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Maxime Lucas

Current position

06/22– **Postdoctoral researcher**, *CENTAI Institute*, Turin, Italy
Various projects on networks with group interactions, dynamical systems, TDA, with G. Petri

Past positions

10/21–05/22 **Postdoctoral researcher**, *ISI Foundation*, Turin, Italy
Various projects on networks with group interactions, dynamical systems, TDA, with G. Petri

2019–2021 **CENTURI postdoctoral fellow**, *Aix-Marseille University*, Marseille, France
Cell cycle modelling as a temporal network of protein interactions with A. Barrat, B. Habermann, and L. Tichit.

PhD Thesis

Title *Synchronisation and stability in nonautonomous oscillatory systems*

Supervisors Pr. Aneta Stefanovska and Pr. Duccio Fanelli

Institutions Joint degree between Lancaster University, UK, and University of Florence, Italy

Description I investigated synchronisation and stability in driven systems and networks of coupled oscillators, with an eye on possible applications in biological and other real life systems.

Funding COSMOS, a Marie Curie Initial Training Network (ITN) of the type European Joint Doctorate (EJD).

Dates October 2015–February 2019

Education

2014–2015 **Master of Artificial Intelligence**, *Katholieke Universiteit Leuven*, Leuven, Belgium, *cum laude*
Thesis: Instabilities in Cortical Networks with Embedded Synfire Chains

2012–2014 **MSc Physics**, *Université Libre de Bruxelles*, Brussels, Belgium, *magna cum laude*
Thesis: Instabilités dynamiques de systèmes de billards avec interactions rares

2012 **One-term exchange programme**, *University of Toronto*, Toronto, Canada

2009–2012 **BSc Physics**, *Université Libre de Bruxelles*, Brussels, Belgium, *cum laude*

Publications

'*' indicates co-first authorship.

Preprints

- Lucas, M.*, Iacopini, I. *., Robiglio, T., Barrat, A. & Petri, G. *Simplicially driven simple contagion* arXiv:2206.07645. 2022.
- Zhang, Y. *., Lucas, M.* & Battiston, F. *Do higher-order interactions promote synchronization?* arxiv:2203.03060. 2022.
- Lucas, M. *et al. Inferring cell cycle phases from a partially temporal network of protein interactions* bioRxiv. 2021.

Journal articles

- Newman, J., Lucas, M. & Stefanovska, A. Stabilization of cyclic processes by slowly varying forcing. *Chaos* **31,** 123129 (2021).
- Lucas, M., Cencetti, G. & Battiston, F. Multiorder Laplacian for synchronization in higher-order networks. *Phys. Rev. Research* **2,** 033410 (2020).
- Battiston, F. *et al.* Networks beyond pairwise interactions: structure and dynamics. *Phys. Rep.* (2020).
- Lucas, M., Fanelli, D. & Stefanovska, A. Nonautonomous driving induces stability in network of identical oscillators. *Phys. Rev. E* **99,** 012309 (2019).
- Lucas, M., Fanelli, D., Carletti, T. & Petit, J. Desynchronization induced by time-varying network. *Europhys. Lett.* **121,** 50008 (2018).
- Lucas, M., Newman, J. & Stefanovska, A. Stabilization of dynamics of oscillatory systems by nonautonomous perturbation. *Phys. Rev. E* **97,** 042209 (2018).
- Duncan, R. & Lucas, M.. Verifying the Steane code with Quantomatic. *Electronic Proceedings in Theoretical Computer Science* **171,** 33–49 (2014).

Book chapters

- Lucas, M., Cencetti, G. & Battiston, F. *Higher-Order Systems 233* (Springer Nature, 2022).
- Lucas, M., Newman, J. M. I. & Stefanovska, A. *Physics of Biological Oscillators: New Insights into Non-Equilibrium and Non-Autonomous Systems* (eds Stefanovska, A. & McClintock, P. V. E.) *85–110* (Springer International Publishing, Cham, 2021).
- Newman, J. M. I., Lucas, M. & Stefanovska, A. *Physics of Biological Oscillators: New Insights into Non-Equilibrium and Non-Autonomous Systems* (eds Stefanovska, A. & McClintock, P. V. E.) *111–129* (Springer International Publishing, Cham, 2021).

Presentations

Oral at conferences, workshops, and schools

2022 **MB2022**, *Invited*, IPAM, Los Angeles, USA, 31 August

2022 **Biomat 2022**, *Invited*, Granada, Spain, 18 November

2021 **BeNet2021**, Namur, Belgium, 18 November

2021 **XIX Curso Boliviano de sistemas complejos**, Online, 5 October

2021 **Networks 2021**, Online, 5-10 July
2021 **NetBioMed (Networks2021 satellite)**, Online, 25 June
2021 **Complenet Live**, Online, 24-26 May
2020 **CENTURI day, Aix-Marseille University**, Marseille, France, 20 November
2020 **Belgian Network Research Meeting (BeNet)**, Brussels, Belgium, 12 November
2020 **Toponets (NetSci satellite)**, Rome, Italty, 18–19 September
2020 **Networks and Molecular Biology winter school**, Marseille, France, 2–6 March
2019 **Belgian Network Research Meeting (BeNet)**, Hasselt, Belgium, 22 February
2018 **COSMOS meeting**, Dolenjske Toplice, Slovenia, 24–27 September
2018 **Workshop on Long-range Interactions and Synchronization**, São Paulo, Brazil, 28–31 June
2017 **COSMOS toolbox laboratory**, Brijuni, Croatia, 8–13 October
2017 **Dynamics Days**, Szeged, Hungary, 5–9 June
2017 **COSMOS retreat**, Wittenberg, Germany, 26–31 March
2016 **COSMOS workshop 2**, Amsterdam, Netherlands, 11–16 December
2016 **COSMOS school 2**, Aberdeen, UK, 27 June–6 July
2013 **Quantum Physics and Logic (QPL) workshop**, Barcelona, Spain, 17–19 July

Seminars

2021 **naXys, Université de Namur**, Namur, Belgium, 18 February
2021 **CENTURI seminar, Aix-Marseille University**, Marseille, France, 4 February
2019 **naXys, Université de Namur**, Namur, Belgium, 16 May
2019 **Department of Network and Data Science, Central European University**, Budapest, Hungary, 29 March
2018 **Université Libre de Bruxelles**, Brussels, Belgium, 3 April
2017 **University of Florence**, Florence, Italy, 7 December

Posters

2022 **Oustanding challenges in nonlinear dynamics**, Les Houches, France, 21–25 March
2020 **NetSci**, Rome, Italy, 17–25 September
2020 **NetBioMed2020 (Netsci satellite)**, Rome, Italty, 17 September
2020 **Alea day**, Marseille, France, 7 February
2019 **4th CENTURI day**, Marseille, France, 22 February
2019 **IBDM days**, Arles, France, 3–4 October
2019 **Workshop on Higher-order Interaction Networks: Dynamics, Structure, Data**, Oxford, UK, 9–11 September
2019 **Complenet**, Tarragona, Spain, 18–21 March
2018 **Analysis and Modeling of Complex Oscillatory Systems (AMCOS)**, Barcelona, Spain, 19–23 March
2017 **STATPHYS26**, Lyon, France, 18–22 July
2016 **International conference on biological oscillations (ESGCO)**, Lancaster, UK, 10–14 April
2015 **Lancaster University Christmas Conference**, Lancaster, UK, 15 December

Conference organisation and scientific committees

2018 **Co-organiser of the "Analysis and Modeling of Complex Oscillatory Systems" (AMCOS) conference**, *Barcelona, Spain*, international conference with about 100 participants, website: amcosconference.com

Teaching and outreach

01/10/21- **Co-supervision of pre-doctoral student**, *CENTAI Institute, Italy*, Antonio Leitao

2021 **Taught S8BIO2021: Artificial Intelligence**, *École Centrale Marseille, France*, March, 3x2h of introduction to AI for bioengineering students

2020 **Supervision of undergrad internship**, *Marseille, France*, July, 2-month internship of Alex Townsend-Teague (Uni. Oxford)

2020 **Supervision of undergrad internship**, *Marseille, France*, July, 1-month internship of Arthur Morris (Uni. Oxford)

2018 **Interview and videos by the STA (Slovenian Press agency)**, *Novo Mesto, Slovenia*, 15 September

2017 **Interview for Radio Moka**, *Florence, Italy*, 17 November

2017 **Masterclass "Waves and oscillations"**, *Lancaster University, UK*, 13 July, We hosted 30 A-level students within the programme Headstart from all over the UK

2017 **Masterclass "Waves and oscillations"**, *Lancaster University, UK*, 1 March, We hosted 9 A-level students

2010–2015 **Private tuitions in physics and maths**

2014 **Teacher at Reussit'school**, *individual tuitions*

Awards and grants

2020 **Travel grant**, *from COSTNET Short Term Scientific Mission (STSM)*

2019 **Travel grant**, *from COSTNET Short Term Scientific Mission (STSM)*

2018 **Best group project "Plan Bee"**, *at the Mediterranean School of Complex Networks (MSCx)*, Salina, Italy

2015 **COSMOS PhD Fellowship**, *Marie Curie ITN EJD*

2011 **Gold medal with the ULB-Brussels Team**, *at the international Genetically Engineerd Machine competition (iGEM) organised by MIT*, Amsterdam, Netherlands

Administration

2015–2018 **Early Stage Researcher (ESR) representative**, on the Supervisory board of the COSMOS ITN

2011–2012 **Student representative**, at the Physics Department, Université Libre de Bruxelles, Brussels, Belgium

Service

Referee for Phys. Rev. E, Chaos, Sci. Rep., Commun. Phys., Philos. Trans. Royal Soc. A, PLOS ONE, Fluct. Noise Lett., Commun. Nonlinear Sci. Numer. Simul., Springer book: Physics of Biological Oscillations

Program committee for FRCCS

Computer skills and projects

Languages Python, Matlab, Fortran, Java, Prolog, LaTeX

OS Linux, macOS, Windows

Code **CompleX Group Interactions (XGI):** python package that provides data structures and algorithms for modeling and analyzing complex systems with group (higher-order) interactions,
`xgi.readthedocs.io/`

Phasik: python package to infer temporal phases in temporal networks,
`phasik.readthedocs.io/`

AMCOS_booklet : a LaTeX template for conference booklets,
`github.com/maximelucas/AMCOS_booklet`

Languages

- French: mother tongue
- English: fluent (IELTS: 8/9 in 2015)
- Italian: advanced
- Dutch: advanced
- Hungarian: beginner

Interests

Music (play the violin), football, squash, hiking, former youth movements leader

References

Giovanni Petri, Senior Scientist.
CENTAI Institute, Turin, Italy.
Email: petri.giovanni@gmail.com

Alain Barrat, CNRS Research Director.
Centre de Physique Théorique, Aix-Marseille University, France.
Email: alain.barrat@cpt.univ-mrs.fr

Aneta Stefanovska, Professor.
Nonlinear and Biomedical Physics, Physics Department, Lancaster University, UK.
Email: aneta@lancaster.ac.uk