Emmanouela Filippidi

filippidi@mpi-cbg.de, filippidi@materials.uoc.gr
Post-doctoral scholar at the Max Planck Institute
of Molecular Cell Biology and Genetics

Orcid ID: 0000-0002-4044-0022
Researcher ID : K-9415-2015

Education

09/2007–05/2014	**Ph.D.** in Physics, Center for Soft Matter Research, New York University, New York, NY *Thesis: Random Organization: Out-of-equilibrium phase transitions in periodically driven suspensions.* Advisor: Prof. David J. Pine. Committee members: P. Chaikin, A. Grosberg, A. Donev, J. Morris
09/2005–09/2007	**Master of Science**, Dept. of Biomedical Engineering, Boston University, Boston, MA *Thesis: Controlled biopolymer assembly in microfluidic devices.* Advisor : Prof. Joyce Y. Wong
09/2001–06/2005	**Bachelor of Science** in Engineering, Cum Laude, Harvard University, Cambridge, MA *Thesis: Protein preservation in sugar glasses.* Advisor : Prof. Mehmet Toner
06/2001	**Apolytirio**, Athens College, Greece (19.6 / 20)

Academic Appointments / Employment

05/2019–04/2020	**Postdoctoral Scholar**, Max Planck Institute (MPI) for Molecular Cell Biology and Genetics and **visiting scientist**, MPI for the Physics of Complex Systems, Dresden. Advisors: Anthony A. Hyman and Frank Jülicher. *"The role of sequence in biomolecular phase separation".*
07/2018–06/2019	**Affiliate Scientist**, Mechanical Engineering, University of California, Santa Barbara, CA.
07/2016–06/2018	**Otis Williams Postdoctoral Scholar in Bioengineering**, Dept. of Mechanical Engineering and Materials Research Laboratory (MRL), University of California, Santa Barbara, CA. Independent project on *"Novel biocompatible but non-biodegradable medical adhesives".* Starting point: coacervation of peptide-mimetic polyelectrolytes.
05/2014–06/2018	**Postdoctoral Scholar**, Materials Research Laboratory (MRL), University of California, Santa Barbara, CA. *Structure and mechanics of adhesive, byssal mussel plaques, design of supramolecular tough mussel-inspired elastomers* Advisor: Prof. Megan T. Valentine
06–08/2010	**Intern at Unilever's R&D** Department of Food Structural Design, Vlaardingen, Netherlands. Investigated water-in-oil emulsions for food structuring and synthesized oil core - zein shell particles for food and cosmetic applications with Dr. Ashok Patel under the supervision of Dr. Krassimir Velikov.
03/2007	Attended the 4-week HERCULES theoretical and experimental course on **Synchrotron Radiation for Condensed Matter Studies** at ESRF and Soleil synchrotrons and ILL neutron source, France.
07–08/2006	**Visiting student** Max Planck Institute for Dynamics and Self-Organisation, Göttingen, Germany. Collagen I assembly via hydrodynamic focusing and in situ, real-time X-ray investigation of collagen packing. Advisor: Prof. Thomas Pfohl.
06-08/2005	**Visiting student**, Polymer Group, Foundation for Research and Technology Hellas (FORTH), Heraklio, Greece. Determined the size-dependence of particle Brownian diffusion close to a polymer brush by evanescent wave dynamic light scattering.
06/2003-05/2004	**Undergraduate researcher**, Harvard Research Experience for Undergraduates (REU), Cambridge, MA. Study of the rheological behavior of collagen I gels and the mechanical properties of expanding glioblastoma tumors in collagen I gels. Supervisors: Clifford Brangwynne, Vernita Gordon and Laura Kaufman, under the supervision of Prof. David A. Weitz.
06/2004	Attended the **Computing Beyond Silicon Summer School**, California Institute of Technology, Pasadena, CA. Month-long program consisting of lectures on DNA, molecular, quantum and nanoscale computing. Team project of our choice on "Stereovision and Synchronization of Spiking Neurons".
03/2004, 07/2001	**Shadowed** breast cancer removal (Atlanta, GA) and vascular **surgeries** (Athens, Greece) as part of career exploration programs.

Publications

687 citations, h-index 9 (Google Scholar)

11 Cristiani T.R., **Filippidi E.**, Behrens R., Valentine M.T. and Eisenbach C.D. Tailoring the toughness of elastomers by incorporating ionic cross-linking. **Macromolecules**, (2020) *Accepted* https://pubs.acs.org/doi/full/10.1021/acs.macromol.0c00500

10 **Filippidi E.***, Cristiani T.R.*, Eisenbach C.D., Waite J.H., Israelachvili J.N., Ahn B.K. and Valentine M.T. Toughening elastomers using mussel-inspired iron-catechol complexes. **Science**, 358 (6362), 502-505 (2017) *equal contribution

9 Wilhelm M.H., **Filippidi E.**, Waite J.H. and Valentine M.T. Influence of multi-cycle loading on the structure and mechanics of marine mussel plaques, **Soft Matter**, 13 (40), 7381-7388 (2017)

8 Seo S., Lee D.W., Ahn J.S., Cunha K., **Filippidi E.**, Ju S.W., Shin E., Kim B.-S., Levine Z.A., Lins R.D., Israelachvili J.N., Waite J.H., Valentine M.T., Shea J.E. and Ahn B.K. Significant performance enhancement of polymer resins by bioinspired dynamic bonding. **Advanced Materials**, 29 (39), 1703026 (2017)

7 **Filippidi E.**, DeMartini D., Malo de Molina P., Danner E.W, Kim J., Helgeson M.E., Waite J.H. and Valentine M.T. The microscopic network structure of mussel (*Mytilus*) adhesive plaques. **J. R. Soc. Interface**, 12 (113), 20150827 (2015)

6 **Filippidi E.**, Patel A.R., Bouwens E.C.M., Voudouris P. and Velikov K.P. All-natural oil-filled microcapsules from water-insoluble proteins. **Advanced Functional Materials**, 24 (38), 5962-5968 (2014)

5 Franceschini A., **Filippidi E.**, Guazzelli E. and Pine D.J. Dynamics of non-Brownian fiber suspensions under periodic shear. **Soft Matter**, 10 (35), 6722-6731 (2014)

4 Franceschini A., **Filippidi E.**, Guazzelli E. and Pine D.J. Transverse alignment of fibers in a periodically sheared suspension: an absorbing phase transition with a slowly-varying control parameter. **Physical Review Letters**, 107 (25), 250603 (2011)

3 Kinahan M.E., **Filippidi E.**, Köster S., Hu X., Evans H.M., Pfohl T., Kaplan D.L., Wong J. Tunable silk: using microfluidics to fabricate silk fibers with controllable properties. **Biomacromolecules**, 12 (5), 1504-1511 (2011)

2 **Filippidi, E.**, Michailidou, V., Loppinet, B., Rühe, J., Fytas G. Brownian diffusion close to a polymer brush. **Langmuir**, 23 (9), 5139-5142 (2007)

1 Kaufman L.J., Brangwynne C.P., Kasza K.E., **Filippidi E**., Gordon V.D., Deisboeck T.S., Weitz D.A. Glioblastoma multiforme shows distinct invasion and remodeling patterns in three dimensional collagen matrices of different concentration. **Biophysical Journal**, 89 (1), 635-650 (2005)

Manuscripts in preparation

12 **Filippidi E.**, Bernstein J., Bartz G.C., DeMartini D.G, Waite J.H. and Valentine M.T. pH and time dependence of the structural maturation of marine mussel plaques (in preparation).

13 **Filippidi E.**, DeMartini D., Waite J.H. and Valentine M.T. Not all plaques are equal: variability among marine mussel genera (in preparation).

Invited Presentations

10 "Networks with covalent and metal-coordination cross-links." **Summer School on 'Double Dynamics for design of new responsive polymer networks and gels'**, DodyNet Initial Training Network, Capri, July 2019

9 "From mussel adhesion to novel materials: toughening elastomers with mussel-inspired metal coordination complexes." **Institute of Nanoscience and Nanotechnology of NCSR 'Demokritos'**, Athens, February 2019

8 "From mussel adhesion to novel materials: toughening elastomers with mussel-inspired metal coordination complexes." **National Hellenic Research Foundation**, Athens, November 2018

7 "From mussel adhesion to novel materials: toughening elastomers with mussel-inspired metal coordination complexes." **Department of Materials Science and Technology**, University of Crete, Heraklio, October 2018

6 "Toughening elastomers using covalent and mussel-inspired metal coordination complexes." **Polymat seminar**, University of the Basque Country, Donostia-San Sebastián, April 2018

5 "Controlling toughness and dynamics of polymer networks via mussel-inspired dynamical bonds." **APS March Meeting**, New Orleans, March 2017

4 "From mussels to mussel-inspired materials." **Soft Matter Symposium**, Univ. of Florida, Gainesville, Oct 2016

3 "Random Organization : from reversibility to irreversibility in non-Brownian sheared suspensions." Workshop on flow of granular materials, **Centro Argentino-Frances de Ciencias de la Ingenieria** (CAFCI), Buenos Aires, September 2016

2 "Random Organization : from reversibility to irreversibility in non-Brownian sheared suspensions." **Physics Department, Harvard University**, Cambridge, MA, May 2016

1 "Critical phenomena in periodically-sheared suspensions." **Chaos, Complexity and Transport Conference**, Marseille, France, May 2011

Contributed Conference Presentations

23 **Filippidi E.**, Jülicher F., Hyman A.A., *"Experimental determination of binodal compositions of protein and peptide solutions"* (talk) APS March Meeting, Denver, CO, March 2020 (online session due to COVID-19 cancellation)

22 **Filippidi E.**, Palles D., Cristiani T.R., Eisenbach C.D., Kamitsos E.I. *"Tough polymer networks with covalent and catechol-iron coordination bonds: correlation of binding stoichiometry with mechanical performance"* (poster) European Polymer Congress EPF, Hersonissos, Greece, June 2019

21 **Filippidi E.**, Patterson A., Danielsen S., Eisenbach C., Fredrickson G., Segalman R., Valentine M.T. *"Effect of Charge Density and Topology on Polyelectrolyte Complex Coacervation"* (talk) APS March Meeting, Los Angeles, CA, March 2018

20 Bartz C.G., DeMartini D., Waite J.H., **Filippidi E.**,Valentine M.T. *"Effects of physical parameters on structural maturation of marine mussel adhesive plaques"* (poster) APS March Meeting, Los Angeles, CA, March 2018

19 **Filippidi E.**, DeMartini D.G., Bartz G.C., Valentine M.T., Waite J.H., *"Effect of seawater pH and composition on the structural maturation of marine mussel adhesive plaques."* (talk) 6^{th} World Congress and 41^{st} Annual Meeting of the Adhesion Society, San Diego, CA, February 2018

18 **Filippidi E.**, Patterson A.L., Davidson E.C., Wonderly W.R., Waite J.H., Segalman R.A., Valentine M.T. *"The effect of charge density on peptoid coacervation."* (poster) 10^{th} Peptoid Summit, Lawrence Berkeley National Laboratory, July 2017

17 **Filippidi E.**, Cristiani T., Eisenbach C., Ahn B.K., Waite J.H., Israelachvili J.N., Valentine M.T. *"Toughening elastomers using mussel-inspired catechol-metal coordination complexes."* APS March Meeting (talk) and US-Brazil Young Physicists Forum (poster). Baltimore, MD, March 2016

16 **Filippidi E.**, DeMartini D.G., Malo de Molina P., Danner E.W, Kim J., Helgeson M.E., Waite J.H. and Valentine M.T., *"The mussel attachment plaque: a load-bearing protein scaffold."* (talk) Biophysical Society Annual Meeting, Los Angeles, CA, February 2016

15 **Filippidi**, DeMartini D.G., Waite J. H., Valentine M.T. *"The adhesive mussel plaque as a force distribution mechanism."* (poster) Materials Research Outreach Program Symposium, MRL, UC Santa Barbara, February 2016

14 **Filippidi E.**, DeMartini D., Malo de Molina P., Danner E.W, Kim J., Helgeson M.E., Waite J.H. and Valentine M.T., *"Mussels: an inspiration for underwater glue. The microscopic structure of adhesive plaques."* Gordon Research Seminar (talk) and Gordon Research Conference (poster) on Science of Adhesion, Mount Holyoke College, South Hadley, MA, July 2015

13 **Filippidi E.**, DeMartini D., Malo de Molina P., Ewert K., Danner E.W, Kim J., Eisenbach C., Helgeson M.E., Waite J.H., Valentine M.T., *"Novel view: the adhesive mussel plaque as a porous material."* NSF MRSEC site visit to UC Santa Barbara, May 2015

12 **Filippidi E.**, DeMartini D., Danner E.W, Kim J., Helgeson M.E., Waite J.H. and Valentine M.T., *"Network structure of the mussel plaque and its significance for load bearing and adhesion."*, APS March Meeting, San Antonio, TX, March 2015

11 **Filippidi**, DeMartini D.G., Danner E.W., Kim J., Helgeson M.E., Waite J. H., Valentine M.T., *"A novel view of the porous structure and mechanics of adhesive mussel plaques."* (poster) Materials Research Outreach Program Symposium, MRL, UC Santa Barbara, February 2015

10 **Filippidi E.**, Lerner E., Chaikin P.M., Pine D.J., *"Random Organization of Suspensions: Geometry versus Hydrodynamics."* APS March Meeting, Denver, CO, March 2014

9 **Filippidi E.**, Pine D.J., *"Criticality of non-colloidal suspensions under periodic shear."* APS March Meeting, Baltimore, MD, March 2013

8 **Filippidi E.**, Pine D.J., *"Application of the generalized fluctuation-dissipation theorem on a sheared suspension."* APS March Meeting, Boston, MA, February 2012

7 **Filippidi E.**, Franceschini A., Chaikin P.M. and Pine D.J., *"Critical phenomena in sheared suspensions."* (poster) at Gordon Research Seminar and Gordon Conference on Soft Matter Far from Equilibrium, Colby-Sawyer College, New London, NH, August 2011

6 **Filippidi E.**, Franceschini A. Chaikin P.M. and Pine D.J., *"Particle and fluid diffusivity of non-colloidal suspensions."* APS March Meeting, Dallas, TX, March 2011

5 **Filippidi E.**, Ramos L., Chaikin P., Pine D., *"Critical Phenomena in Periodically-Sheared Suspensions."* APS March Meeting, Portland, OR, March 2010

4 **Filippidi E.**, Pine D., Chaikin P., *"Self-organised criticality in sheared suspensions."* (poster), at the Conference on Flowing Complex Fluids: Rheological measurements and constitutive modeling at the Institute of Mathematics and its Applications, University of Minnesota, September 2009

3 **Filippidi E.**, Corte L., Chaikin P., Ramos L., Pine D., *"Self-organised Criticality in Periodically-Sheared Sedimenting Suspensions."* APS March Meeting, Pittsburgh, PA, March 2009

2 **Filippidi E.**, Corte L., Chaikin P., Ramos L., Pine D., *"Self-organised Criticality in Periodically-Sheared Sedimenting Suspensions."* 3rd I2CAM/FAPERJ School on Condensed Soft Matter Physics, Rio de Janeiro, Brazil, May 2009

1 Kinahan M.E., **Filippidi E.**, Köster S., Evans H., Pfohl T., Kaplan D. and Wong J.Y., *"A Novel Microfluidic Method to Fabricate Regenerated Bombyx Mori Silk Fibers for Tissue Engineering Applications."* Materials Research Society Fall Meeting 2008

Awards and Fellowships

01/2020	Junior group leader 3-year proposal "From polymers to Peptides" entered the second round of evalution (Greek Elidek)
09/2019	Approval notice of proposal "Polymer networks with improved mechanical properties" for 15-month project at FORTH, Crete with Prof. D. Vlassopoulos and Dr. S. Alexandris
09/2019	European Soft Matter Infrastructure (EUSMI) proposal "Ageing and slow dynamics of bulk biomolecular condensates" for feasibility study of ageing via multi-speckle dynamic light scattering at FORTH, Crete (E190800325)
06/2019	Springer Poster Award, European Polymer Congress for *"Tough polymer networks with covalent and catechol-iron coordination bonds: correlation of binding stoichiometry with mechanical performance"* by Filippidi E., Palles D., Cristiani T.R., Eisenbach C.D., Kamitsos E.I.
07/2016–07/2018	Otis Williams Postdoctoral Fellowship in Bioengineering for supporting the project "Novel Biocompatible but Non-Biodegradable Medical Adhesives" ($150,000)
05/2016	Doctoral Thesis Award of the Circle of Hellenic Academics in Boston ($1000)
03/2016	Dow Materials institute & MRL Travel Fellowship to attend the APS March Meeting
2009–2012	Alexander S. Onassis Foundation fellowship for four years of graduate studies
2009–2011	MacCracken and Kessler Fellowships of the Graduate School of Arts and Sciences, NYU
2005–2006	Whitaker Foundation Fellowship
2007	Eleni Gatzoyiannis Scholarship, Boston University
2005	MRSEC REU conference presentation award, REU conference at Univ. Southern Mississippi
2003–2004	Harvard College Research Grant and Radcliffe externship for career exploration
2005	Certificate of Recognition, Harvard Foundation for Intercultural and Race Relations
2002	Parents' Award to recent alumni, Athens College

Service

2016–present	**Referee** for *Nature Communications*, *Soft Matter*, *ACS Applied Materials & Interfaces*, *ACS Chemistry of Materials*, *Journal of Rheology*, *Polymers* and *Marine Drugs*.
07/2015	**Discussion leader** for the Gordon Research Seminar on the Science of Adhesion, Mount Holyoke College, South Hadley, MA.
2006, 2010–2012	Elected board member at the **Hellenic Bioscientific Association of the USA**
2002–2004	Treasurer and then **President of the Harvard Hellenic Society**

Teaching

2008–2009	**Instructor of Record**, New York University. Duties included teaching the laboratory class, error analysis; lab report and problem set grading; assignment of final grades
Fall	Physics III laboratory (Electricity-Magnetism-Optics), 2 credits
Spring	Physics II laboratory (Mechanics), 2 credits
Fall 2007	**Teaching Fellow**, General Physics I (Mechanics). New York University.
Fall 2006	**Teaching Fellow**, Introduction to Fluid Mechanics. Boston University.
09/2002–06/2005	**On-Call Peer Tutor**, Bureau of Study Counsel, Harvard University. Tutoring undergraduates in mathematics and physics: linear algebra, differential equations, complex analysis, mechanics.

Mentoring

05/2018–present	Mentoring UCSB undergraduate student Justin Bernstein funded by the Summer Undergraduate Research Fellowship (SURF)
06/2016–05/2018	Mentored undergraduate student Chandler Bartz, funded by the UCSB Research Internships in Science and Engineering (RISE) program. Both Justin and Chandler work(ed) on the determination of *M. californianus'* mussel plaque formation and structural maturation via electron microscopy.
05/2015–05/2016	Mentored undergraduate student Grant Antalek, funded by the UCSB RISE program. Building an automated system for imaging plaque formation using Arduino/Raspberry Pi. Currently, works as a chemist at LeChat Nails, CA.
09/2014–05/2015	Mentored undergraduate student Noah Rubin, funded by the UCSB RISE program. Decoupling mechanical properties of the mussel plaque from those of the thread. Noah will start his Ph.D. this fall.
06-08/2008	Mentored UMass Amherst student Sean Paradiso during the summer REU at NYU. Sean went on to receive his PhD in Chemical Engineering from UCSB /Fredrickson group, working on polymer simulations. Currently works at Citrine, CA.

Outreach

11/2017	**Panelist** at the UCSB SACNAS-sponsored panel discussion "Surviving grad school".
2015–2018	Participate as a **regular respondent** in the UCSB, MRL-organized **ScienceLine**, where 4^{th} to 12^{th} grade students and their teachers ask science questions weekly. Graduate students and post-doc volunteers provide level-appropriate answers. *http://www.scienceline.ucsb.edu*
04/2015	**Led interactive demonstrations** of electron microscopy for school-children during **Nano-Days 2015**. We shared the joy of SEM imaging by exploring natural specimens such as beetles and butterflies on a portable SEM. Event organized by the UCSB NSF-supported Nanoscale Informal Science Education and hosted by the Santa Barbara Museum of Natural History.
12/2014, 01/2015 08/2015, 04/2017 10/2017, 7/2018	**Led hands-on activities for elementary school students** with UCSB's MRL **"Solar Car"** workshop and **"It's a material world"** teams during local elementary school Science teams during local elementary school Science Nights. Guided students and parents of diverse backgrounds through building solar cars, demonstrations of hydrophobic lotus leaves artificial snow, ferro fluids, memory wire, thermochromic materials.
06/2013	**Instructor**, "Squishy Physics: Soft Matter in the House". Summer course for high school students organized by the Hellenic-American Educational Foundation in Athens, Greece

Professional Affiliations

2009–present	American Physical Society
2015–2018	Biophysical society
2017–2018	Adhesion Society

In popular media

05/2020	Interview with the Federal German Ministry for Education and Research for the brochure "Research careers in Germany"
11/2017	**C&EN News** "Mussels' iron grip inspires strong and stretchy polymer," https://cen.acs.org/articles/95/i44/Mussels-iron-grip-inspires-strong-stretchy-polymer.html
10/2017	"Designing tougher elastomers with ionomers," **Brief Perspective** on Materials Science by Karen Winey, ***Science***, 358 (6362), 449-450, doi: 10.1126/science.aap8114
10/2017	"Material inspired by ocean mussels could lead to self-healing plastics," **News Piece** by Robert Service, ***Science***, doi:10.1126/science.aar3333
10/2017	"Learning from mussels: A marine bivalve inspires researchers to make stronger polymers," **Phys.org news**, https://phys.org/news/2017-10-mussels-marine-bivalve-stronger-polymers.html
08/2017	"A tougher tooth: A new dental restoration composite developed by UCSB scientists proves more durable than the conventional material," The **UCSB Current** newspaper http://www.news.ucsb.edu/2017/018209/tougher-tooth
08/2017	"A tougher tooth: A new dental restoration composite proves more durable than the conventional material," **ScienceDaily** https://www.sciencedaily.com/releases/2017/08/170821154616.htm
09/2016	"And the winner is ...," The **UCSB Current**, article about the Otis-Williams Fellowship award, http://www.news.ucsb.edu/2016/017126/and-winner?
02/2016	Image submission voted at the **Top 10** at the Biophysical Society Art of Science Image Contest and exhibited throughout the Annual Meeting, Los Angeles, CA
02/2016	**Art of Science Popular Vote winner**. The competition is open to UCSB students and post-docs and is organized by the Schuller Lab, the California Nanosystems Institute (CNSI), the UCSB Library and the AD&D Museum
03/2015	"How Do Mussels Stick to Wet Rocks?", **APS Physics Central Blog** http://physicsbuzz.physicscentral.com/2015/03/how-do-mussels-stick-to-wet-rocks.html
03/2015	"The application of physics," **BBC's Science in Action** podcast and radio interview

Skills

Experimental Methods

rheology	microfluidics	scanning electron microscopy (SEM)	specimen sectioning techniques
light scattering	X-ray scattering	neutron scattering	
NMR spectroscopy	isothermal titration and differential scanning calorimetry (ITC and DSC)		
tensile testing	metal & plastic machining	laser cutting	cell culture
protein purification		chromatography	quartz crystal microbalance

Marine Science relevant

Mussel Mariculture SCUBA Open Water certification, Level I Night Diving
Sailing (Optimist, Europe, J/22, J/24)

Computer Programming

Matlab Fortran Java AutoCad HTML

Languages

Greek (native) English (fluent) Portuguese (conversational) French (DELF A)