Pascal Grange

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Scientific interests. Theoretical physics, computational biology, quantitative finance.

PROFESSIONAL EXPERIENCE

Xi'an Jiaotong-Liverpool University, Suzhou. Assistant professor. **2014–present**
Subjects taught: quantum mechanics, fluid mechanics, physics, mathematical finance.
Research in theoretical physics and computational biology.
Fellow of the UK Higher Education Academy since 2016.

Cold Spring Harbor Laboratory, New York. Computational postdoc. **2009–2013**
PIs: Michael Hawrylycz (Allen Institute for Brain Science) and Partha P. Mitra.
- Developed software to analyze brain-wide, genome-wide data sets.
- Identified co-expression patterns of genes related to autism.
- Reported yearly on NIH-NIDA grant 1R21DA027644-01 *Co-expression networks in the brain*.

Goldman Sachs, London. Associate strategist. **2008–2009**
Implemented mathematical models to price options.
Monitored risks in currencies and emerging markets.

University of Hamburg, Zentrum für mathematische Physik. **2006–2008**
Postdoctoral fellow. Published work on mirror symmetry with magnetic fluxes.

Institute for Advanced Study, Princeton. **2005–2006**
Member, School of Natural Sciences.
Published work on phase transitions and mirror symmetry.

EDUCATION AND TRAINING

École Polytechnique, Paris. **2002–2005**
PhD in theoretical physics, with highest honours. Adviser: Prof. Ruben Minasian (Saclay).
Thesis: *D-branes, effective actions and mirror symmetry.*

CERN Theory Division, Geneva. Research internship. Published first paper. **2001–2002**

Université Paris 7. M.S. in mathematics (geometry, integrable models), with honours. **2000–2001**

École des Ponts, Paris. Degree in mathematical engineering. **2000–2003**

École Polytechnique, Paris. Degree in engineering. Ranked 12 out of 398 students. **1997–2000**
Majoring in physics, minoring in mathematics.
L.-E. Rivot Prize awarded in 2000 by the **Académie des Sciences**, Paris (four prizes awarded annualy for scientific excellence at École Polytechnique).

SCIENTIFIC OUTPUT

Metrics. The impact factor (I.F.) is the yearly average number of citations of articles published in the last two years in a journal. **In theoretical physics an impact factor of 2 is considered very good.** CiteScore measures the average citation received in a four-year period by articles published in a journal.

Journal	Contribution	Metrics
Proceedings of the National Academy of Sciences	one paper, first author	I.F = 9.412, Citescore = 8.58
Journal of Physics A: Mathematical and Theoretical	three papers, single author	I.F. = 1.996, Citescore = 4.1
Journal of Statistical Mechanics	one paper, single author	I.F. = 2.371, Citescore = 2.3
Journal of Physics Communications	two papers, single author	Citescore = 1.2
Frontiers in Computational Neuroscience	one paper, first author	I.F. = 2.535, Citescore = 4.8
Nature Neuroscience	one paper	I.F. = 21.12 , Citescore = 19.6

Bibliometric records are available from Google Scholar.
Citation counts are given for papers with more than 50 citations to date.

JOURNAL ARTICLES (PUBLISHED AFTER JOINING XJTLU)

- **Grange, P.** (2020). Entropy barriers and accelerated relaxation under resetting. *Journal of Physics A: Mathematical and Theoretical, 53*(37), 375002.
- **Grange, P.** (2020). Susceptibility to disorder of the optimal resetting rate in the Larkin model of directed polymers. *Journal of Physics Communications, 4*(9), 095018.
- **Grange, P.** (2020). Grange, P. (2020). Non-conserving zero-range processes with extensive rates under resetting. *Journal of Physics Communications, 4*(4), 045006.
- **Grange, P.** (2020). Topology of the mesoscale connectome of the mouse brain. *Computational and Mathematical Biophysics, 8*(1), 126-140.
- **Grange, P.** (2019). Steady states in a non-conserving zero-range process with extensive rates as a model for the balance of selection and mutation. *Journal of Physics A: Mathematical and Theoretical, 52*(36), 365601.
- **Grange, P.** (2017). Log-gamma directed polymer with one free end via coordinate Bethe Ansatz. *Journal of Statistical Mechanics: Theory and Experiment, 2017*(7), 073102.
- **Grange, P.** (2017). Quantum centipedes with strong global constraint. *Journal of Physics A: Mathematical and Theoretical, 50*(22), 225302.
- Hawrylycz, M., Miller, J. A., Menon, V. *et al.* (2015). Canonical genetic signatures of the adult human brain. *Nature neuroscience, 18*(12), 1832. [Cited 299 times]
- **Grange, P.**, Menashe, I., & Hawrylycz, M. (2015). Cell-type-specific neuroanatomy of cliques of autism-related genes in the mouse brain. *Frontiers in computational neuroscience, 9*, 55.
- **Grange, P.**, Bohland, J. W., Okaty *et al.* (2014). Cell-type–based model explaining coexpression patterns of genes in the brain. *Proceedings of the National Academy of Sciences, 111*(14), 5397-5402. [Cited 71 times]

TEXTBOOK

Grange, P. (2021). Mathematical Models of Solids and Fluids, a short introduction. *XJTLU Imprint and Liverpool University Press*. In press (publication scheduled in September 2021).

PREPRINTS

- **Grange, P.** (2020). Aggregation with constant kernel under stochastic resetting. `https://arxiv.org/pdf/2012.15106.pdf`, under revision.

- **Grange, P.**, & Yao, X. (2020). Run-and-tumble particles on a line with a fertile site. `https://arxiv.org/pdf/2012.08276.pdf`, under revision.

PROCEEDINGS

Grange, P. (2015). Computational neuroanatomy: mapping cell-type densities in the mouse brain, simulations from the Allen Brain Atlas. In Journal of Physics: Conference Series (Vol. 633, No. 1, p. 012070). IOP Publishing.

ARTICLES PUBLISHED BEFORE JOINING XJTLU

- Menashe, I., **Grange, P.**, Larsen, E. C., Banerjee-Basu, S., & Mitra, P. P. (2013). Co-expression profiling of autism genes in the mouse brain. *PLoS computational biology, 9*(7), e1003128. [Cited 66 times]

- **Grange, P.**, Hawrylycz, M., & Mitra, P. P. (2013). Computational neuroanatomy and co-expression of genes in the adult mouse brain, analysis tools for the Allen Brain Atlas. Quantitative Biology, 1(1), 91-100.

- **Grange, P.**, & Mitra, P. P. (2012). Computational neuroanatomy and gene expression: Optimal sets of marker genes for brain regions. In 2012 46th Annual Conference on Information Sciences and Systems (CISS) (pp. 1-6). IEEE.

- **Grange, P.**, & Schäfer-Nameki, S. (2007). Towards mirror symmetry a la SYZ for generalized Calabi–Yau manifolds. *Journal of High Energy Physics, 2007*(10), 052.

- **Grange, P.**, & Schäfer-Nameki, S. (2007). T-duality with H-flux: non-commutativity, T-folds and $G \times G$ structure. *Nuclear Physics B, 770*(1-2), 123-144. [Cited 65 times]

- **Grange, P.**, & Minasian, R. (2006). Tachyon condensation and D-branes in generalized geometries. *Nuclear Physics B, 741*(1-2), 199-214.

- **Grange, P.**, & Minasian, R. (2006). Modified pure spinors and mirror symmetry. *Nuclear Physics B, 732*(1-2), 366-378.

- **Grange, P.** (2005). Tachyon potential in a magnetic field with anomalous dimensions. *Journal of High Energy Physics, 2005*(06), 018.

- **Grange, P.** (2005). Deformation of p-adic string amplitudes in a magnetic field. *Physics Letters B, 616*(1-2), 135-140.

- **Grange, P.** (2004). Branes as stable holomorphic line bundles on the non-commutative torus. *Journal of High Energy Physics, 2004*(10), 002.

- **Grange, P.** (2004). Modified star-products beyond the large-B limit. *Physics Letters B, 586*(1-2), 125-132.

- **Grange, P.** (2003). Derivative corrections from boundary state computations. *Nuclear Physics B, 649*(1-2), 297-311.

RESEARCH ACTIVITIES WHILE AT XJTLU

GRANT APPLICATIONS

2021: application for the for the National Science Foundation of China general programme (PI): *Condensation in out-of-equilibrium physics*. Under review.

2019: application for PGRS, funded, **PGRS1912025** (*Condensation phenomena in out-of-equilibrium systems*), supporting one graduate student (2020-2023).

2019: application for the National Science Foundation of China general programme (PI). Team: Dr Linglong Yuan, Dr Li Cai (Department of Mathematical Sciences). Project: *Topology of brain circuits, application of persistent homology*.

2015–16: Research Development Fund, **RDF-14-01-34** (*Statistical modelling of the morphology of neurons and of brain connections*), 50,000 RMB. Completed, resulted in two published papers.

PRESENTATIONS

2019: Represented the Department of Mathematical Sciences at the second **Research Festival**. Talk: *Models of condensation phenomena*.

2018: **Workshop on stochastic processes**. Talk: *Polymers, random walks and integrability*.

2016: Represented the Department of Mathematical Sciences at the first **Research Festival**. Talk: *Computational maps of complex systems: putting coordinates on the brain*.

2014: Seminar, **Department of Biological Sciences**. Talk: *Cell-type-specific maps of the brain*.

SERVICE FOR INTERNATIONAL RESEARCH ORGANISATIONS

- Referee for **PLoS Computational Biology**, **Frontiers in Computational Neuroscience**, **Bioinformatics**, **Journal of High Energy Physics**, **Europhysics Letters**.
- External grant reviewer for the **Israel Science Foundation** (2016), **Natural Sciences and Engineering Research Council of Canada** (2017), **Canada Foundation for Innovation** (2017).

TEACHING AND LEARNING ACTIVITIES AT XJTLU

Postgraduate supervision. **2020–present**

- Principal superviser of Ms Xueqi Yao's PhD work (supported by PGRS1912025): *Condensation phenomena in out-of-equilibrium systems*. Co-supervisers: Prof. Takis Konstantopoulos, Dr Linglong Yuan (UoL), Dr Jia Meng (XJTLU).
- Co-superviser of a PhD student on computational genomics with Dr Xiaowei Jiang (Department of Biological Sciences), to start in 2021.

Member of teaching team: Explore Science (SCI001). **2020–present**

- Topic taught: *Orders of magnitude*.
- Developed a video lecture for online delivery. Double delivery of a tutorial. Designed online quizzes and assessment of the topic.
- A short version and the video, together with lecture notes, obtained a 2nd prize at the MoE microlecture competition in 2020.

Module leader: Mathematical Models of Solids and Fluids (MTH308). **2014–present**

- Rewrote module specifications extensively (including aims and fits, extended learning outcomes).
- Introduced coursework in 2016 (failure rates have been reduced by a factor of two).
- Wrote a textbook based on lecture notes (*Mathematical Models of Solids and Fluids, a Short Introduction*, 140 pages, to be published by XJTLU Imprint and LUP in September 2021).

Module leader: Quantum Mechanics (MTH311, PHY301). **2014–present**

Rewrote module specifications extensively (including aims and fits, extended learning outcomes, research-informed teaching based on numerical approximations).

Curriculum development. **2018**

Developed module specifications for the BEng Data Science and Big Data Technology with Contemporary Entrepreneurialism (successfully launched in 2019): **DTS002TC Introduction to Big Data**, **INT305TC Machine Learning**.

XJTLU-funded research-led teaching. **2017, 2019**

- Summer Undergraduate Research Fund (SURF), three students (out of 45 applicants) co-supervised with Dr Yinna Ye and Dr Linglong Yuan, *Statistical arbitrage in high-frequency trading*.
- SURF, five students (out of 120 applicants) co-supervised with Dr Linglong Yuan, *Models of economic integration in the Yangtze River Delta region*.

Oral presentation at the Learning and Teaching Colloquium. **2016**

Talk: *The case for Exercise Zero* (active involvement of students in the editing of teaching material).

ACADEMIC SERVICE AT XJTLU

Programme director, BSc Applied Mathematics. **September 2019–present**

- Presented the programme to Year One students, leading to a 30% growth of student registration over the period (the programme is above School cap for the first time this year).
- Chaired working groups, resulting in proposals for the reform of the delivery of Numerical Analysis, and for new modules in numerical analysis and topology.
- Presented the programme to prospective students in high schools: in Sichuan province (Chengdu and Mianyang, December 2020), in Zhejiang province (Hangzhou and Quzhou, April 2021).
- Prepared and submitted documents for the Internal Programme Review in 2021.
- Developed data-analysis software to study the correlation between Year One marks and performance in the programme.
- Liaised with UoL and managed pre-registration of students in the 2+2 articulation.

Final-year project coordinator (MTH301). **2018–2019**

Liaising with IBSS, where the financial-mathematics students may be advised.

Peer-review coordinator, Department of Mathematical Sciences. **2017–2019**

More than 70 members of staff on schedule.

Year 4 leader. **2015–2018**

Liaised with module leaders to plan assessment (while number of optional modules and frequency of assessment were increasing sharply in two programmes).

Member of the Committee for Module and Programme Review. **2014–2016**

Internal reviewer for the BSc programme in Bioinformatics.

MAIN INTERNATIONAL CONFERENCES AND PRESENTATIONS

2017: **Multiscale modelling and experimental approaches to genome organization**, Les Houches. Poster: *From genome-wide data to cell-type-specificity maps of the brain*.

2016: **Genomics of brain disorders, Wellcome Genome Campus**, Cambridge. Poster: *Cell-type-specificity of brain-wide expression profiles of cliques of autism-related genes*.

2014: **Analyzing Brainomics (NIPS, Neural Information Processing Systems)**, Montreal. Invited talk: *Region-specificity of cell types in the mouse brain*.

2012: – **Neuroinformatics 2012, Marine Biological Laboratory**, Woods Hole. Lecture: *Analysis of brain-wide gene-expression data*.
– **46th Conference on Information Sciences and Systems**, Princeton. Invited talk: *Computational neuroanatomy and gene expression*.

2011: – **Society of Neuroscience Meeting 2011**, Washington, D.C. Poster: *Distribution of cell types in the mouse brain from the Anatomic Gene Expression Atlas*.
– **Circuits and connectivity in the vertebrate brain, Cold Spring Harbor Laboratory**. Lecture: *Computational methods for neuroanatomy*.
– **Network architecture of brain structures, KITP**, Santa Barbara. Talk: *The Allen Gene Expression Atlas and neuronal cell types*.

2010: **Society of Neuroscience Meeting 2010**, San Diego. Two posters:
– *Marker genes and the anatomy of the mouse brain*,
– *Computer-guided stereotactic injections*.

2007: **Workshop on Poisson geometry, Erwin Schrödinger Institut**, Vienna. Talk: *Magnetic fluxes and generalized geometry*.

ADDITIONAL INFORMATION

- **Computing**: MATLAB, released `Brain Gene Expression Analysis`, a toolbox for analysis of brain-wide gene-expression data, see `http://pjgrange.github.io` for download instructions and manual.
- **Languages**: French (mother tongue), English (fluent), German (estimated C2 level), elementary Mandarin Chinese (HSK3, obtained in March 2017 with a score of 398/400).
- **Extra-scientific interests**: middle and long-distance running (2009 Paris Marathon finisher), Chinese scholar's objects of the Ming and Qing dynasties (article *Supporting Treasures* published in Orientations, the magazine for collectors of Asian art, March–April 2018).

REFERENCES

- Jason W. Bohland, Associate director, Cognitive Neuroimaging Center, Boston University, USA, `jbohland@gmail.com`
- Ruben Minasian, Senior investigator, Institut de Physique Théorique, CEA Saclay, France, `Ruben.Minasian@cea.fr`
- Sakura Schäfer-Nameki, Professor of mathematical physics, University of Oxford, UK, `Sakura.Schafer-Nameki@maths.ox.ac.uk`