Jacopo Grilli

Contact Information	Omidyar Postdoctoral Fellow Santa Fe Institute 1399 Hyde Park Road Santa Fe 87501 NM, USA
	Mobile: +1-773-431-3968 jgrilli@santafe.edu jacopogrilli.github.io

Vita

- January 2018 to *present*
  Omidyar Postdoctoral Fellow at Santa Fe Institute, Santa Fe, NM, USA.
- January 2015 to December 2017
  Postdoctoral Scholar at Department of Ecology and Evolution, University of Chicago, Chicago, IL, USA.
  Advisor: S. Allesina
- January 2012 to February 2015
  Ph.D. in Physics at Università degli Studi di Padova, Padova, Italy.
  Advisor: A. Maritan
- October 2011 to December 2011
  Post-Master Scholarship 'ex 60%' 2011 at Department of Physics and Astronomy G. Galilei, Università degli Studi di Padova, Padova, Italy.
- October 2009 to July 2011
  M.S. in Theoretical Physics at Università degli Studi di Milano.
  Advisors: A. Maritan and B. Bassetti. Final grade *110/110 cum Laude.*
- October 2006 to October 2009
  B.S. in Physics at Università degli Studi di Milano.
  Advisors: B. Bassetti and M. Cosentino Lagomarsino. Final grade *110/110 cum Laude.*

Editor

Plos Computational Biology (Guest editor, 2018-)

Oikos (Editorial board, 2018-)

Complexity (Special issue "Scales and Complexity in Ecological Communities: Models, Methods, and Predictions", 2018)

Reviewer

Grants: *National Science Foundation (USA)*

Journals: *Nature Ecology and Evolution, Nature Communications, Physical Review Letters, Plos Computational Biology, Physical Review X, Ecology Letters, The ISME Journal, American Naturalist, Proceedings of the Royal Society B, Proceedings of the Royal Society A, Journal of Statistical Mechanics, Joournal of Statistical Physics, Physical Review E, Frontiers in Ecology and Evolution, Scientific Reports, Plos One, npj Systems Biology and Applications, Methods in Ecology and Evolution, Journal of Theoretical Biology, Oikos, Entropy, Journal of Biogeography, Journal of Complex Networks, Functional Ecology, Communications in Nonlinear Science and Numerical Simulation*
Publons ID 558637

Organized conferences and workshops

- Santa Fe, 29-31 January 2019
  SFI Working Group, Irreversibility in Ecological Evolution
- Paris, 12 June 2018
  EcoNet, workshop on ecological network: spandrels, selection and assembly (NetSci 2018 satellite meeting).
- Amsterdam, 20 September 2016
  LIVING 2.0, workshop on Robustness, Adaptability and Critical Transitions in Living Systems (CCS 2016 satellite meeting).
- Venice, 16-19 September 2015
  Living Systems: from Interaction Patterns to Critical Behavior.
- Lucca, 25 September 2014
  LIVING, workshop on Robustness, Adaptability and Critical Transitions in Living Systems (ECCS 2014 satellite meeting).

Seminars at Institutions

- February 4, 2019. CNLS, LANL, Los Alamos, NM, USA.
  Invited seminar: *Higher-order interactions stabilize the dynamics of ecological communities.*
- December 14, 2018. Department of Ecology, USP, So Paulo, SP, Brazil.
  Invited seminar: *Higher-order interactions stabilize the dynamics of ecological communities.*
- December 13, 2018. ICTP-SAIFR, So Paulo, SP, Brazil.
  Invited seminar: *Higher-order interactions stabilize the dynamics of ecological communities.*
- May 2, 2017. International Centre for Theoretical Physics, Trieste, Italy.
  Invited seminar: *Higher-order interactions stabilize the dynamics of ecological communities.*
- January 26, 2017. Santa Fe Institute, Santa Fe, NM, USA.
  Invited seminar: *Higher-order interactions stabilize the dynamics of ecological communities.*
- April 15, 2016. Laboratory of Computational and Quantitative Biology, UPMC, Paris, France.
  Invited seminar: *Coexistence in large ecosystems: from structure to function.*
- April 12, 2016. International Centre for Theoretical Physics, Trieste, Italy.
  Invited seminar: *Coexistence in large ecosystems: from structure to function.*
- May 26, 2015. The University of Chicago, Chicago, USA.
  Seminar: *Stability and feasibility of large ecosystems.*
- March 26, 2015. Wageningen University, Wageningen, The Neatherlands.
  Invited seminar: *On the stability of large ecosystems.*
- November 3, 2014. Department of Environmental Systems Science, ETH, Zürich, Switzerland.
  Invited seminar: *Spatial aggregation and spatial fragmentation: simple random models for spatial ecology.*
- October 6, 2014. Dipartimento di Fisica, Università di Torino, Torino, Italy.
  Invited seminar: *Scaling laws in genome evolution.*
- December 17, 2013. University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, USA.
  Invited seminar: *Emergence of criticality in living systems through adaptation and evolution.*

Talks at meetings

- February 13-15, 2019. PyeongChang Forum, PyeongChang, South Korea.
  Invited Talk: *Mysteries and Laws of Biodiversity.*
- February 11, 2019. SFI-SNU Miniworkshop, Seoul National University, Seoul, South Korea.
  Invited Talk: *Higher-order interactions stabilize dynamics in competitive network models.*
- September 26, 2018. ReAct 3 (CCS 2018 Satellite Meeting), Thessaloniki, Greece.
  Invited Talk: *Higher-order interactions stabilize dynamics in competitive network models.*
- July 23 - July 25, 2018. Working group: Cognitive Regime Shifts I, Santa Fe, United States.
  Invited Talk: *On the stability of large ecological communities.*
- May 7 - March 11, 2018. Statistical physics of cells and genomes, Alghero, Italy.
  Invited Talk: *Diversity in ecological communities.*
- March 5 - March 9, 2018. APS March Meeting, Los Angeles, CA, USA.
  Talk: *Statistical physics of (meta)genomes.*
- February 27, 2017. Second Science of Science Meeting, Chicago, IL, USA.
  Invited talk: *What's in a Last Name? Mobility, Gender Imbalance and Nepotism across Academic Systems*
- August 9 - August 14, 2015. 100th ESA Conference, Baltimore, MD, USA.
  Talk: *Feasibility and stability of large ecosystems.*
- June 15 - June 19, 2015. Granada Seminar, La Herradura, Spain.
  Talk: *Persistence of a population in randomly fragmented landscapes.*
- December 18, 2014. Workshop on Physics of Complex Systems, Padova, Italy.
  Invited talk: *Emergence of criticality in communities of living systems.*
- September 22 - September 26, 2014. ECCS 2014, European Conference on Complex Systems, Lucca, Italy.
  Talk: *Persistence of a population in randomly fragmented landscapes.*
- September 16 - September 20, 2013. ECCS 2013, European Conference on Complex Systems, Barcelona, Spain.
  Talk: *Emergence of criticality in living systems through adaptation and evolution.*
- June 27 - July 5, 2013. Workshop on Quantitative Laws of Genome Evolution, Como, Italy.
  Talk: *Universal properties of ecological interactions and stability of ecosystems.*
  Awarded as F1000 Best Young Presentation.
- March 13 - 15, 2013. CompleNet 2013, IV Workshop on Complex Networks, Berlin, Germany.
  Poster: *Complexity-stability relation in ecological networks*
- December 20, 2012. Workshop on Physics of Complex Systems, Padova, Italy.
  Invited talk: *Growth or Reproduction? Emergence of a Strategy*
- November 9, 2012. Scientific day in honor of Bruno Bassetti, Milan, Italy.
  Invited talk: *Growth or Reproduction? Emergence of a Strategy*
- July 23 - August 3, 2012. Summer School "Emergent Order in Biology", Cargese, France.
  Poster: *Emergence of scaling laws in functional and evolutionary partitioning of genomes*
- June 20 - 22, 2012. XVII Conference on Statistical Physics and Complex Systems, Parma, Italy.
  Talk: *Spatial distribution of species across scales*

Scientific visits

- November 18, 2013 to May 30, 2014
  Visiting Student at Department of Ecology and Evolution, The University of Chicago, Chicago, IL, USA.
- July 22, 2013 to August 3, 2013
  Visiting Student at Departamento de Electromagnetismo y Física de la Materia, Universitad de Granada, Granada, Spain.
- February 20, 2012 to March 31, 2012
  Visiting Student at Genomic Physics Group, Genomique des Microorganismes, UMR 7238 CNRS - Université Pierre et Marie Curie, Paris, France.
- June 1, 2010 to June 28, 2010
  Summer Internship under the supervision of S. Maslov at Department of Condensed Matter Physics, Brookhaven National Laboratory, Upton, NY, USA.

Publications

[1] G. Micali[♮], J. Grilli[♮], M. Osella, and M. Cosentino Lagomarsino. Concurrent processes set E. coli cell division. *Science Advances*. 4, eaau3324. 2018. doi:10.1126/sciadv.aau3324 bioarXiv:2018/04/16/301671

[2] G. Micali[♮], J. Grilli[♮], J. Marchi, M. Osella, and M. Cosentino Lagomarsino. Dissecting the control mechanisms for DNA replication and cell division in E. coli. *Cell Reports*. 25,3:761-771.E4. 2018. doi:10.1016/j.celrep.2018.09.061 bioarXiv:2018/04/25/308155

[3] J.N. Pruitt, A. Berdahl, C. Riehl, N. Pinter-Wollman, H.V. Moeller, E.G. Pringle, L.M. Aplin, E.J.H. Robinson, J. Grilli, P. Yeh, V.M. Savage, M.H. Price, J. Garland, I.C. Gilby, M. C. Crofoot, G.N. Doering, and E.A. Hobson. Social tipping points in animal societies. *Proceedings of the Royal Society B*. 285:20181282. 2018. doi:10.1098/rspb.2018.1282

[4] T. Gibbs, J. Grilli, T. Rogers, and S. Allesina. The effect of population abundances on the stability of large random ecosystems. *Physical Review E*. 98, 022410. 2018. doi:10.1103/PhysRevE.98.022410 arXiv:1708.08837

[5] C. Cadart, S. Monnier, J. Grilli, P.J. Sáez, N. Srivastava, R. Attia, E. Terriac, B. Baum, M. Cosentino Lagomarsino, and M. Piel. Size control in mammalian cells involves modulation of both growth rate and cell cycle duration. *Nature Communications*. 9:3275. 2018. doi:10.1038/s41467-018-05393-0 bioarXiv:2017/08/22/152728

[6] J. Grilli, C. Cadart, G. Micali, M. Osella, and M. Cosentino Lagomarsino. The empirical fluctuation pattern of *E. coli* division control. *Frontiers in Microbiology*. 9, 1541. 2018. doi:0.3389/fmicb.2018.01541

[7] A. Mazzolini, J. Grilli, E. De Lazzari, M. Osella, M. Cosentino Lagomarsino, and M. Gherardi. Zipf and Heaps laws from dependency structures in component systems. *Physical Review E*. 98, 012315. 2018. doi:10.1103/PhysRevE.98.012315 arXiv:1801.06438

[8] C.A. Serván, J.A. Capitán, J. Grilli, K.E. Morrison, and S. Allesina. Coexistence of many species in random ecosystems. *Nature Ecology&Evolution*. 2, 12371242. 2018. doi:10.1038/s41559-018-0603-6 pmid:29988167

[9] K. Jovic, M.G. Sterken, J. Grilli, R.P.J. Bevers, M. Rodriguez, J.A.G. Riksen, S. Allesina, J.E. Kammenga, L.B. Snoek. Temporal dynamics of gene expression in heat-stressed *Caenorhabditis elegans*.
Plos One. 12(12), e0189445. 2017.
doi:10.1371/journal.pone.0189445 bioarXiv:2017/05/16/135988

[10] J. Grilli, G. Barabás, M. Michalska-Smith and S. Allesina. Higher-order interactions stabilize dynamics in competitive network models.
Nature. 548, 210-213. 2017.
doi:10.1038/nature23273

[11] J. Grilli and S. Allesina. Last name analysis of mobility, gender imbalance, and nepotism across academic systems.
Proceedings of the National Academy of Sciences. 114(29):7600-7605. 2017.
doi:10.1073/pnas.1703513114

[12] C. Tu, J. Grilli, F. Schuessler and S. Suweis. Collapse of resilience patterns in generalized Lotka-Volterra dynamics and beyond.
Physical Review E. 95, 062307. 2017.
doi:10.1103/PhysRevE.95.062307 arXiv:1606.09630

[13] E. de Lazzari, J. Grilli, S. Maslov and M. Cosentino Lagomarsino. Family-specific scaling laws in bacterial genomes.
Nucleic Acids Research. 45 (13): 7615-7622. 2017
doi:10.1093/nar/gkx510 arXiv:1703.09822

[14] J. Grilli, M. Osella, A.S. Kennard and M. Cosentino Lagomarsino. Relevant parameters in models of cell division control.
Physical Review E. 95, 032411. 2017.
doi:10.1103/PhysRevE.95.032411 arXiv:1606.09284

[15] J. Grilli, M. Adorisio, S. Suweis, G. Barabás, J.R. Banavar, S. Allesina and A. Maritan. Feasibility and coexistence of large ecological communities.
Nature Communications. 8:14389. 2017.
doi:10.1038/ncomms14389 arXiv:1507.05337

[16] S. Azaele, S. Suweis, J. Grilli, I. Volkov, J.R. Banavar, and A. Maritan. Statistical mechanics of ecological systems: neutral theory and beyond.
Review of Modern Physics. 88, 035003. 2016.
doi:10.1103/RevModPhys.88.035003 arXiv:1506.01721

[17] J. Grilli, T. Rogers and S. Allesina. Modularity and stability in ecological communities.
Nature Communications. 7:12031. 2016.
doi:10.1038/ncomms12031

[18] J. Hidalgo, J. Grilli, S. Suweis, A. Maritan and M.A. Muñoz. Cooperation, competition and the emergence of criticality in communities of adaptive systems.
Journal of Statistical Mechanics: Theory and Experiment. 2016(3):033203. 2016.
doi:10.1088/1742-5468/2016/03/033203 arXiv:1510.05941

[19] A.S. Kennard, M. Osella, A. Javer, J. Grilli, P. Nghe, S. Tans, P. Cicuta and M. Cosentino Lagomarsino. Individuality and universality in the growth-division laws of single E. coli cells.
Physical Review E. 93, 012408. 2016.
doi:10.1103/PhysRevE.93.012408 arXiv:1411.4321

[20] S. Suweis, J. Grilli, J.R. Banavar, S. Allesina and A. Maritan. Effect of localization on the stability of mutualistic ecological networks.
Nature Communications. 6:10179. 2015.
doi:10.1038/ncomms10179

[21] S. Allesina, J. Grilli, G. Barabás, S. Tang, J. Aljadeff and A. Maritan. Predicting the stability of large structured food webs.
Nature Communications. 6:7842. 2015.
doi:10.1038/ncomms8842

[22] J. Grilli, G. Barabás and S. Allesina. Metapopulation persistence in random fragmented landscapes. *Plos Computational Biology*. 11(5):e1004251. 2015.
doi:10.1371/journal.pcbi.1004251

[23] J. Hidalgo♮, J. Grilli♮, S. Suweis, M.A. Muñoz, J.R. Banavar and A. Maritan. Information-based fitness and the emergence of criticality in living systems.
Proceedings of the National Academy of Sciences. 111(28):10095-10100. 2014.
doi:10.1073/pnas.1319166111 arXiv:1307.4325

[24] J. Grilli, M. Romano, F. Bassetti and M. Cosentino Lagomarsino. Cross-species gene-family fluctuations reveal the dynamics of horizontal transfers.
Nucleic Acids Research. 42(11):6850-6860. 2014.
doi:10.1093/nar/gku378

[25] S. Suweis♮, J. Grilli♮ and A. Maritan. Disentangling the effect of hybrid interactions and of the constant effort hypothesis on ecological community stability.
Oikos. 123(5):525-532. 2014.
doi:10.1111/j.1600-0706.2013.00822.x arXiv:1301.1569

[26] J. Grilli, S. Suweis and A. Maritan. Growth or reproduction: emergence of an evolutionary optimal strategy.
Journal of Statistical Mechanics: Theory and Experiment. 2013(10):P10020. 2013.
doi:10.1088/1742-5468/2013/10/P10020 arXiv:1306.5877

[27] J. Grilli, S. Azaele, J.R. Banavar and A. Maritan. Absence of detailed balance in ecology.
Europhysics Letters. 100:38002. 2012.
doi:10.1209/0295-5075/100/38002 arXiv:1210.5819

[28] J. Grilli, S. Azaele, J.R. Banavar and A. Maritan. Spatial aggregation and the species-area relationship across scales.
Journal of Theoretical Biology. 313:87-97. 2012.
doi:10.1016/j.jtbi.2012.07.030 pmid:22902426 arXiv:1209.3591

[29] L. Grassi, J. Grilli and M. Cosentino Lagomarsino. Large-scale dynamics of horizontal transfers.
Mobile Genetics Elements. 2(3):163-167. 2012.
doi:10.4161/mge.21112 pmid:23061026

[30] J. Grilli, B. Bassetti, S. Maslov and M. Cosentino Lagomarsino. Joint scaling laws in functional and evolutionary categories in prokaryotic genomes.
Nucleic Acids Research. 40(2):530-540. 2012.
doi:10.1093/nar/gkr711 pmid:21937509 arXiv:1101.5814

PREPRINTS

[31] C. Tu, S. Suweis, J. Grilli, M. Formentin and A. Maritan. Cooperation promotes biodiversity and stability in a model ecosystem.
arXiv:1708.03154

[32] M. Adorisio, J. Grilli, S. Suweis, S. Azaele, J.R. Banavar and A. Maritan. Spatial maximum entropy modeling from presence/absence tropical forest data.
arXiv:1407.2425

♮ *indicates equal contributions*

Teaching Experience

November 2017
Advanced topics in stochastic processes - Random Matrix Theory (with A. Maritan & S. Suweis). Ph.D. School in Physics, Università degli Studi di Padova. (8 hours)

9 November 2017
Lecture on *neutral theory* during the class *An Introduction to Stochastic Processes in Continuous Time* (held by D. Alonso). Ph.D. program in Ecology&Evolution, University of Chicago. (2 hours)

October 2014
Introduction to Complex Systems (with S. Suweis). Master in Scientific Communication, Università degli Studi di Padova. (2 hours)

September 2014
Tutor at ESTAGE, internship for high-school students at Department of Physics and Astronomy, Università degli Studi di Padova. (8 hours)

November 2012 - June 2013
Tutor Junior at Università degli Studi di Padova
Mathematics (for 1st year Geology students), Mathematical Analysis and Linear Algebra (for 1st year Physics students).

Student Supervision

E. De Lazzari, M.Sc. in Physics 2013, Padova (with A. Maritan and S. Suweis).
M. Insolia, B.Sc. in Physics 2014, Padova (with A. Maritan).
M. Adorisio, M.Sc. in Physics 2014, Padova (with A. Maritan and S. Suweis).
R. Satterwhite, Ph.D. Student (rotation) 2015, Ecology & Evolution, Chicago (with S. Allesina).
T. Gibbs, Undergraduate Student 2016-2017, Ecology & Evolution, Chicago (with S. Allesina).
N. Dorilas, Research Experience for Undergraduates 2018, Santa Fe Institute.

Grants, Fellowships and Awards

- January 2018 to December 2019
  Omidyar Fellowship, Santa Fe Institute.
- January 2014
  Fellowship sponsored by the Ing. Aldo Gini private foundation in Padua, funding a visit of 6 months at the University of Chicago [4.8k€].
- January 2012 to December 2014
  Three years fellowship for Ph.D. studies from Università degli Studi di Padova.
- October 2011 to December 2011
  Post-master scholarship 'ex 60%' 2011.

Habilitations

- October 8, 2018 to October 8, 2024
  Italian National Scientific Habilitation as Associate Professor in Ecology (ASN, 05/C1 II Fascia).
- September 12, 2018 to September 12, 2024
  Italian National Scientific Habilitation as Associate Professor in Applied Physics (ASN, 02/D1 II Fascia).
- August 8, 2018 to August 8, 2024
  Italian National Scientific Habilitation as Associate Professor in Theoretical Physics of Matter (ASN, 02/B2 II Fascia).

Other

Languages
Italian (native speaker), English (fluent) and Spanish (good)

Member of American Physical Society (2014,2018) Member of Ecological Society of America (2015), Member of Complex System Society (2013-2014),

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References

Stefano Allesina
Professor, Department of Ecology & Evolution and Computation Institute, The University of Chicago, 1101 E 57th, Chicago, IL 60637 Chicago, USA
e-mail: sallesina@uchicago.edu; phone: +1-(773)-702-7825

Amos Maritan
Professor, Department of Physics and Astronomy G. Galilei, Università degli Studi di Padova, Via Marzolo 8, 35131 Padova, Italy
e-mail: amos.maritan@pd.infn.it; phone: +39-049-827-7175

Marco Cosentino Lagomarsino
CNRS Researcher (DR2), UMR 7238 Genomique des Microorganismes, Université Pierre et Marie Curie, Group Leader of the Genomic Physics Group, Laboratory of Computational and Quantitative Biology, Place Jussieu 4, 75005 Paris, France
e-mail: marco.cosentino-lagomarsino@upmc.fr; phone: +33-(0)1-44277341

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