Emilio Hernández García, Dr. Víctor Martínez Eguíluz and Prof. Carlos M. Duarte Quesada

- Rafael Silva Rocha, "The logic of bacterial regulatory networks". Universidad Autónoma de Madrid, December 2011. PhD supervisor: Prof. Víctor de Lorenzo

- Héctor Tejero Franco, "Mutación y extinción. De la catástrofe de error a la defección letal".

Universidad Complutense de Madrid, July 2012. PhD supervisor: Prof. Francisco Montero Carnerero

- François Serra, "Informational, Ecological and System Approaches for Complete Genome Analysis".
  Universitat de València, December 2012. PhD supervisor: Prof. Hernán Dopazo

- Celia Blanco de Torres, "Models for Chiral Amplification in Spontaneous Mirror Symmetry Breaking".
  Universidad Complutense de Madrid, May 2014. PhD supervisor: Dr. David Hochberg

- Member of the Assessment Comittee (with Kim Christensen, Imperial College, and Tomas Bohr, University of Lyngby), for an Associate Professorship in Theoretical Complex Systems Physics at the Niels Bohr Institute, June 2008.

5 Teaching Experience

From September 1992 to September 1995, assistant professor in the Dept. de Física i Enginyeria Nuclear, UPC (Escola Tècnica Superior d'Engingers Industrials de Terrassa). Fundamental physics for engineers.

5.1 Student supervision

- Master Degree on Mathematical Engineering of Jaime Iranzo Sanz, *Evolutionary dynamics of genome segmentation in multi-partite viruses.* Universidad Carlos III de Madrid, 5 October 2011. Mark: 10/10.

- Master Degree on Biophysics of Pablo Hernández Cerdán, co-supervised with Prof. José A. Cuesta (Univ. Carlos III de Madrid), *Viral infection on competitive environments: adding random immune spots to the propagation space (Propagación de virus en entornos competitivos con ruido espacio-temporal).* Universidad Autónoma de Madrid, 7 October 2011. Mark: 8,5/10.
  He is developing his PhD in New Zealand.

- International PhD Degree of Jaime Iranzo Sanz, *Evolutionary responses of fast adapting populations to opposing selection pressures*, 20th June 2013. Mark: *apto cum laude* (highest mark).
  He is now a postdoc researcher at NIH under the supervision of Prof. Eugene Koonin.

6 Workshops and Meetings

6.1 Organization

NoLineal 2004
Member of the organizing committee
Oral presentation: *Universality classes and collective behavior in chaotic oscillators* 1-5 June 2004, Toledo, Spain.
Proceedings of the Conference, pp. 60-61, ISBN 84-688-7462-0.

NoLineal 2007
Member of the organizing committee.
6-9 June 2007, Ciudad Real, Spain.

Dynamics and evolution of biological and social networks
Member of the organizing committee.
Oral presentation: Phylogeny and the construction of biological relationships
18-20 February 2008, Palma de Mallorca, Spain.

NoLineal 2008
Member of the organizing committee.
16-19 June 2008, Barcelona, Spain.

150 years after Darwin: From molecular evolution to language
Member of the scientific organizing committee (with J. A. Cuesta and A. J. McKane)
23-27 November 2009, Palma de Mallorca, Spain.

NoLineal 2010
Member of the scientific organizing committee. 8-11 June 2010, Polytechnic University of Cartagena, Spain.

Jornadas Evolutivas Transdisciplinares
Organizer. 6-7 October 2010, Centro de Astrobiología, Madrid, Spain.

XI Congreso Nacional de Virología
Member of the scientific organizing committee.
Oral contribution: *Tempo and mode of inhibitor-mutagen antiviral therapies: A multidisciplinary approach* 29 May-1 June 2011, Granada, Spain.

Engineering of Chemical Complexity
Co-organizer, with Kunihiko Kaneko, of the Symposium "Biochemical Evolution and Protocells".
Invited contribution: Introduction to the Symposium. 4-8 July 2011, Berlin, Germany.

An Evolutionary Journey II (Jornadas Evolutivas Transdisciplinares)
Co-organizer, with José A. Cuesta and Anxo Sánchez. 20-21 October 2011, Universidad Carlos III, Madrid, Spain.

An Evolutionary Journey III (Jornadas Evolutivas Transdisciplinares)
Co-organizer, with José A. Cuesta and Anxo Sánchez. 25-26 October 2012, Universidad Carlos III, Madrid, Spain.

XII Virology National Congress (Congreso Nacional de Virología
Member of the scientific organizing committee. 9-12 June 2013, Burgos, Spain.

European Conference on Complex Systems 2013
Member of the scientific committee. 16-20 September 2013, Barcelona, Spain.

Meeting of the Spanish Society for Evolutionary Biology
Member of the scientific commitee. Chair of the Symposium on "Evolutionary Systems Biology". 27-29 November 2013, Barcelona, Spain.

6.2 Plenary and invited talks. Chaired sessions

European Scientific Foundation (ESF)-Workshop: Deterministic Chaos and the Organization of Tropical Canopy Ecosystems in Time and Space.
Criticality and diversity in rainforest dynamics.

Hirschegg (Austria), 1996.

GTÖ-Tagung über Tropikalische Ökologie.
Modelling the tropical rainforest.
Leipzig (Germany), 1997.

Institute for Scientific Interchange (ISI)-Workshop on Interdisciplinary Theoretical Physics.
Species interaction as a mechanism for macroevolutionary patterns.
Torino, Villa Gualino (Italy), 1997.

Adriatico Research Conference: The dynamics of complexity.
The emergence of urban structure.
26-29 August 1997, ICTP, Italy.

Theory and synthesis in ecology and evolution
Critical transitions in biological systems. What do we learn about rainforests from a ferromagnet?
June 1999, University of Barcelona (Spain).

Nordita Workshop on Nonequilibrium Physics
Theoretical approaches to large-scale evolution.
23-25 September 1999, Copenhagen, Denmark.

Biological Evolution and Statistical Physics
Chair of the session on Large-Scale Evolution.
10-14 May 2000, Dresden, Germany.

No lineal 2000
Non-linear dynamics in biology: Simple models for complex systems.
Chair of the minisimposium on Nonlinear problems in Biology.
31 May-3 June 2000, Almagro (Madrid), Spain.

No lineal 2002
Chair of the minisimposium on Biomedicine.
Contributed talk: *Scaling of voids and fractality in the galaxy distribution.*
5-8 June 2002, Cuenca, Spain.

Congreso de la Sociedad Española de Genética 2003
Evolution of replicator populations: Stationary states and Muller's ratchet in RNA viruses, S.C. Manrubia

September 2003, El Escorial, Madrid, Spain.

FISES 2003
From Petri to Markov: Evolutionary mechanisms in asexual populations in-vitro and in-silico, S.C. Manrubia
October 2003, Pamplona, Spain.

13th International IEEE Workshop on Nonlinear Dynamics of Electronic Systems
Long-range transport and universality classes in in vitro viral infection spread
18-22 September 2005, University of Potsdam, Germany.

Latin American Workshop on Nonlinear Phenomena
Evolution of fast mutating replicators – RNA viruses and the RNA world
23-28 October 2005, San Carlos de Bariloche, Argentina.

Dynamics on complex networks and applications
Neutral networks of RNA secondary structure. Theory, experimental evidence, and open questions
26 February-3 March 2006, Max-Planck-Institut für Physik Komplexer Systeme, Dresden, Germany.

Institute Para Limes Workshop on Genes, Infections, and Epidemics
Evolutionary models inspired by experimental observations
13-15 June 2007, Wageningen University, the Netherlands.

ICBP 2007 – 6th International Conference of Biological Physics
Entangled webs: Phylogeny and the construction of biological relationships
27-31 August 2007, Montevideo, Uruguay

ExoBio '07 – Summer School
Invited course: *From process to pattern: Evolutionary constraints and the architecture of life*
22-29 September 2007, Propriano, Corsica

The Noble Foundation's Fifth Workshop in Virus Evolution
Models of viral evolution motivated by experimental observations
2-5 October 2008, Ardmore, Oklahoma, USA.

Quasispecies: Past, present, and future

Robustness and evolutionary constraints in the adaptation of quasispecies
17-18 November 2008, Barcelona, Spain.

XXI CEDYA – Congreso de ecuaciones diferenciales y aplicaciones
Dynamics of viral quasispecies: From experiments to models
21-25 September 2009, Ciudad Real, Spain.

Jacques Monod Conference – Understanding emergence of infectious diseases: focus on New Experimental and Theoretical Approaches to Virus Evolution
Stochastic extinction of viral infectivity: The role of defectors
26-30 September 2009, Roscoff (Britany), France.

European Conference on Complex Systems, ECCS 2011. Invited talk in the satellite workshop *Frontiers in the Theory of Evolution.*
Evolution on neutral networks: On the topology of RNA sequence space and quasispecies adaptation
Chair of the session "From molecules to living systems".
14-15 September 2011, Vienna, Austria.

Spring meeting of the German Physical Society 2012. Invited talk in the Symposium on the *Origin of Life*.
From sequence to function: Random polymerization and modular evolution of RNA
25-30 March 2012, Berlin, Germany.

NoLineal 2012
Dynamics of viral infections: from theory to therapy
3-6 June 2012, Zaragoza, Spain.

XXXIII Dynamics Days Europe
Evolution on genotype networks leads to phenotypic entrapment
3-7 June 2013, Madrid, Spain.

Net-Works 2013
Evolution on genotype networks leads to phenotypic entrapment
12-13 December 2013, El Escorial, Madrid, Spain.

FisEs 2014
Evolutionary theory evolves: From the Beagle to Deep sequencing

1-4 April 2014, Ourense, Madrid, Spain.

Workshop on Virus dynamics and evolution
Modelling viral evolution and adaptation: Challenges and rewards 30 June-4 July 2014, Centre de Recerca Matemàtica (CRM), Bellaterra, Barcelona, Spain.

6.3 Contributed talks

Zweites Herbstseminar: Strukturbildung in Chemie und Biophysik
(Second Autumm Seminar: Pattern Formation in Chemistry and Biophysics)
it Large-scale biological evolution: Data and modelling.
2-5 October 1997, Alexisbad (Ostharz), Germany.

Drittes Herbstseminar: Strukturbildung in Chemie und Biophysik
(Third Autumm Seminar: Pattern Formation in Chemistry and Biophysics)
Mutual synchronization and clustering in randomly coupled chaotic dynamical networks.
8-10 October 1998, Kelbra (Ostharz), Germany.

Second European Workshop on Exo/Astrobiology
Spontaneous emergence of catalytic networks in spatially extended systems
Poster: *Magnetic field reversals on Earth: Possible implications for the biosphere.* H. Biernat, N.V. Erkaiev, D.F. Vogl, S. Mühlbacher, H. Lammer, S.C. Manrubia, F. Selsis, and T. Penz.
16-19 September 2002, Graz, Austria. Contributions to proceedings with same titles, European Space Agency Special Publication ESA-SP-518, pp. 197-200 and 433-434.

NASA Astrobiology Institute General Meeting 2003
Evolution of replicator populations under high mutational pressure: Stationary states and Muller's ratchet in RNA virus
10-12 February 2003, Tempe, Arizona, USA.

Third European Workshop on Exo/Astrobiology Conference
Comparative analysis of geological features and seasonal processes of Inca City and Cavi Novi regions of Mars
November 2003, Madrid, Spain.

European Space Agency Special Publication ESA-SP-545, pp. 77-80.

EPS 13th General Conference – Beyond Einstein – Physics for the 21st Century
Theoretical approaches to viral population dynamics: mutation, growth, and infection spread
11-15 July 2005, Bern, Switzerland.

Astrobiology Science Conference 2006
Phenotypic selection, modular evolution, and emergence of function in the RNA world
26-30 March 2006, Washington DC, USA.

Astrobiology Science Conference 2008
Theory of lethal defection
14-18 April 2008, Santa Clara, California, USA

ISSOL '08 – 15th International Conference on the Origin of Life
Seeking robustness: High neutrality and stable structures in populations of RNA sequences
Proceedings: J. M. Buldú, J. Aguirre, and S. C. Manrubia (2009), *Origins of Life and Evolution of Biospheres* **39**, 199. 24-29 August 2008, Florence, Italy.

BCNet Workshop – Trends and perspectives in complex networks
Evolution of molecular quasispecies on neutral networks: The topology of sequence space conditions adaptation
10-12 December 2008, Barcelona, Spain.

The Noble Foundation's Sixth Workshop in Virus Evolution
The struggle for space: Viral extinction through competition for cells
20-24 October 2010, Ardmore, Oklahoma, USA.

SESBE 2011 – III Meeting of the Spanish Society for Evolutionary Biology
RNA virus extinction: Beyond the error threshold
21-25 November 2011, Madrid, Spain.

International Conference on Evolutionary Patterns
Evolution on genotype networks leads to phenotypic entrapment

27-29 May 2013, Lisbon, Portugal.

6.4 Posters and attendance to conferences and courses

XXV Years of Non-equilibrium Statistical Mechanics.
Poster: Manrubia, S.C. and Solé, R.V. *Multifractality and Scaling in a Forest Growth Model.*
Sitges (Barcelona), 1996.

ESF-Workshop on Protocols and Data Processing, in the Scientific Programme on Tropical Canopy Research.
Participation by invitation.
Sant Feliu de Guíxols (Spain), 1996.

ESF-Workshop on the Field Station of Puerto Ayacucho.
Participation by invitation.
Puerto Ayacucho (Venezuela), 1997.

Summer College in Condensed Matter on "Statistical Physics of Frustrated Systems".
With U. Bastolla, notes of the lectures by prof. L. Peliti: *Introduction to the statistical theory of Darwinian evolution*, cond-mat/9712027.
28 July-15 August 1997, International Center for Theoretical Physics (ICTP), Italy.

Adriatico Research Conference: Non-linear cooperative phenomena in biological systems.
19-22 August 1997, ICTP, Italy.

XXth IUPAP International Conference on Statistical Physics, STATPHYS 20
Poster: Manrubia, S.C. and Mikhailov, A.S. *Mutual synchronization and clustering in randomly coupled networks.*
20-25 July 1998, Paris, France.

Physics of Information and Synchronization in Stochastic Dynamics
Poster: Manrubia, S.C. *Globally coupled logistic maps as dynamical glasses.*
1-4 April 2001, Dresden, Germany.

Astrobiology Science Conference 2002
Poster: *Resistance of virus to extinction upon bottleneck passages: study of a decaying and fluctuating pattern of fitness loss.*
7-11 April 2002, NASA Ames Research Center, Moffett Field, CA 94035-1000, USA.

Participation in the *International Astrobiology School "Josep Comas i Solá"*: The search for life on Mars.
Summer University "Menendez y Pelayo", Santander, July 2003.

Astrobiology Science Conference 2004
Poster: *Effect of environmental parameters in the persistence time of heterogeneous replicator populations,* S. C. Manrubia, E. Lázaro, A. Grande-Pérez, J. García Arriaza, C. Escarmís, J. Pérez-Mercader, and E. Domingo
28 March-1 April 2004, NASA Ames Research Center, Moffett Field, CA 94035-1000, USA.
International Journal of Astrobiology, Supplement 1, March 2004, p. 48.

NASA Astrobiology Institute General Meeting 2005
Poster: *Modular evolution and complexity increase in replicating RNA populations,* S.C. Manrubia and C. Briones.
10-14 April 2005, Boulder, Colorado, USA.

ISSOL'05 – The 14th International Conference on the Origin of Life
Poster: *Motif shuffling in RNA molecules – Structural constraints in the acquisition of function,* S.C. Manrubia and C. Briones.
16-24 June 2005, Beijing, China.

RNA 2007 – 12th Annual Meeting of the RNA Society
Poster: Modular evolution and emergence of functional structures in RNA, C. Briones and S. C. Manrubia; On the structural repertoire of random RNA sequences: Families of secondary structures and their relation with nucleotide composition, S. C. Manrubia, M. Stich, and C. Briones
29 May-3 June 2007, University of Wisconsin, Madison, USA.

FisEs 2009 – Física Estadística 2009
Posters: (1) Evolution of molecular quasispecies on neutral networks – Dynamic response to opposing selection pressures. J. Aguirre, J. M. Buldú, M.

Stich, and S. C. Manrubia; (2) A percolation theory for viral extinctions. J. A. Capitán, J. Aguirre, S. C. Manrubia, and J. A. Cuesta.
10-12 September 2009, Huelva, Spain.

RNA 2010 – 15th Annual Meeting of the RNA Society
Poster: Effect of mutations on fitness: The case of RNA secondary structure S. C. Manrubia, M. Stich, E. Lázaro, and R. Sanjuán
22 June-26 June 2010, University of Washington, Seattle, USA.

FisEs 2011 – Física Estadística 2011
Poster: Demographic growth and competition shape the size-area relationship for human languages. S. C. Manrubia, J. B. Axelsen, and D. H. Zanette
1-4 June 2011, Barcelona, Spain.

III Jornada de Medicina Evolucionista: Infecciones como motor de la evolución
Hospital Universitario de la Princesa. 29 November 2011, Madrid, Spain

SMBE 2012 Annual Meeting of the Society for Molecular Biology and Evolution
Poster: Topological structure of the space of phenotypes: The case of RNA neutral networks. S. C. Manrubia, J. Aguirre, M. Stich, J. Martín-Buldú
23-26 June 2012, Dublin, Ireland.

XII Congreso Nacional de Virología
Poster: Modelling viral evolution and adaptation: challenges and rewards. S. C. Manrubia
9-12 June 2013, Burgos, Spain.

Meeting of the Spanish Society for Evolutionary Biology
Poster: Topological structure of the space of phenotypes: The case of RNA neutral networks. S. C. Manrubia, J. Aguirre, M. Stich, J. Martín-Buldú
27-29 November 2013, Barcelona, Spain.

7 Other invited talks and courses

1. *Caos a l'univers*. Astronomical Association of Barcelona (ASTER), July 1995.

2. *Complexitat i fenòmens crítics.* Course at the Universitat Catalana d'Estiu. Prada de Conflent (France), August 1995.

3. *Fractals en biologia.* Conferences of the Societat Catalana de Física. Prada de Conflent (France), August 1995.

4. *Caos.* Series of talks given in the Museu de la Ciència de Barcelona (Spain), February-March 1995.

5. *A simple model of macroevolution.* Brookhaven National Laboratory, Upton (New York), May 1996.

6. *Large-scale evolution: The fossil record and the models.* Laboratorio de Astrofísica Espacial y Física Fundamental (LAEFF), Madrid (Spain), January 1997.

7. *Extinctions: Bad Genes or Weak Chaos?* Carl von Ossietzky Universität, Oldenburg (Germany), March 1997.

8. *Large-scale evolution: The fossil record and the models.* Fritz-Haber-Institut der MPG, Berlin (Germany), March 1997.

9. *Dynamics of large-scale evolution.* KFA, Forschungszentrum Jülich, Jülich (Germany), November 1997.

10. *Large-scale patterns of biological evolution.* Technische Universität, Berlin (Germany), November 1997.

11. *Large-scale patterns of biological evolution.* Max Planck Institut für Kolloid- und Grenzflächenforschung, Berlin (Germany), June 1998.

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nische Universität, Berlin (Germany), October 1999.

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18. *Collective properties of globally coupled chaotic systems.* Universidad Rey Juan Carlos, Madrid (Spain), April 2000.

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20. *Statistical mechanics of biological evolution.* Institute for theoretical physics, Köln University, Cologne (Germany), November 2000.

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24. *Dynamical behavior of viral populations: In-vitro and in-silico studies.* Universität Potsdam, Potsdam (Germany), June 2003.

25. *Fitness distributions, fluctuations, and resistance to extinction in evolving viral populations.* Technische Universität Berlin (Germany), June 2003.

26. *Evolutionary dynamics and error catastrophe in RNA virus.* Universitat Pompeu Fabra, Barcelona (Spain), October 2003.

27. *Witnessing evolution: RNA viruses in the lab* In: Lectures in Complex Systems, Firenze (Italy), October 2004.

28. *Habitando la Tierra. Un recorrido desde los orgenes.* Instituto de Biocomputación y Física de Sistemas Complejos (BIFI), Universidad de Zaragoza (Spain), February 2005.

29. *Astrobiología – En busca de los límites de la vida.* Universidad de Málaga, Málaga (Spain), December 2005.

30. *Evolution of fast mutating replicators: RNA viruses and the RNA world.*

Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin (Germany), February 2006.

31. *En busca de los límites de la Vida – Claves desde la Tierra* Facultad de Ciencias, Universidad de Zaragoza, March 2006.

32. *Evolución de replicadores a altas tasas de mutación: virus de RNA y el mundo de RNA*. Universidad Carlos III de Madrid, June 2006.

33. *El vértigo del infinito – Geometría y límites*. Museo Nacional de Ciencias Naturales, Semana de la Ciencia y la Tecnología, November 2006.

34. *Evolution of fast mutating replicators: RNA viruses and the RNA world* and *De las múltiples representaciones del fenotipo: RNA y redes neutrales en evolución*. Instituto Mediterráneo de Estudios Avanzados (IMEDEA), Palma de Mallorca, Spain, December 2006.

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37. *De las múltiples representaciones del fenotipo: RNA y redes neutrales en evolución*. Complex Systems Department, Instituto de Física de la Universidad Nacional Autónoma de México, México DF, Marzo 2007.

38. *Evolutionary models. 150 years quantifying reproduction, mutation, and selection*. Course (3 hours) taught at the Summer School "Complex Systems", SIMUMAT. International Center for Mathematical Meetings (CIEM), Castro Urdiales, Spain, 9-13 July 2007.

39. *Buscando vida extraterrestre: lecciones en Tierra*. Talk within the cycle "Introducción a la Astrofísica" organized by Jesús Cabrera Caño and Luis Giménez Aragón Sierra sponsored by Caja Rural del Sur. Sevilla, Spain, 30-31 October 2007.

40. *Leyendo en la geometría del paisaje: cuando la estructura nos desvela el proceso*. Astronomical Association of Burgos, Hall of Caja Burgos, Burgos, Spain, 24 November 2007.

41. *Historias de la evolución: del experimento al modelo.* Cycle of conferences of the Departamento de Física de la Materia Condensada, Universidad de Zaragoza. Zaragoza, Spain, 11 January 2008.

42. *Human languages and biodiversity – Beyond the analogy.* Meeting of group 4 (Evolution and Co-evolution) of the COST action *Physics of cooperation and conflict.* Madrid, Spain, 27 January 2009.

43. *Evolutionary stories: from the entangled web to the genome.* Darwin's Day, Institut Cavanilles de Biodiversitat i Biologia Evolutiva de la Universitat de València. Valencia, Spain, 12 February 2009.

44. *Theory of lethal defection.* Institute for Cross-disciplinary Physics and Complex Systems (IFISC). Palma de Mallorca, Spain, 25 February 2009

45. *Biodiversidad, ecosistemas y extinciones. Algunas cosas que Darwin sí sabía.* Conference cycle in commemoration of Darwin's year. University of Cantabria, Santander, Spain, 2 April 2009.

46. *Biodiversidad, ecosistemas y extinciones: lo que Darwin sí sabía.* Conference cycle "Survival of the fittest: 150 years of Darwinism". Instituto de Estudios Altoaragoneses, Huesca, Spain, 28 April 2009.

47. *Phylogeny and the construction of biological relationships.* Course "The science of networks". ETSI Telecomunicaciones, Madrid, Spain, 6 November 2009.

48. *Biodiversidad, ecosistemas y extinciones: lo que Darwin sí sabía.* Conference cycle "Darwin y la Astrobiología". Museo Nacional de Ciencias Naturales, Madrid, Spain, 13 November 2009.

49. *Evolución y Astrobiología – De los virus a otros mundos.* Course "Synthetic Biology". Universidad Politécnica de Valencia, Spain, 30 November-1 December 2009.

50. *Astrobiología y los límites de la adaptación.* Conference cycle "Emergence of biological complexity from evolutionary mechanisms". University of Cantabria, Santander, Spain, 29 April 2010.

51. *Effect of mutations on fitness: The case of RNA secondary structure.* Department of Mathematics, University Carlos III of Madrid, Madrid, Spain, 15 October 2010.

52. *Effect of mutations on fitness: The case of RNA secondary structure.* Centro Atómico Bariloche, San Carlos de Bariloche (Argentina), November 2010.

53. *Models of viral evolution motivated by experimental observations – The struggle for space.* Universitat Rovira i Virgili, Tarragona, January 2011.

54. *Effect of mutations on fitness: The case of RNA secondary structure.* Institute for Cross-disciplinary Physics and Complex Systems (IFISC). Palma de Mallorca, Spain, February 2011.

55. *Astrobiología y los límites de la adaptación.* Semana de la Ciencia, Universidad Católica de Valencia. Valencia, Spain, November 2011.

56. *Understanding viral adaptation: from theory to therapy.* II Colloquium on Systems and Synthetic Biology. Centro Nacional de Biotecnología, CSIC. Madrid, December 2011.

57. *Evolution. The unfinished story.* Cicle Introduction to Astrobiology. Centro de Astrobiología, Madrid, April 2012.

58. *Is life a cosmic imperative? Thoughts on the search and expectations.* XI Matinal de l'Evolució. Botanical Garden of Valencia, València, May 2012.

59. *Evolution. The unfinished story.* Facultad de Biología, talk within the course "Evolution". Universidad Autónoma de Madrid, December 2012.

60. *From sequence to function: Random polymers and modular evolution in an RNA world.* Workshop "RNAs never stop". Université Pierre et Marie Curie, Paris, March 2013.

61. *Is life a cosmic imperative? Thoughts on the search and expectations.* Instituto de Biología Molecular y Celular de Plantas. Universidad Politécnica de Valencia, València, April 2013.

62. *On the structure of genotype networks and its effects in molecular evolution.* Centro Nacional de Biotecnología, Madrid, April 2013.

63. *Tinkering in an RNA world and the origins of life.* COMPUTE programme. Lund University, Lund, Sweden, May 2013.

64. Course *Theory and models of molecular evolution.* III GEFENOL Summer School on Statistical Physics of Complex and Small Systems. Palma de

Mallorca, Spain, 2-13 September 2013.

65. *Genetic inheritance and family names.* Premis literaris Ciutat d'Alzira 2013. Casa de la cultura d'Alzira, 24 October 2013.

66. *Evolution on genotype networks leads to phenotypic entrapment.* Centre de Recerca Matemàtica. Bellaterra, Barcelona, 21 November 2013.

8 Publications list

- 3 published books (one of them in two languages, see below)
- 95 publications in ISI journals with 1962 citations; 1744 without self-citations. Hirsch index H=25 (Web of Science, 5th September 2014)
- 132 available documents with 3547 citations; Hirsch index H=33; i10 index=67 (Google Scholar, public profile, 18th December 2014)

Encyclopedia

Author of the entries *Adaptation, Fitness, Genotype, Natural Selection, Phenotype,* and *Selection* for the Encyclopedia of Astrobiology, Editor-in-chief: Muriel Gargaud. R. Amils, J. Cernicharo Quintanilla, H. J. Cleaves, W. M. Irvine, D. Pinti, and M. Viso (Eds.) 1st edition., 2011, XLIV, 1853 p. Springer-Verlag.

Books

1. R.V. Solé and S.C. Manrubia
   Orden y Caos en Sistemas Complejos (*Order and Chaos in Complex Systems.*)
   Col.lecció Politext, Edicions UPC, Barcelona, 1996 (594 p.).
   The elaboration of this book was supported through a grant from the Universitat Politècnica de Catalunya in April 1994.

2. S.C. Manrubia, A.S. Mikhailov, and D.H. Zanette
   Emergence of Dynamical Order. Synchronization Phenomena in Complex Systems
   Lecture Notes in Complex Systems, Vol. 2, 360 pp., ISBN 981-238-803-6. World Scientific Publishing Co., Singapore, 2004.

3. S. Manrubia y D.H. Zanette
   Gens i Genealogies. Sobre la nostra herència cultural i biològica
   Col.lecció Sense Fronteres, Edicions Bromera, May 2013 (200 p.).
   This work was awarded the *XVIII Premi Europeu de Divulgació Científica Estudi General* (Alzira, València, November 2012).

4. S. Manrubia y D. H. Zanette
Genes y genealogías. Sobre nuestra herencia cultural y biológica
Cátedra de Divulgación de la Ciencia y Publicaciones de la Universidad de Valencia, June 2014 (164 p.).

Articles in Journals and Contributions to Books

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Proc. 1st Copenhagen Symposium on Computer Simulation in Biology, Ecology and Medicine, 117–121.

2. Solé, R.V., Manrubia, S.C. and Luque, B. (1994) Multifractals in rainforest ecosystems: Modelling and simulation.
In: *Fractals in the Natural and Applied Sciences*, North-Holland, Amsterdam, 397–407.

3. Solé, R.V. and Manrubia, S.C. (1995) Are rainforests self-organized in a critical state?
Journal of Theoretical Biology **173**, 31–40.

4. Solé, R.V. and Manrubia, S.C. (1995) Self-similarity in rainforests: Evidence for a critical state.
Physical Review E **51**, 6250–6253.

5. Solé, R.V., Bascompte, J., Delgado, J., Luque, B. and Manrubia, S.C. (1996) Complejidad en la Frontera del Caos (*Complexity at the edge of chaos*).
Investigación y Ciencia, May 1996, 14–21 (Spanish issue of Scientific American).

6. Manrubia, S.C. and Solé, R.V. (1996) Self-organized criticality in rainforest dynamics.
Chaos, Solitons and Fractals **7**(4), 523–541.

7. Solé, R.V., Manrubia, S.C., Bascompte, J., Delgado, J. and Luque, B. (1996) Phase transitions and complex systems.
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8. Solé, R.V. and Manrubia, S.C. (1996) Extinction and self-organized criticality in a model of large-scale evolution.
Physical Review E **54**, R42–R45.

9. Solé, R.V., Bascompte, J. and Manrubia, S.C. (1996) Extinctions: Bad genes or weak chaos?
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10. Solé, R.V. and Manrubia, S.C. (1997) Criticality and Unpredictability in Macroevolution.
Physical Review E **55**, 4500–4507.

11. Manrubia, S.C. and Solé, R.V. (1997) On forest spatial dynamics with gap formation.
Journal of Theoretical Biology **187**, 159–164.

12. Solé, R.V., Manrubia, S.C., Benton, M.J. and Bak, P. (1997) Self-similarity of extinction statistics in the fossil record.
Nature **388**, 764–767 (21 August 1997). Featured in *New Scientist*, 8 November 1997, and in *The New York Times*, 2 September 1997.

13. Correig, A., Urquizu, M., Manrubia, S.C. and Vila, J. (1997) Aftershock series of event February 18, 1996: An interpretation in terms of self-organized criticality.
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20. Derrida, B., Manrubia, S.C. and Zanette, D.H. (1999) Statistical properties of genealogical trees.
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24. Solé, R.V., Manrubia, S.C., Benton, M.J., Kauffman, S. and Bak, P. (1999) Self-organized criticality in ecology and evolution (reply).
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Journal of theoretical Biology **203**, 303–315.

26. Manrubia, S.C. and Mikhailov, A.S. (2000) Very long transients in globally coupled maps.
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Translation to french: La généalogie à l'ère de la génomique
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Physical Review Letters **90**, 188102. Selected to appear in the *Virtual Journal of Biological Physics Research* **5**(10), May 15 (2003).

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Europhysics Letters **64** (4), 557–563.

44. Manrubia, S.C., Arribas, M., and Lázaro, E. (2003) Supercritical branching processes and the role of fluctuations under exponential population growth.
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45. García Arriaza, J., Manrubia, S.C., Toja, M., Domingo, E., and Escarmís, C. (2004) Evolutionary transition toward defective RNAs that are infectious by complementation.
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Special issue: *Virus entry into error catastrophe as a new antiviral strategy.*

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