



# Pedro E. S. Silva

PhD in Nanosciences and Nanotechnology



## Personal info

- Name** Pedro Emanuel Santos Silva
- Birthday** September 5th, 1986
- Nationality** Portuguese
- Civil Status** Married (by common-law) with one children, with 1 year.
- Summary** Currently, I am a Researcher Fellow in the Soft and Biofunctional Materials Group (SBMG) group of CENIMAT+i3N (Portugal), a research centre devoted to nanomaterials science. My main area is structural functional and smart materials, with focus in the bioinspired design of macro and microscopic structures with helical architectures.


## Education


- PhD in Nanosciences and Nanotechnology**  
University of Aveiro. 2012 – 2018  
Dissertation Topic: *Development of new structures with helical filaments.*
- MSc. in Physics**  
University of Aveiro. 2008 – 2010  
Dissertation Topic: *Modelling the dynamics of elastic filaments.*
- BSc. in Physics**  
University of Aveiro. 2004 – 2008  
Dissertation Topic: *Photoluminescence decay times of Hybrid Organic Inorganic.*

## Academic Experience

- Research Fellowship (M-ERA-NET2/0007/2016)  
NOVA University of Lisbon, 2018 – present.
- Research Fellowship (FCT UID/CTM/50025/2013)  
NOVA University of Lisbon, 2016 – 2018.
- PhD Scholarship (FCT SFRH/BD/76369/2011)  
University of Aveiro, 2012 – 2015.
- Research Fellowship (FCT PTDC/CTM/101776/2008)  
University of Aveiro, 2010 – 2011.

## Contact

 CENIMAT+i3N,  
Dept. of Materials Science,  
FCT-UNL, Campus de Caparica,  
2829-516 Caparica, Portugal


 [pess@fct.unl.pt](mailto:pess@fct.unl.pt)  
[pess@ua.pt](mailto:pess@ua.pt)

 +351 910 594 210

 [pedrosilva.page/](http://pedrosilva.page/)

 [p5ilva](https://www.linkedin.com/in/p5ilva)


 [@silva\\_phd](https://twitter.com/silva_phd)

 **ORCID:** 0000-0002-8783-8740  
**Google ID:** jMXeWMcAAAAJ  
**Researcher ID:** F-4918-2016  
**Scopus ID:** 7203089095  
**Ciência ID:** 7215-C034-E843

## Research Interests

Molecular dynamics simulations,  
GPU computing, Polymer Physics,  
Helices, Tendril perversions

## Languages

Portuguese (native) 

English 

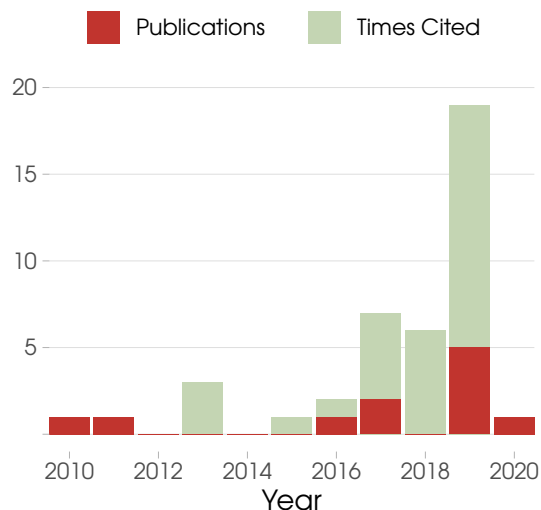
French 

Spanish 

## Research Synopsis

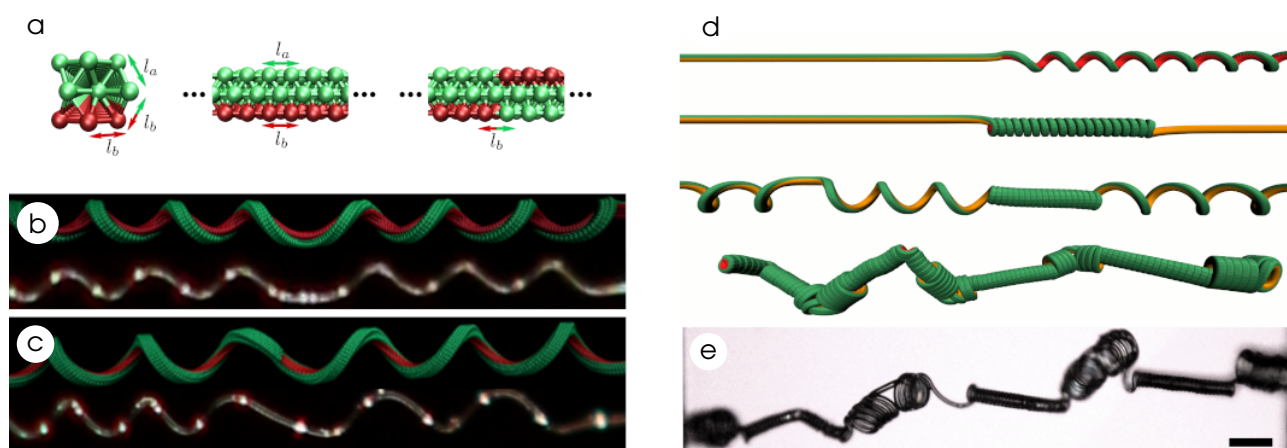
Pedro Silva dedicated his research and educational interests to bioinspired flexible materials. During his PhD, he devised several strategies to validate both theoretical and computational models with real experiments, using innovative and creative approaches in molecular dynamics simulations and electrospinning technique. Resourceful, with ingenious skills, able to work as part of a team and to use own initiative. Committed to the highest levels of professional and personal excellence. His work is driven by passion for science and on the basis of discovering relevant phenomena that can help making a better society.

Main contributions include 6 research papers published in peer-reviewed in Science Citation Index journals and 2 book chapters, being the first author of 6, with 37 citations (34 in the last 5 years), as shown in Fig. 1, and an h-index of 4.



**Fig. 1:** Citation report retrieved from [Google Scholar](#) in February 3, 2020.

Main additions to science are related to shaping elastomeric fibres to acquire specific designs. In 'Perversions with a Twist' a whole range of perversion geometries in elastic filaments was proposed. Fig. 2a-c shows two extreme types of perversions, denominated symmetric and antisymmetric, that can be shaped in polymeric fibres, replicating a behaviour predicted by computer simulations. In subsequent work, experiments demonstrated for the first time how to produce microfilaments composed by segments with different curvatures, by applying different exposure times to UV light, and how their shapes changed under tension, Fig. 2d-e



**Fig. 2:** Computer simulations and experimental results of (a-c) symmetric and antisymmetric perversions and (d-e) alternated intrinsic curvatures; (b) the shape of perversions is similar to the ones found in plant tendrils, when no local twist is applied; (c) a half turn twist changes the overall behaviour and geometry of the perversion; (d) from simulation it can be observed that regions with higher intrinsic curvatures curl first.

## Book Chapters

- ② P. E. S. SILVA, M. H. Godinho and F. V. de Abreu. *Computational design of superhelices*. In: J. Rodrigues et al. (eds) *Computational Science – ICCS 2019. Lecture Notes in Computer Science*, **11536**. Springer, Cham (2019)
- ① P. E. S. SILVA, F. V. de Abreu, A. I. D. Correia and M. H. Godinho. *Handedness in plant tendrils*. In: B. Bahadur et al. (eds) *Asymmetry in Plants: Biology of Handedness*. CRC Press, Taylor & Francis Group (2019).

## Journal Publications

- ⑦ D. V. Saraiva, R. Chagas, B. M. de Abreu, C. N. Gouveia, P. E. S. SILVA, M. H. Godinho and S. N. Fernandes. *Flexible and Structural Coloured Composite Films from Cellulose Nanocrystals/Hydroxypropyl Cellulose Lyotropic Suspensions*. *Crystals*, **10:2**, 122 (2020).
- ⑥ A. P. C. Almeida, L. Querciagrossa, P. E. S. SILVA, F. Gonçalves, J. P. Canejo, P. L. Almeida, M. H. Godinho and C. Zannoni. *Reversible water driven chirality inversion in cellulose-based helices isolated from Erodium awns*. *Soft Matter*, **15**, 2838–2847 (2019).
- ⑤ P. E. S. SILVA, F. V. de Abreu and M. H. Godinho. *Shaping helical electrospun filaments: A review*. *Soft Matter*, **13:38**, 6661–6958 (2017).
- ④ P. E. S. SILVA and M. H. Godinho. *Helical Microfilaments with Alternating Imprinted Intrinsic Curvatures*. *Macromolecular Rapid Communications*, **38:5**, 1600700 (2017).
- ③ P. E. S. SILVA, J. L. Trigueiros, A. C. Trindade, R. Simoes, M. H. Godinho, R. G. Dias and F. V. de Abreu. *Perversions with a twist*. *Scientific Reports*, **6**, 23413 (2016).
- ② M. Facção, A. Lopes, A. L. Silva and P. SILVA. *Computer simulation for calculating the second-order correlation function of classical and quantum light*. *European Journal of Physics*, **32**, 925–934 (2011).
- ① P. E. S. SILVA, F. V. de Abreu, R. Simoes and R. G. Dias. *A first approach to model filament dynamics with a computer*. *European Journal of Physics*, **31**, 1473–1483 (2010).

## Participation in Scientific Meetings

- ⑩ P. E. S. SILVA, M. H. Godinho, F. V. de Abreu. *Computational Design of Superhelices Inspired by Tendril Perversions*. 2nd Eutopia Annual Meeting 2019 (COST), San Sebastian, November 2019. (oral)
- ⑨ P. E. S. SILVA, M. H. Godinho, F. V. de Abreu. *Computational Design of Superhelices by Local Change of the Intrinsic Curvature*. 19th International Conference on Computational Science, Faro, June 2019. (oral)
- ⑧ P. E. S. SILVA, F. V. de Abreu, M. H. Godinho. *Designing elastomeric ribbons with superhelical shapes*. *Materiais 2019*, Lisboa, April 2019. (poster) 🏆 **best poster award**
- ⑦ P. E. S. SILVA, F. V. de Abreu, M. H. Godinho. *Producing fibres with helical shapes using UV light*. 5th Annual International Workshop on Soft & Complex Matter, Oslo, October 2018. (invited)

- 6 P. E. S. SILVA, F. V. de Abreu, M. H. Godinho. *Printing curvature and torsion in elastomeric ribbons*. 3rd International Conference on Photoalignment and Photopatterning in Soft Materials, Tampere, June 2018. (oral)
- 5 P. E. S. SILVA, F. V. de Abreu, M. H. Godinho. *Tuning the curvature and torsion of anisotropic elastic filaments*. International Liquid Crystal Elastomer Conference, Houston, October 2017. (oral)
- 4 P. E. S. SILVA, F. V. de Abreu, M. H. Godinho. *A new twist on perversions*. 6th Jornadas do CENIMAT, Lisbon, July 2016. (oral)
- 3 P. E. S. SILVA, A. C. Trindade, F. Vistulo de Abreu, M. H. Godinho. *Intrinsic curvature of elastic filaments revealed by wrinkling*. 8th International Liquid Crystal Elastomer Conference, Erice, Italy, October 2015. (poster)
- 2 P. E. S. SILVA, B. F. Faria, R. G. Dias, F. V. de Abreu. *Simulation of force-extension experiments for elastic filaments using GPUs*. 6th International Liquid Crystal Elastomer Conference, Lisbon, September 2011. (poster)
- 1 P. E. S. SILVA, F. Vistulo de Abreu, R. Simoes, R.G. Dias. *Modelação da dinâmica de filamentos elásticos*. 17th Conferência Nacional de Física, Vila Real, September 2010. (poster)

## Lecture Experience

- 2 Lab classes of **Liquid Crystals and Applications** – 2 h/week  
NOVA University of Lisbon. 1st Semester 2019/20
- 1 Lab classes of **Polymer Chemistry** – 1 h/week  
NOVA University of Lisbon. 1st Semester 2018/19

## Other Activities

- 6 Course: *Sciencepreneur - Entrepreneurship and Science*. Coordinators: Paulo Soares de Pinho and Isabel Rocha. 11 sessions (56 hours). Lisbon, Portugal, January 15 – March 25, 2020.
- 5 School: *Evolving Soft Matter: Shape, Dynamics and Functionality*. Lecturers: Eric Clement, Stephane Douady, Tom Witten, Daniel Bonn, Maria Helena Godinho, David Hu, Ramin Golestanian, David Nelson, Adrian Rennie, Petra Rudolf, and Alain Goriely. Geilo, Spain, March 11 – 21, 2019.
- 4 Research visit: Laboratory for soft and complex matter studies (Jon Otto Fossum). Norwegian University of Science and Technology, Norway, October 15 – 22, 2018.
- 3 Workshop: *Beyond Molecular Dynamics: Long Time Atomic-Scale Simulations*. Max Planck Institute for the Physics of Complex Systems, Germany, March 26 – 29, 2012.
- 2 School: *Programming and Tuning Massively Parallel Systems*. Lecturers: Wen-mei W. Hwu and David B. Kirk (NVIDIA). Barcelona Supercomputing Center, Spain, July 18 – 22, 2011.
- 1 Workshop: *GPU Workshop*. University of Coimbra, Portugal, July 6 – 8, 2011.

# ★ Skills

- MATLAB
- Python
- LAMMPS
- L<sup>A</sup>T<sub>E</sub>X
- HTML/CSS

- C, C++, Cuda C
- Fortran
- R
- Microsoft Office
- GIMP, ImageJ, Inkscape