# Pascal Grange

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**Scientific interests.** Modelling of complex systems, quantitative biology, mathematical physics,.

## PROFESSIONAL EXPERIENCE

**1/2014– : Xi'an Jiaotong-Liverpool University, Department of Mathematical Sciences**.
Senior lecturer (honorary lecturer at the University of Liverpool).
Module leader for Quantum Mechanics (MTH311) and Cartesian Tensors (MTH308).
Fellow of the UK Higher Education Academy since 2016.

**2009–2013: Cold Spring Harbor Laboratory**. Computational postdoc.
PIs: Michael Hawrylycz (Allen Institute for Brain Science) and Partha P. Mitra.
Analysed brain-wide expression profiles of genes related to autism and addiction (reported on NIH-NIDA grant *Co-expression networks in the brain*, for yearly funding).

**2008–2009: Goldman Sachs**, London. Associate strategist.
Priced options and monitored risks.

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

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

## EDUCATION AND TRAINING

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

**2001–2002: CERN Theory Division**, Geneva. Research internship.

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

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

**1997–2000: École Polytechnique**, Paris. Degree in engineering. Ranked 12/398.
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).

## RESPONSIBILITIES AND ACADEMIC SERVICE

- Referee for **PLoS Computational Biology**, **Frontiers in Computational Neuroscience**, **Bioinformatics**, **Journal of High Energy Physics**.
- External grant reviewer for the **Israel Science Foundation** (2016), **Natural Sciences and Engineering Research Council of Canada** (2018), **Canada Foundation for Innovation** (2018).
- **Academic service at XJTLU**: internal assessor of Mr Zhen Wei's PhD thesis (*Topological analysis of cytosine methylation*), final-year leader, member of the Committee for Module and Programme Review (2014–2016), panel member for student admission, peer-review coordinator.
- **Funded projects at XJTLU**: *Statistical modelling of brain connections* (internal grant), *Statistical arbitrage and high-frequency trading* (Summer undergraduate research programme, three students).

## PUBLICATIONS AND PREPRINTS

Bibliometric records and links to papers are available from Google Scholar.

- **Quantitative biology.**
  1. M. Hawrylycz *et al.*, *Canonical genetic signatures of the adult human brain*, Nature Neuroscience (2015) **18 (12)**, 1832–1844.
  2. **P. Grange**, I. Menashe and M. Hawrylycz, *Cell-type-specific neuroanatomy of cliques of autism-related genes in the mouse brain*, Frontiers in Computational Neuroscience **9**, 55.
  3. **P. Grange**, J.W. Bohland, B.W. Okaty, K. Sugino, H. Bokil, S.B. Nelson, L. Ng, M. Hawrylycz and P.P. Mitra, *Cell-type–based model explaining coexpression patterns of genes in the brain*, Proc. Natl. Acad. Sci. USA 2014 111 (14) 5397–5402.
  4. I. Menashe, **P. Grange**, E.C. Larsen, S. Banerjee-Basu and P.P. Mitra, *Co-expression profiling of autism genes in the mouse brain*. PLoS computational biology, 9(7), e1003128.
  5. **P. Grange**, M. Hawrylycz and P.P. Mitra, *Computational neuroanatomy and co-expression of genes in the adult mouse brain, analysis tools for the Allen Brain Atlas*, Quantitative Biology 2013, **1(1)**: 91–100, `[arXiv:1301.1730 [q-bio.QM]]`.
  6. **P. Grange** and P.P. Mitra, *Computational neuroanatomy and gene expression: optimal sets of marker genes for brain regions*, IEEE, CISS Princeton 2012, `[arXiv:1205.2721 [q-bio.QM]]`.
- **Statistical mechanics and high-energy physics.**
  1. **P. Grange**, *Crossover in the log-gamma polymer from the replica coordinate Bethe Ansatz*, submitted, `[arXiv:1707.03521 [cond-mat.dis-nn]]`.
  2. **P. Grange**, *Log-gamma directed polymer with one free end via coordinate Bethe Ansatz*, J. Stat. Mech. (2017) 073102, `[arXiv:1701.08606 [cond-mat.dis-nn]]`.
  3. **P. Grange**, *Quantum centipedes with strong global constraint*, Journal of Physics A: Mathematical and Theoretical **50** 22, 5302 (2017), `[arXiv:1608.04711 [cond-mat.dis-nn]]`.
  4. **P. Grange** and S. Schäfer-Nameki, *Towards mirror symmetry à la SYZ for generalized Calabi–Yau manifolds*, JHEP **0710**, 052 (2007), `[arXiv:0708.2392 [hep-th]]`.
  5. **P. Grange** and S. Schäfer-Nameki, *Noncommutativity, T-folds and $G \times G$ structure*, Nucl. Phys. **B770**, 123 (2007), `[arXiv:hep-th/0609084]`.
  6. **P. Grange** and R. Minasian, *Tachyon condensation and D-branes in generalized geometries*, Nucl. Phys. **B741**, 199 (2006), `[arXiv:hep-th/0512185]`.
  7. **P. Grange** and R. Minasian, *Modified pure spinors and mirror symmetry*, Nucl. Phys. **B732**, 366 (2006), `[arXiv:hep-th/0412086]`.
  8. **P. Grange**, *Tachyon potential in a magnetic field with anomalous dimensions*, JHEP **0506**, 018 (2005), `[arXiv:hep-th/0410180]`.
  9. **P. Grange**, *Deformation of p-adic amplitudes in a magnetic field*, Phys. Lett. **B616**, 135 (2005), `[arXiv:hep-th/0409305]`.
  10. **P. Grange**, *Branes as stable holomorphic line bundles on the noncommutative torus*, JHEP **0410**, 002 (2004), `[arXiv:hep-th/0403126]`.
  11. **P. Grange**, *Modified star-products beyond the large-B limit*, Phys. Lett. **B586**, 125 (2004), `[arXiv:hep-th/0304059]`.
  12. **P. Grange**, *Derivative corrections from boundary state computations*, Nucl. Phys. **B649**, 297 (2003), `[arXiv:hep-th/0207211]`.

## SOFTWARE

`Brain Gene Expression Analysis`, MATLAB software for analysis of brain-wide gene-expression data, see `http://pjgrange.github.io` for download instructions and manual.

## MAIN 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 Discorders, Wellcome Genome Campus**, Cambridge. Poster: *Cell-type-specificity of brain-wide expression profiles of cliques of autism-related genes.*
– **1st XJTLU Research Festival**, Suzhou. Invited talk (as the representative of the mathematics cluster): *Computational maps of complex systems, putting coordinates on the brain.*

**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:** – **Neuroscience 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. Lecture: *Computational methods for neuroanatomy.*
– **Network architecture of brain structures, KITP**, Santa Barbara. Talk: *The Allen Gene Expression Atlas and neuronal cell types.*

**2010:** **Neuroscience 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 (seven years of regular use), notions of Python.
- **Languages**: French (mother tongue), English, German, elementary Mandarin Chinese (HSK3, obtained in January 2018 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 (paper to appear in Orientations, the magazine for collectors of Asian art).

## REFERENCES

- Jason W. Bohland, Associate director, Cognitive Neuroimaging Center, Boston University, USA, `jbohland@gmail.com`
- Michael Hawrylycz, Senior director of informatics, Allen Institute for Brain Science, Seattle, USA, `MikeH@alleninstitute.org`
- 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`