

## TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO CODE 5465

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di Biotecnologie Medicine e Medicina Traslazionale**.

Scientist- in - charge: Prof. Marco Buscaglia.

## Maria Izabel Muniz Foscarini

## **CURRICULUM VITAE**

#### PERSONAL INFORMATION

Surname	Muniz Foscarini
Name	Maria Izabel

#### PRESENT OCCUPATION

Appointment	Structure
PhD Candidate	Department of Physics, Universidade Federal de Minas Gerais

## EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Degree	Bachelor in Physics	Universidade Federal de Minas Gerais (UFMG)	2016
Specialization	Not Applicable	Not Applicable	Not Applicable
PhD	Physics (ongoing)	Universidade Federal de Minas Gerais (UFMG)	Dec. 2022
Master	Physics	Universidade Federal de Minas Gerais (UFMG)	2018
Degree of mee specialization	dical Not Applicable	Not Applicable	Not Applicable
Degree of Europ specialization	ean Not Applicable	Not Applicable	Not Applicable

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# UNIVERSITÀ DEGLI STUDI DI MILANO

Other	Introduction to Computer Science with Python Part 1	Universidade de São Paulo (USP) via Coursera	2021
Other	Python for Everybody	University of Michigan via Coursera	2022

## REGISTRATION IN PROFESSIONAL ASSOCIATIONS

Date of registration	Association	City
Not Applicable	Not Applicable	Not Applicable

#### FOREIGN LANGUAGES

Languages	level of knowledge
Portuguese	Native
English	Fluency

## AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
2014-2015	Undergraduate project scholarship (18 months, CNPq/PIBIC): R\$7,200.00
2015-2016	Undergraduate project scholarship (12 months, CNPq/PIBIC): R\$4,800.00
2016-2018	Master scholarship (24 months, CNPq/GM/GD): R\$36,000.00
2018-2022	PhD scholarship (51 months: 3 Fapemig/PAPG, 45 CAPES/PROEX + 3 pandemic extension): R\$112,200.00

## TRAINING OR RESEARCH ACTIVITY

#### description of activity

1º undergraduate research project: I developed a study in time-resolved spectroscopy and nonlinear microscopy in hexagonal Boron Nitride (h-BN) samples through second harmonic generation (SHG). Optical microscopy allowed me to analyze the dependence of SHG intensity and incidence angle from wrinkles in h-BN.

Advisor: Dr. Ana Maria de Paula in the Biophotonics Laboratory at the Department of Physics, UFMG.

2º undergraduate research project: I performed numerical simulations of the countercurrent flow limitation (CCFL) during a Loss of Coolant Accident (LOCA) in Pressurized Water Reactors (PWR) using SolidWorks, Ansys, OpenFOAM and CFD. The main goal was to identify more efficient strategies to prevent the reactor core from overheating, which could lead to its melting.



Advisor: Dr. Hugo Cesar Rezende in the Thermo-Hydraulic Laboratory in the Nuclear Technology Development Center (CDTN, Brazil).

Master's degree research project: The classical trajectories for a positron interacting collinearly with a vibrating molecule  $H_2$  are calculated in search for a chaotic scattering behavior. The interaction positron-molecule has been modelled via a coupled Morse potential as the internal potential of the molecule, and the interaction positron-molecule was obtained by Finite Nuclear Mass Correction (FNMC).

Advisors: Drs. José Rachid Mohallem and Luis Argel Poveda Calviño.

#### PROJECT ACTIVITY

Year	Project
2018-2022	PhD research projects: I study the denaturation of nucleic acids, defined as the unwinding of double-stranded helix, leading to two separate single strands, based on a physical statistical model called Peyrard-Bishop (PB) model. The PB model defines the Morse potential as the connecting hydrogen bonds in two bases on opposite strands, and the harmonic elastic potential as the stacking interaction between two neighboring pairs. I applied the PB model to parameterize threose nucleic acid (TNA) and RNA/DNA mismatches, and to investigate the influence of magnesium ions on the denaturation of DNA. Advisor: Dr. Gerald Weber.

#### PATENTS

Patent	
Iot Applicable	

## CONGRESSES AND SEMINARS

Date	Title	Place
19-21 Nov. 2014	5th INCT Meeting on Carbon Nanomaterials	Belo Horizonte, MG, Brazil
9-12 Dec. 2014	XXV Physics School	Belo Horizonte, MG, Brazil
23-24 Nov. 2017	I Workshop of the Department of Physics	Belo Horizonte, MG, Brazil
28-30 Nov. 2018	II Workshop of the Department of Physics	Belo Horizonte, MG, Brazil
17-20 Oct. 2019	XLIV Congress of the Brazilian Society of Biophysics	Santos, SP, Brazil
1-4 Dec. 2020	IV Workshop of the Department of Physics	Belo Horizonte, MG, Brazil
16-18 Dec. 2020	Physics Institute/Universidade Federal de Alagoas~(UFAL) Graduate Meeting	Online
15-19 Mar. 2021	School of Synthesis and Characterization of Biological	Online



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	and Nanostructured Systems	
22-25 Mar. 2021	VI Regional Congress of the Brazilian Society of Biophysics	Online
24-28 May 2021	X School of Molecular Modeling in Biological Systems	Online
22-24 Sep. 2021	2nd Conference of Women in Bioinformatics and Data Science LA	Online
25-26 Oct. 2021	6th Brazilian Student Council Symposium: Omics and Data Science	Online
9-11 Nov. 2021	Structural Biology Symposium	Online
30 Nov 3 Dec. 2021	V Workshop of the Department of Physics	Online
5-8 Sep. 2022	46th Congress of the Brazilian Society of Biophysics/LAFESB	Águas de Lindóia, SP, Brazil
20-23 Sep. 2022	3rd Conference of Women in Bioinformatics and Data Science LA	Online

#### PUBLICATIONS

Articles in reviews

DNA/TNA mesoscopic modeling of melting temperatures suggests weaker hydrogen bonding of CG than in DNA/RNA, Maria Izabel Muniz, Hershel H. Lackey, Jennifer M. Heemstra and Gerald Weber, Chemical Physics Letters, v. 749, 137413, doi: 10.1016/j.cplett.2020.137413, Mar. 2020.

Cation valence dependence of hydrogen bond and stacking potentials in DNA mesoscopic models, Maria Izabel Muniz, Adrian H. Bustos, Sofie Slott, Kira Astakhova and Gerald Weber, submitted in Biophysical Chemistry in October 2022.

Congress proceedings

Poster title: Second harmonic generation in boron nitride crystals, 5th INCT Meeting on Carbon Nanomaterials, Brazil, 2014.

Poster title: Chaos in positron-molecule systems, I Workshop of the Department of Physics, Brazil, 2017.

Poster title: Magnesium concentration effects on the thermal stability of DNA with mesoscopic model, XLIV Congress of the Brazilian Society of Biophysics, Brazil, 2019.

Talk title: Analysis of thermal stability of DNA/TNA sequences via a mesoscopic model, IV Workshop of the Department of Physics, Brazil, 2020.

Talk title: Mesoscopic model applied to DNA/TNA hybrid, Physics Institute/Universidade Federal de Alagoas (UFAL) Graduate Meeting, Online, 2020.

Talk title: Analysis of thermal stability of single internal mismatches in RNA/DNA duplexes via a mesoscopic model, V Workshop of the Department of Physics, Online, 2021.



Poster title: Magnesium dependence of hydrogen bond and stacking potentials in DNA, 46th Congress of the Brazilian Society of Biophysics/LAFESB, Brazil, 2022.

#### OTHER INFORMATION

Evaluator in Department of Physics at UFMG (Sep. 2020, 2021): I took part in the evaluation committees of the XXIX and XXX Weeks of Scientific Research, in which I analyzed different research projects of undergraduate physics students.

Student representative at Collegiate of the Graduate Program in Physics (Oct. 2020 - Oct. 2021): I participated in monthly meetings representing the interests of students, I integrated committees that aimed to regulate the resolutions of the mandatory teacher training program and student qualification exam, I aided students with miscellaneous administrative issues.

Lecturer in Physics in undergraduate courses (May 2021 - Sep. 2021): In the subject of "Experimental Physics (Mechanics)", as part of the graduate program in physics. "Mandatory teacher training program" at the Exact Sciences Institute (ICEx, UFMG).

I prepared and gave a weekly 2h class on the subject Experimental Physics (Mechanics) online, for 2 classes of 25 students each. Besides that, I also prepared, applied and corrected exams and homework on the same subject.

Master's degree: "Chaos in a positron-molecule system".

PhD thesis: "Mesoscopic model applied to DNA/TNA hybrids and DNA in solutions containing Mg<sup>2+</sup>".

Skills:

Computational: Python, Linux, LaTeX.

Biophysics: Theory of nucleic acids, mesoscopic model, thermal stability, DNA, RNA, XNA, mismatches.

Physics: Experiment, theory, nonlinear optics, spectroscopy, 2D materials, countercurrent flow limitation, caos, chaotic scattering.

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

Please note that CV WILL BE PUBLISHED on the University website and It is recommended that personal and sensitive data should not be included. This template is realized to satisfy the need of publication without personal and sensitive data.

Please DO NOT SIGN this form.

Place and date: Belo Horizonte, MG, Brazil, November 8, 2002.