

# Miles Martinati

## Profile

Experimental physicist in the field of nanostructures with a background in condensed matter physics, optical spectroscopy and non-linear optics.

## Keywords

Physics, carbon nanotubes (CNTs), graphene, graphene nanoribbons (GNRs), linear carbon chains (LCCs), Raman spectroscopy, photo-luminescence excitation (PLE) spectroscopy.

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## Research experience

### PhD in Physics



<b>Duration</b>	Jan 2017 – May 2021
<b>Location</b>	<b>Universiteit Antwerpen</b> , Antwerp, Belgium
<b>Group</b>	<b>NANOrOPT</b> group, Faculty of Science, Physics department
<b>Supervisors</b>	Prof. dr. <b>Sofie Cambré</b> , Prof. dr. <b>Wim Wenseleers</b>
<b>Scholarships</b>	<b>Jan 2017 - Oct 2017</b> (9 months) funded by the European Research Council through an ERC Starting Grant No. 679841 (ORDERin1D) "Order in one dimension: Functional hybrids of chirality-sorted carbon nanotubes", granted to prof. Dr. Sofie Cambré. <b>Oct 2017 - May 2021</b> (3.5 years) PhD grant (BOF-DOCPRO4) "Diameter-dependent phase transitions in one-dimension arrays of molecules confined inside single-wall carbon nanotubes" funded by the University of Antwerp Research Fund.
<b>General topic</b>	My PhD research is focused on the spectroscopic characterization of carbon-based nanostructures, <i>i.e.</i> carbon nanotubes (CNTs), graphene nanoribbons (GNRs), linear carbon chains (LCCs), via absorption, photo-luminescence excitation (PLE) and wavelength-dependent resonance Raman spectroscopy.
<b>PhD Thesis</b>	Optical spectroscopy of one-dimensional carbon nanostructures encapsulated inside carbon nanotubes.
<b>Defense</b>	University of Antwerp, 22 June 2021.

## Projects

<b>Project #1</b>	<b>GNR and LCC@CNTs</b>
<b>Description</b>	Wavelength-dependent resonant Raman characterization of GNRs and LCCs synthesized inside single-walled carbon nanotubes.
<b>Objectives</b>	1) Full Raman characterization of GNRs and LCCs encapsulated inside CNTs. 2) Determination of the electronic and vibrational properties of the encapsulate structures.
<b>Results</b>	Determination of the exact structure of GNRs via Raman spectroscopy. Determination of the higher electronic optical transitions of LCCs.
<b>Project #2</b>	<b>Phase transitions of water in 1D</b>

<b>Description</b>	Chirality-dependent study of the phase transition of water encapsulated inside the 1D inner cavity of CNTs.
<b>Objectives</b>	1) Realization of film samples of sorted empty and water-filled CNTs. 2) Low-temperature measurements of empty and water-filled samples by Raman and PLE spectroscopy. 3) Identification of structural and/or orientational phase transitions of the encapsulated water molecules.
<b>Results</b>	Observation of the phase transition of water encapsulated inside 5 different CNT chiralities by means of low-temperature PLE and Raman spectroscopy.

### **Project #3 PLE fitting GUI**

<b>Description</b>	Development of a Graphic User Interface for fitting photoluminescence excitation spectra of CNTs.
<b>Objectives</b>	Standardization of the PLE fitting analysis.
<b>Output</b>	Free standardized Graphic User Interface.

### **Project #4 Aqueous two-phase separation**

<b>Description</b>	Monitoring the concentration of sorted CNTs during ATP separation with absorption, PLE and Raman spectroscopy as a function of the concentration of different surfactants.
<b>Objectives</b>	Sorting of CNTs chirality via aqueous two-phase separation.
<b>Results</b>	Complete overview of the ATP separation method as a function of the concentration of the most used surfactants.

## **Collaborations**

**Sun Yat-sen University**, Guangdong, P. R. China. Prof. dr. **Lei Shi**. Synthesis of 1D nanostructures.

**University of Vienna**, Vienna, Austria. Prof. dr. **Hans Kuzmany**. Solid state physics, spectroscopy.

**University of Arizona**, Tucson, Arizona. Prof. dr. **Jean-Luc Brédas**. Quantum chemistry.

**ELTE Eötvös Loránd University**, Budapest, Hungary. Prof. dr. **Jenő Kürti**. Quantum chemistry of CNTs.

**Ulm University**, Ulm, Germany. Prof. Dr. **Ute Kaiser**. Transmission electron microscopy (TEM).

**Nanotube Research Centre**, Tsukuba, Japan. Prof. dr. **Takeshi Saito**. CNT syntehsis.

## **Summerschool**

<b>Jun 2019</b>	<b>Summer School on Low Dimensional Systems</b> , University of Montpellier, Montpellier, France.
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## **Education**

### **Master of Science in Condensed Matter Physics**



<b>Duration</b>	Dec 2013 – Jul 2016
<b>University</b>	University of Rome, "La Sapienza"
<b>Location</b>	Rome (Italy)
<b>Final mark:</b>	110/110 cum laude

**Thesis title:** "Phonon anomalies in graphene reveal by pulsed Raman spectroscopy"

**Project** Ultrafast Raman spectroscopy of graphene

**Group** Femtoscopy group, Physics department, La Sapienza.

**Objectives** Determination of the non-equilibrium vibrational properties of graphene.

**Collaborations** Istituto Italiano di Tecnologia, Rome, Italy. Cambridge Graphene Centre, Cambridge, UK. IFN-CNR, Milano, Italy.



## Bachelor of Science in Physics

**Duration** Sep 2010 – Dec 2013

**University** University of Rome, "La Sapienza",

**Location** Rome (Italy) **Final mark**

103/110



## Secondary School Diploma

**Duration** Sep 2005 – Jul 2010

**School** Liceo Classico, "Virgilio", Rome (Italy)

## Publications

C. Ferrante, A. Virga, L. Benfatto, **M. Martinati**, D. De Fazio, U. Sassi, C. Fasolato, A. K. Ott, P. Postorino, D. Yoon, G.

## Extra courses

**Nov 2019** **Leadership & Teamwork @** Antwerp Doctoral School.  
How to lead and coordinate a team.

**May 2019** **Optimizing Cooperation in International Environment @** Cultural Quantum  
Cross cultural training to improve communications and synergy in international projects.

**Oct 2018** **Writing Academic Paper in English @** Antwerp Doctoral School Tools  
and techniques to improve scientific paper writing.

**May 2017** **Applied Communication @** GEVAK-consulting –  
Practice tools and techniques to improve communication with stakeholders.

**March 2015** **Project Management Foundation @** Eureka Service  
Project Management methodology according to PMI standard (PMBok 6<sup>th</sup> edition).

**June 2015** **Microsoft Project Basic @** Eureka Service  
Use of Microsoft Project software application for project planning and monitoring.

Cerullo, F. Mauri, A. C.

Ferrari, T. Scopigno. **Raman spectroscopy of graphene under ultrafast laser excitation.** *Nat Commun* **9**, 308 (2018).  
<https://doi.org/10.1038/s41467-017-02508-x>

H. Kuzmany, L. Shi, **M. Martinati**, S. Cambré, W. Wenseleers, J. Kürti, J. Koltai, G. Kukucska, K. Cao, U. Kaiser, T. Saito, and T. Pichler. **Well-defined sub-nanometer graphene ribbons synthesized inside carbon nanotubes.** *Carbon*, vol. 171, pp. 221–229, (2021). <https://doi.org/10.1016/j.carbon.2020.08.065>

M. Martinati, L. Shi, T. Pichler, P. Saied, V. Coropceanu, J.L. Brédas, W. Wenseleers and S. Cambré. **Full electronic spectrum of carbene synthesized inside CNTs from resonant Raman spectroscopy.** In preparation.

S. Cambré, W. Van Werveke, M. De Clercq, M. Erkens, M. Martinati, and W. Wenseleers. **Quantitative 2D fitting of fluorescence-excitation maps: Excitation line shape of single-wall carbon nanotubes.** In preparation.

J. Defiliet, M. Martinati, M. Avramenko, M. A. L. Carillo, D. Van der Elst, W. Wenseleers and S. Cambré. **The role of bile salt surfactants in aqueous two-phase separation of single-walled carbon nanotubes revealed by systematic parameter variations.** In preparation.

## Conference and Networking

Jun 2018	Mol@NT2018 workshop, Université Sorbonne, Paris, France.
Jan 2019	Research day, Universiteit Antwerpen, Antwerp, Belgium. <b>Poster presentation.</b>
Jun 2019	Summer School on Low Dimensional Systems, University of Montpellier, Montpellier, France. <b>Poster presentation.</b>
Jul 2019	NT19 : International Conference on the Science and Application of Nanotubes and LowDimensional Materials. University of Wurzburg, Würzburg, Germany. <b>Poster presentation.</b>
Sep 2020	v-WNMO: virtual Workshop on NanoMaterials & Optics Cyberspace. Julius-Maximilians-University Würzburg, Germany. <b>Contributed talk.</b>

Date 20/08/2021

Signature



IT skills

Matlab

C/C++

Microsoft Office

Microsoft Project

Languages

(A1)

(A2)

Hobbies