



## ZÉLIA MARIA DA COSTA LUDWIG: RESILIENCE IN PHYSICS

*Gustavo Augusto Assis Faustino<sup>1</sup>*

**Abstract:** Zélia Maria Da Costa Ludwig was born on April 22, 1968, in the city of Ituiutaba, in the Minas Triangle. Daughter of a lathe worker and a housewife, she was encouraged by her father, used to leaf through electronic magazines reading about electronic components and how to assemble electrical circuits. In 1989, she graduated in Physics from the Pontifical Catholic University of São Paulo, did a master's degree at IPEN (Institute of Energy and Nuclear Research), at the University of São Paulo (USP), where she obtained her title in 1994. In her doctorate, she glimpsed the possibility of working with new materials, as well as changing their properties for specific applications. In 2000, he obtained his doctoral degree and, in 2002, he earned another undergraduate degree at the Institute of Physics at USP. In 2007, Zélia Ludwig entered the Federal University of Juiz de Fora as a visiting professor. Two years later, she became an effective teacher at the institution, where she works today.

**Keywords:** physics; materials science, spectroscopy, nuclear energy; mom; black scientist;

## ZÉLIA MARIA DA COSTA LUDWIG: RESILIÊNCIA NA FÍSICA

**Resumo:** Zélia Maria Da Costa Ludwig nasceu em 22 de abril de 1968, na cidade de Ituiutaba, no Triângulo Mineiro. Filha de um torneiro mecânico e de uma dona de casa, foi incentivada pelo seu pai, costumava folhear revistas de eletrônica lendo sobre componentes eletrônicos e como montar circuitos elétricos. Em 1989, graduou-se em Física pela Pontifícia Universidade Católica de São Paulo, fez mestrado no IPEN (Instituto de Pesquisas Energéticas e Nucleares), na Universidade de São Paulo (USP), onde obteve o título em 1994. No doutorado, ela vislumbrou a possibilidade de trabalhar com novos materiais, bem como a alteração de suas propriedades para aplicações específicas. Em 2000, obteve seu título de doutorado e, em 2002, conquistou mais um diploma de graduação, no Instituto de Física da USP. Em 2007, Zélia Ludwig entrou na

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<sup>1</sup> Licenciando em Química na Universidade Federal de Goiás, integrante do Coletivo Negro/a Ciata do Laboratório de Pesquisas em Educação Química e Inclusão (LPEQI/NUPEC/IQ/UFG). Bolsista do Programa Institucional de Iniciação Científica - PIBIC nas Ações Afirmativas (PIBIC AF/CNPq). Assistente editorial da Revista da Associação Brasileira de Pesquisadores/as Negros/as (ABPN). Técnico em Química pelo Instituto Federal de Goiás - Campus Inhumas (IFG). Atua na área de ensino de química, história africana e afro-brasileira, feminismos negros e a descolonização do currículo de ciências. E-mail: [gustavoaugusto531@gmail.com](mailto:gustavoaugusto531@gmail.com)

Universidade Federal de Juiz de Fora como professora visitante. Dois anos depois, tornou-se professora efetiva da instituição, onde trabalha até hoje.

**Palavras-Chave:** física; ciência dos materiais, espectroscopia, energia nuclear; mãe; cientista negra;

### **ZÉLIA MARIA DA COSTA LUDWIG: RESILIENCIA EN FÍSICA**

**Resumen:** Zélia Maria Da Costa Ludwig nació el 22 de abril de 1968 en la ciudad de Ituiutaba, en el Triángulo de Minas. Hija de un tornero y ama de casa, fue alentada por su padre, solía hojear revistas electrónicas leyendo sobre componentes electrónicos y cómo ensamblar circuitos eléctricos. En 1989, se graduó en Física de la Pontificia Universidad Católica de São Paulo, hizo una maestría en el IPEN (Instituto de Investigaciones Energéticas y Nucleares), en la Universidad de São Paulo (USP), donde obtuvo el título en 1994. En su doctorado, vislumbró la posibilidad de trabajar con nuevos materiales, así como cambiar sus propiedades para aplicaciones específicas. En 2000, obtuvo su doctorado y, en 2002, obtuvo otra licenciatura en el Instituto de Física de la USP. En 2007, Zélia Ludwig ingresó en la Universidad Federal de Juiz de Fora como profesora invitada. Dos años después, se convirtió en una maestra efectiva en la institución, donde trabaja hoy.

**Palabras-clave:** física; ciencia de materiales, espectroscopia, energía nuclear; mamá; científico negro;

### **ZÉLIA MARIA DA COSTA LUDWIG: RÉSILIENCE EN PHYSIQUE**

**Résumé:** Zélia Maria Da Costa Ludwig est née le 22 avril 1968 dans la ville d'Ituiutaba, dans le Triangle des Minas. Fille d'un ouvrier tour et d'une femme au foyer, elle a été encouragée par son père, habitué à feuilleter des magazines électroniques lisant sur les composants électroniques et comment assembler des circuits électriques. En 1989, elle est diplômée en physique de l'Université pontificale catholique de São Paulo, a fait un master à l'IPEN (Institut de recherche sur l'énergie et le nucléaire), à l'Université de São Paulo (USP), où elle a obtenu son titre en 1994. Dans son doctorat, elle a entrevu la possibilité de travailler avec de nouveaux matériaux, ainsi que de modifier leurs propriétés pour des applications spécifiques. En 2000, il a obtenu son doctorat et, en 2002, il a obtenu un autre diplôme de premier cycle à l'Institut de physique de l'USP. En 2007, Zélia Ludwig entre à l'Université fédérale de Juiz de Fora en tant que professeur invité. Deux ans plus tard, elle est devenue une enseignante efficace à l'institution, où elle travaille aujourd'hui.

**Mots-clés:** la physique; science des matériaux, spectroscopie, énergie nucléaire; maman; scientifique noir;

### **INTRODUÇÃO**

Zélia Maria Da Costa Ludwig was born on April 22, 1968, in the city of Ituiutaba, in the Minas Gerais Triangle (Triângulo Mineiro). Daughter of a lathe worker and a

housewife, she remembers getting a book on Illustrated Science from her father, through a neighbour. It was from that book that she began to study. In addition, she remembers, affectionately, that her aunt was always bringing books to her as gifts, as she was a student of Literature course in Uberlândia. With great joy, she says that she read and studied all subjects with the books she won.

Zélia's entire family soon moved to São Paulo, a small town in the suburbs called Francisco Morato. It was there that Zélia studied until high school. To attend higher education, she had to get the train, bus and subway every day, taking this route to the university. She says that all her colleagues had a car while she had always worked and conquered her things, valuing each achievement she had.

Consequently, in 1989 she completed her Bachelor's Degree in Physics at the Pontifical Catholic University of São Paulo (PUC / SP). She says that she inherits from her mother this model of being focused, doing things with determination aiming the best result possible. On the other side, her scientist model was inspired by her father. In addition, she says that she never had an example of black professors in graduation.

Subsequently, in 1990 she entered the master's degree in Basic Nuclear Technology, at the University of São Paulo (USP). She reports that all the opportunities that appeared to her were not easy. She always had to look for them all, and in 1994, she concluded her master's degree, entering the following year for a PhD in Physics at the same institution, defending her thesis in 1994. Thus, she recalls that she first had recognition from foreign countries, and then she was recognized here in Brazil.

Zélia says she was also a teacher of basic education, working at Colégio Liceu Coração de Jesus. She always had in mind that she had to add to the lives of new people, and for that, people should walk alongside her, following her steps to occupy spaces of power, where they could make a difference.

Later, she also took the Full Degree in Physics course at USP, completing in 2001, and entered the post-doctorate in 2004, completing it in 2006, by the same institution, in the area of vitreous materials and optical fibers. During this period, she participated in the Visitors Program of the Max Planck Institute in Dresden-Germany and the Materials Research Center at the University of Missouri, in the United States.

The following year, in 2007, after completing her post-doctorate, she was approved as a Visiting Professor at the Federal University of Juiz de Fora (UFJF),

working in the Physics Department of the Institute of Exact Sciences. Likewise, on January 19, 2009, Zélia Maria Da Costa Ludwig became an effective professor at UFJF.

She is currently a professor, researcher and advisor at the Physics Department, has experience in the field of Physics, with an emphasis on Optical and Spectroscopic Properties of Ceramic Materials, as well as in Nanostructured Glassy Materials for applications in Optoelectronics and Photonics, acting mainly on the following topics: rare earth ions, luminescence, energy transfer, thermo-optical properties of materials, dosimetry and thermal analysis, and characterization techniques (electronic paramagnetic resonance (ESR), optical absorption (AO), Thermoluminescence (TL), Raman spectroscopy, Ray diffraction -X (DRX), Scanning and Transmission Electron Microscopy).

In addition, she created the Vitreous Materials Production Laboratory (LaProMaV / UFJF), which belongs to the Nucleus for Research, Teaching and Innovation in Glass at UFJF, of which she is also the coordinator. Member of the WG for Increasing Diversity and Racial Equity in Physics, of the Brazilian Physics Society, Member of the Brazilian Association of Black Researchers (ABPN) and Member of Parent in Science. She develops Interdisciplinary Studies on Gender, Race, Maternity, Science and Society with the proposal to discuss equity and the rights of the black community in academia and society, through the deconstruction of pre-established concepts. All her research contributions made her winning the following awards: Merit Commander Nelson Silva (2018), Rosa Cabinda Medal (2019), and Nelson Silva Medal (2019).

Zélia was vice-coordinator of the Graduation's and Bachelor's Degree in Physics at UFJF in the 2014-2017 period. She was also part of the Advisory Committee for Scientific Initiation projects at the Dean of Research (Propesq at UFJF). Member of the NDE Physics and Mathematics, Member of the Board, Counselor of Congrad UFJF (2018) and of the Evaluation Committee of PROP-UFJF. In addition, she created and implemented the Centre for Research, Teaching and Innovation in Materials (CEPEM) at the Physics Department of UFJF. Beyond that, she leads the Journal Quarks: Brazilian Electronic Journal of Physics, Chemistry and Materials Science and collaborates with the Institute of Energy and Nuclear Research and the Institute of Physics at USP.

She currently develops research extension projects, bringing science to underserved communities and using science as a tool to reduce inequalities. She is also

the creator of the following pages on the social networks “Black Women Scientists in Brazil - Race, Gender, and Science”, “Women, Science and Society” and “For ALL Girls in Science”.

Furthermore, she has published more than 79 congress works, 25 articles in journals, two books and signs seven book chapters and two registered patents. She mentored 14 more students in course completion and undergraduate research, seven students in the master's degree and mentors three students in the doctorate degree.

Finally, Zélia Maria Da Costa Ludwig (figure 01) emphasizes that black women, instead of earning a productivity grant, should receive a resilience grant. Mother and Researcher. Adupé!

**Figure 1:** Cientista Zélia.



*Source:* Social media of the Scientist Zélia.

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*Received in 07/15/2021*

*Approved in 08/15/2020*