

## LORENZO DI MICHELE: CURRICULUM VITAE AND LIST OF PUBLICATIONS

**Place and date of birth:** Pescara (Italy), 21st January 1985

**Nationality:** Italian

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### **Personal profile**

- Soft Matter and Chemical Physicist with experience in colloidal and macromolecular self-assembly.
- Experimentalist with good knowledge and experience in computer simulations and theoretical methods.
- Experience in cooperating with scientists of different formation and background: theoreticians, experimentalists, physicists, chemists, and biologists.
- Natural attitude to mentoring and supervising.
- Ability to communicate at different levels, from school kids to academic peers.

### **Research Interests**

I am interested in all aspects of colloidal and macromolecular self-assembly, with particular emphasis on biologically relevant and bio-inspired materials. My currently active research areas include:

- Self-assembly of DNA-functionalised Brownian units, including colloidal particles and lipid vesicles. Synthetic DNA sequences are used as a selective glue to design specific binding rules and control both equilibrium and kinetic features (in collaboration with: Dr B.M. Mognetti, Bruxelles).
- Fundamental aspects of nucleic acid hybridisation thermodynamics and kinetics, with particular attention to non-specific effects (in collaboration with: Dr B.M. Magnet, Bruxelles).
- Self-assembly of DNA-nanoconstructs with applications to novel vectors for targeted gene and drug delivery (active PhD project. In collaboration with: Dr P. Cicuta, Cambridge; Prof. F. Sciortino, Rome).
- Ligand-mediated adhesion between lipid membranes, with applications to bimolecular sensing (active PhD project. In collaboration with Dr P. Cicuta, Cambridge).
- Development of novel super-resolution optical microscopy techniques based on selective DNA probes (In collaboration with Prof. C. Soeller and Dr S. Pagliara, Exeter. Active PhD project. Grant proposal submitted to BBSRC as a Co-I).
- Coarse grained models for protein aggregation and fragmentation (in collaboration with Dr A. Zaccone, Cambridge; Dr V. Fodera, Copenhagen)

### **Education**

2010–2013 University of Cambridge and Corpus Christi College, PhD in Physics – Early-Stage Researcher within the Marie Curie Initial Training Network ITN-COMPLOIDS

**Supervisor:** Dr Erika Eiser

**Thesis title:** *Multicomponent amorphous phases of DNA functionalised colloids*

2008–2010 University of L'Aquila (Italy), Laurea Magistrale in Fisica (equivalent MSc in Physics)

**Grade:** 110/110 cum Laude

**Thesis supervisor:** Prof. Sandro Santucci

**Thesis title:** *Formation of titanium disilicide phases in thin films*

2004-2008 University of L'Aquila (Italy), Laurea in Fisica (equivalent BSc in Physics)

**Grade:** 110/110 cum Laude

**Thesis supervisor:** Prof. Adriano Filippini

**Thesis title:** *Macroscopic dynamics of a viscoelastic system*

### ***Research experience***

I am currently employed as a Research Fellow by the Cavendish Laboratory, University of Cambridge. I am regarded as an independent staff member of the Biological and Soft Systems Sector. I am entitled of pursuing my own research objectives, administrating funds and writing grant proposals, supervising undergraduate and graduate students.

2016–2019 Leverhulme Early Career Research Fellowship underwritten by the Newton Trust, Biological and Soft Systems, Cavendish Laboratory, University of Cambridge.

**Tenure:** 1st May 2016 – 30th April 2019.

2013–2016 Oppenheimer Early Career Research Fellow, Biological and Soft Systems, Cavendish Laboratory, University of Cambridge.

**Tenure:** 1st October 2013 – 30th September 2016.

2013–2016 John Henry Coates Research Fellow, Emmanuel College, University of Cambridge.

**Tenure:** 1st October 2013 – 30th September 2016.

2010–2013 University of Cambridge, Cavendish Laboratory, PhD in Physics.

2010 National Physical Laboratory (Teddington, TW11 0LW, UK), visiting student in the group of Dr Olga Kazakova. Project on the detection of magnetic micro/nano particles with micro-Hall sensors.

2009–2010 Research and Development Group, Micron Technology inc. Project on the formation of crystalline phases in ultra-thin titanium disilicide films (Masters thesis).

### ***Grants and awards***

*Total Awarded:* ~£499,250 (PI+Co-I)

- Leverhulme Early Career Fellowship, awarded by the Leverhulme Trust to young researchers in any discipline. Total awarded £90,000 in three years (May 2016 – April 2019) to cover 50% of salary costs and research expenses.
- Isaac Newton Trust, Matching Funds for Leverhulme Early Career Fellowship, £72,000 in three years (May 2016 – April 2019) to cover 50% of salary costs.
- Oppenheimer Research Fellowship awarded by the School of the Physical Sciences, University of Cambridge, on the broad topic of colloidal science. Total awarded ~£165,000 in three years (October 2013 – September 2016) to cover salary costs and research expenses.
- John Henry Coates Research Fellowship, Emmanuel College, Cambridge. Awarded by the College to an early career researcher in physical sciences and mathematics. This is a non-stipendiary fellowship providing Full Fellow rights (free meals, accommodation/office space, College facilities etc.) and a small travel allowance. Estimated value £~30,000 in three years (October 2013 – September 2016).
- Fully funded PhD student allocated by the NanoDTC (EPSRC Centre for Doctoral Training in Nanoscience and Nanotechnology). Value ~£70,000 in three years (October 2015 – September 2018).
- Fully funded PhD student allocated by the EPSRC Centre for Doctoral Training in Sensor Technology and Applications. Co-supervised with Dr P. Cicuta (Cavendish Laboratory, Cambridge). Value ~£70,000 in three years (October 2015 – September 2018).
- NanoDTC (EPSRC Centre for Doctoral Training in Nanoscience and Nanotechnology) associate studentship (2012). Total awarded £1,750.
- Corpus Christi College small research grant (2012). Total awarded £500.

### ***Undergraduate teaching and supervising***

- Head of Class of a PART-II (3rd year Physics) laboratory practical (2014-2016). My duties include preparing handouts, overseeing the work of the students and that of a postgraduate demonstrator, assessing a written report, carrying out an oral examination, and deciding the final marks.
- Co-Lecturer on the PART-IB (2nd year Physics) course Great Experiments (2016). I will deliver a lecture in February 2016.
- Main project supervisor of 4 PART-III (4th year Physics) Masters students (2013-2016). Duties include submitting project proposals, overseeing the work of the students, marking a final report, carrying out an oral examination and deciding the final mark (with another assessor).
- Assessor for "Long Vacation Project" (3rd year Physics summer research project, 2015). My duties include assessing a report, carrying out an oral examination and deciding the final mark (with another assessor).

- Daily supervisor of 3 PART-III (4th year Physics) Masters students (2010-2012).
- Departmental supervisor for the PART-III (4th year Physics) course "Biological Physics" (2015).
- Departmental supervisor for the PART-II (3rd year Physics) course "Soft Condensed Matter" (2012-2013).

#### ***Postgraduate teaching and supervising***

- Supervisor of 1 PhD student starting in October 2015.
- Co-Supervisor of 1 PhD student starting in October 2015 (with Dr P. Cicuta, Cavendish Laboratory, Cambridge).
- Supervisor and Co-Supervisor of 4 research projects within the EPSRC Centres for Doctoral Training in Nanoscience and Nanotechnology and Sensor Technology and Applications (2014-2016).
- Internal examiner for PhD and MPhil students (2015).
- Examiner for the first year probationary exam of PhD students (2014-2015).
- Daily supervisor of several PhD and visiting students (2011-2015).
- Graduate lectures within the Biological and Soft Systems Sector, Cavendish Laboratory, Cambridge (2014-2015).
- Demonstrator for EPSRC CDT practical classes (2014-2015).

#### ***Laboratory and staff responsibilities***

- Coordinator of the "Biochemistry" lab, Physics of Medicine Building, Cavendish Laboratory, with more than 40 active users (2013-currently). My duties include training, safety induction, overview of health and safety paperwork, everyday support, and organising periodic cleaning/maintenance sessions.
- Responsible for the confocal microscope of my sector. My duties include training, safety induction, everyday support, and routine maintenance (2013-currently).
- Coordinator of the "bionanotechnology" theme of the EPSRC Centre for Doctoral Training in Nanoscience and Nanotechnology (2015-currently). I am in the process of organising a themed seminar series that will take place in 2016.
- Member of the "Financial Committee" of my sector (2014-currently).
- Member of the "Coffee Machine Committee" of my sector.

#### ***Outreach activity***

- Demonstrator (2011-2015) and coordinator (2013-2015) of the exhibition of the Biological and Soft Systems Sector for the outreach event "Physics at Work", a three-day event held in the Cavendish Laboratory with themed scientific presentations addressed to high school students.
- Demonstrator in the UK-Japan Young Scientists event (2012-2013), a three-day event in which Japanese and local school kids get to directly experience lab work.

#### ***Contributed and invited talks (selected)***

- *DNA-driven self-assembly of biomimetic materials*. Université Libre de Bruxelles, 13 May 2015.
- *DNA-driven self-assembly of biomimetic materials*. Bioscience Seminar Series, University of Exeter, 7 May 2015.
- *Thermal regulation of volume and porosity in lipid mesophases by coupling mobile ligands to soft membranes*. Self-assembly Interactive Workshop, Cambridge, 3 December 2014.
- *Effect of inert tails on the thermodynamics of DNA-hybridisation*. Liquid Matter Conference, Lisbon, 24 July 2014.
- *Multistep kinetic self-assembly of DNA-coated colloids*. Physics of Complex Colloids Conference, Ljubljana, 15 May 2013.
- *Arrested phase separation and self-assembly in multicomponent mixtures of DNA-coated colloids*. Weekly Statistical Mechanics Seminar, Department of Chemistry, University of California Berkeley, 19 April 2013.
- *Understanding and modelling colloidal interactions mediated by polymer networks*. XXIII Sitges Conference on Statistical Mechanics, Sitges (Barcelona), 6 June 2012
- *Colloidal interactions induced by polymer networks: Theory and Simulations*. Comploids Annual Meeting, Edinburgh, 1 June 2012.

**Peer review activity:** Physical Review Letters (APS publishing), Lab On A Chip, Soft Matter, CrystEngComm, Physical Chemistry Chemical Physics, Polymer Chemistry, RSC Advances, Nanoscale Horizons (RSC publishing); Applied Physics Letters, The Journal of Chemical Physics (AIP publishing), Scientific Reports (NPG).

### **Publications in peer-reviewed journals**

- (16) L. Parolini, J. Kotar, L. Di Michele\* and B. M. Mognetti\*, Controlling self-assembly kinetics of DNA-functionalized liposomes using toehold exchange mechanism, *ACS Nano*, DOI: 10.1021/acsnano.5b07201 (2016)
- (15) S.F. Shimobayashi, B. M. Mognetti, L. Parolini, D. Orsi, P. Cicuta and L. Di Michele: Direct measurement of DNA-mediated adhesion between lipid bilayers, *Phys. Chem. Chem. Phys.*, **17**, 15615-15628, (2015)
- (14) A. Zaccone, I Terentjev, L. Di Michele and E.M. Terentjev: Fragmentation and depolymerization of non-covalently bonded filaments, *J. Chem. Phys.*, **142**, 114905, (2015)
- (13) L. Parolini, B. M. Mognetti, J. Kotar, E. Eiser, P. Cicuta and L. Di Michele: Volume and porosity thermal regulation in lipid mesophases by coupling mobile ligands to soft membranes, *Nature Commun.*, **6**, 5948 (2015)
- (12) L. Di Michele\*, B. M. Mognetti\*, T. Yanagishima, P. Varilly, Z. Ruff, D. Frenkel and E. Eiser: Effect of Inert Tails on the Thermodynamics of the DNA Hybridization, *J. Am. Chem. Soc.*, **136**(18), 6538-6541 (2014)
- (11) L. Di Michele, D. Fiocco, F. Varrato, S. Sastry, E. Eiser and G. Foffi: Aggregation dynamics, structure, and mechanical properties of bigels, *Soft Matter*, **10**(20), 3633-3648 (2014)
- (10) L. Di Michele, E. Eiser and V. Fodera: Minimal Model for Self-Catalysis in the Formation of Amyloid-Like Elongated Fibrils, *J. Phys. Chem. Lett.*, **4**, 3158-3164 (2013)
- (9) L. Di Michele, F. Varrato, J. Kotar, S. H. Nathan, G. Foffi and E. Eiser: Multistep kinetic self-assembly of DNA-coated colloids. *Nature Commun.*, **4**, 2007 (2013)
- (8) L. Di Michele and E. Eiser: Developments in understanding and controlling self assembly of DNA-functionalized colloids. *Phys. Chem. Chem. Phys.*, **15**(9), 3115 - 3129 (2013)
- (7) F. Varrato, L. Di Michele, M. Belushkin, N. Dorsaz, S. H. Nathan, E. Eiser and G. Foffi: Arrested demixing opens route to bigels, *Proc. Natl. Acad. Sci. USA*, **109**(47), 19155-19160 (2012)
- (6) L. Di Michele, A. Zaccone and E. Eiser: Analytical theory of polymer-network-mediated interaction between colloidal particles, *Proc. Natl. Acad. Sci. USA*, **109**(26), 10187-10192 (2012)
- (5) T. Yanagishima, L. Di Michele, J. Kotar and E. Eiser: Diffusive behavior of PLL-PEG coated colloids on  $\lambda$ -DNA brushes – Tuning hydrophobicity, *Soft Matter* **8**(25), 2792-2798 (2012)
- (4) L. Di Michele, T. Yanagishima, A. R. Brewer, J. Kotar, E. Eiser and S. Fraden: Interactions between colloids induced by a soft cross-linked polymer substrate, *Phys. Rev. Lett.*, **107**(13), 136101 (2011)
- (3) L. Di Michele, C. Shelly, P. De Marco, P. See, D. Cox and O. Kazakova: Detection and susceptibility measurements of a single Dynal bead, *J. Appl. Phys.*, **110**(6), 063916 (2011)
- (2) L. Di Michele, C. Shelly, J. Gallop and O. Kazakova: Single particle detection: phase control in submicron Hall sensors, *J. Appl. Phys.*, **108**(10), 103918 (2010)
- (1) A. Filipponi, L. Di Michele and C. Ferrante: Viscoelastic behavior of a mass-rubber band oscillator, *Am. J. Phys.*, **78**(4), 437-444 (2010)

\* These authors contributed equally.