

INTERVIEW



Professor Edenir Pereira Filho, a researcher with a broad and solid background in science and also a YouTuber, recently gave an interview to BrJAC

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Edenir R. Pereira Filho holds a degree in Chemistry from the Pontifical Catholic University of Campinas (1996), a Master's degree in Chemistry (1999) from the State University of Campinas (Unicamp), a Master's degree in Mathematics (2022) from the Federal University of São Carlos (UFSCar), and a doctorate (2003) in Science (Unicamp). He is currently an Associate Professor at UFSCar. He works mainly on spectroanalytic, with an emphasis on Inductively Coupled Plasma Optical Emission Spectroscopy (ICP OES), Flame Atomic Absorption Spectrometry (FAAS), and Laser Induced-Breakdown Spectroscopy (LIBS), and applications of chemometric tools (Design of Experiments, DoE) in atomic spectrometry.

Would you tell us where you were born and what your childhood was like?

I was born in Colatina, Espírito Santo state, on May 24, 1975. My relatives are originally from Minas Gerais state, and during my first years, we moved from Espírito Santo to Minas Gerais. My father worked in a company dedicated to civil construction (mainly railways and infrastructure), and we moved to several Brazilian states (Espírito Santos, Maranhão, Minas Gerais again, and São Paulo) and cities (6 different locations). From the end of 1980 to the beginning of 1990, we lived in Montes Claros (North of Minas Gerais state). In this case, my first years were rich in different cultures (north and south) of our country.

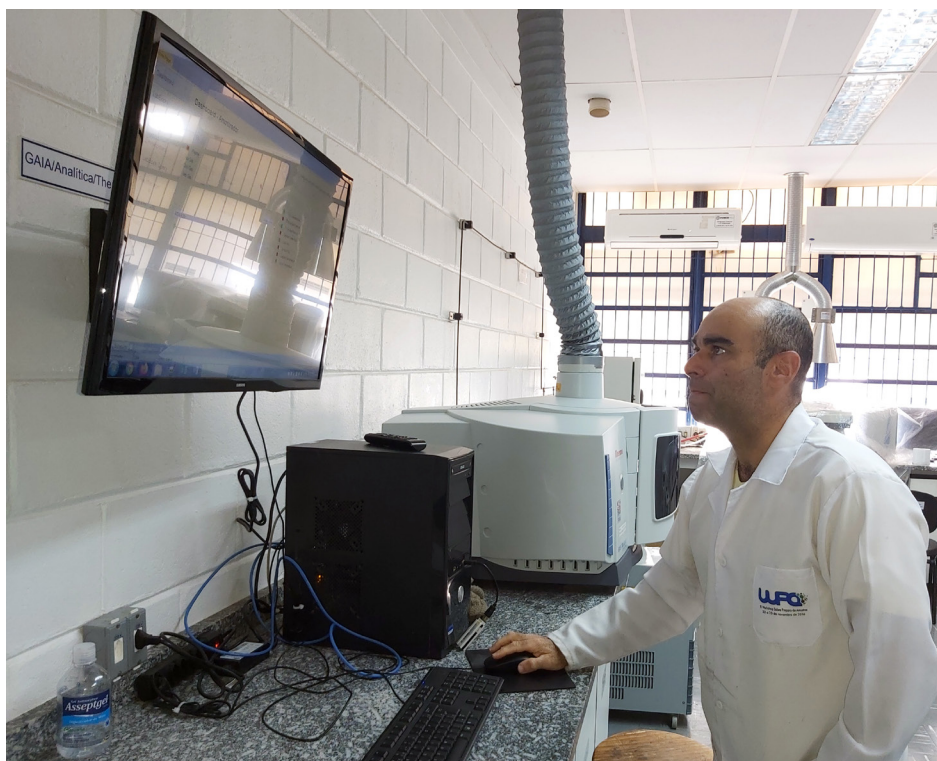
What early influences encouraged you to study chemistry? Did you have any influencers, such as a teacher?

I attended a chemistry technician course in Montes Claros (from 1989 to 1992) (old high school). I also assisted some professors during laboratory classes. This activity exposed me to several aspects of chemistry: mainly physical chemistry and analytical chemistry. Several professors influenced my decision to focus on chemistry in the next steps of my career (university). In addition, during this period, I also visited several chemical industries (cement, metallic magnesium and silicon production, and water treatment) and had contact with chemists and engineers.

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When did you decide to study chemistry? What motivated you? How was the beginning of your career?

I decided to follow the chemistry career after the chemistry technician course (at the beginning of the 1990s). My relatives moved to Valinhos (São Paulo state), and I attended several universities then. In 1993, I enrolled in my first chemistry class at Pontifical Catholic University of Campinas (PUC-Campinas). During my undergraduate course, the classes were at night. I worked as an industry supervisor in a paint manufacturer in Campinas. Later, I was approved as a scientific assistant at the Brazilian Agricultural Research Corporation (Embrapa), Environmental Research Center at Jaguariuna (São Paulo State). At Embrapa, I worked in an analytical chemistry laboratory and operated several analytical chemistry instruments, such as a spectrophotometer (UV-Vis), flame atomic absorption spectrometer (FAAS), and graphite furnace atomic absorption spectrometer for water, plant, and soil analysis. In 1997, I left Embrapa and started a Master's course in chemistry at Campinas State University (Unicamp) under the supervision of Prof. Dr. Marco Aurélio Zezzi Arruda. I finished my Master's course in 1999 and started the Ph.D. course in Science under the supervision of Prof. Arruda and the co-supervision of Prof. Dr. Roney Poppi. In 2001, I performed part of my Ph.D. course in Germany under the guidance of Prof. Dr. Harald Berndt. In 2003, I defended my thesis. Both Master's and Ph.D. projects were financed by São Paulo Research Foundation (Fapesp). From 2004 to 2006, I worked at the Federal University of Alfenas (Minas Gerais state), Unifal (former School of Pharmacy and Odontology, EFOA), and PUC-Campinas. In the middle of 2006, I was approved and appointed as a professor at the Chemistry Department of the Federal University of São Carlos (UFSCar).



Prof. Edenir Pereira Filho at the Group of Applied Instrumental Analysis (GAIA), Dept. of Chemistry, UFSCar.

What has changed in the student's profile, ambitions and performance since the time you started your career?

Nowadays, students have more information, and the professional possibilities are almost infinite. Requirements such as a second or a third language or international experience are no longer intangible activities and are now natural and required steps. The students are more connected; it is necessary to have other required characteristics such as social abilities (soft skills), teamwork, and capacity to solve complex problems using different knowledge (not only the technical).

Could you comment briefly on the recent evolution of analytical chemistry, considering your contributions?

Analytical Chemistry has a fundamental characteristic: the possibility to quickly interact with other areas of chemistry and other sciences — the analytical chemistry professional must know data science, mining, and processing. In addition, it is possible to interact with mathematics and statistics. In my research line, for instance, I am applying several mathematical and statistical techniques, and this combination is a science named Chemometrics. I believe that Chemometrics is a powerful Science, and I am very tempted to learn more and more. For instance, in 2019, I started a Master's course in Mathematics, and my dissertation entitled "Chemistry and Mathematics' synergism: Teaching Design of Experiments in undergraduate and graduate courses of Chemistry at UFSCar" was defended in 2022. Finally, the future of analytical chemistry is to spread its interactions with other areas and solve complex problems related to calibration and data science.

What are your lines of research? You have published many scientific papers. Would you highlight any?

My research line is mainly devoted to developing analytical methods for direct solid sample analysis. In the last 10 years, I have been working with a very complex type of sample: electronic waste (waste electrical and electronic equipment, WEEE). The WEEE has more than 40 chemical elements in its different parts: printed circuit boards (PCBs), polymers, batteries, and screens. Several elements are potentially and economically recoverable. In addition, I am also interested in the application of chemometric techniques to propose calibration models focusing on solid sample analysis. Up to 2022, I have almost 200 publications in different international journals. Instead, to highlight a specific paper, I would like to invite the reader to see and join my YouTube channel: <https://www.youtube.com/c/EdenirPereiraFilho>. This channel presents several contributions of my research group (more than 300 videos): design of experiments (DoE) with two tutorials, chemometrics (principal component analysis, PCA), laser induced-breakdown spectroscopy (LIBS), calibration strategies for direct solid sample analysis, bibliometric analysis, chemical equilibrium, the interaction between academy and industry (professional Master's course), WEEE characterization, and the use of Excel, Octave, Matlab, R, and Python. Part of the channel's content was prepared with the help of my former Ph.D., Master's, and undergraduate students, and the work is completely voluntary. Please, spread the word!!!

"... the interaction between Brazilian researchers and industry must be more collaborative, and the dialogue should be improved..."

What is your opinion on the current progress of research in chemistry in Brazil? What are the most recent advances and challenges in scientific research in Brazil?

Chemistry research has improved a lot in Brazil in the last 20 years. Nowadays, we have access to sophisticated and advanced technologies and instrumentation. In addition, it is possible to have close contact with research centers worldwide. The main challenges are having a regular source of financial support and establishing a healthy interaction with the industry. In my opinion, the interaction between Brazilian researchers and industry must be more collaborative, and the dialogue should be improved. There are several initiatives, but it is necessary to propose clear rules and a governmental incentive.

For you, what have been the most important recent achievements in analytical chemistry research? What are the landmarks? What has changed in the scenario with the pandemic?

From the point of view of solid sample analysis and data science, I think the use of X-ray fluorescence (XRF) and LIBS in a rover sent to Mars is a significant development. During the pandemic, for example, and describing one of my activities, it was possible to interact, even remotely, with researchers and students from different parts of Brazil and the world. I discussed several research activities with national and international students, and some presented webinars for graduate students. Now, it is also possible to attend webinars presented by Nobel Prize winners. During the pandemic period, I offered a discipline about DoE on four different occasions (2020, 2021, and 2022). More than 300 students from 17 states of Brazil and Argentina, Peru, and Colombia participated in this discipline. I saw the pandemic period as a unique opportunity to present my research line and scientific achievements on social media (YouTube and LinkedIn) and try to show to society how their financial investment is used.

There are in Brazil, and in the world, several conferences on chemistry. To you, how important are these meetings to the scientific community? How do you see the development of national chemistry meetings in Brazil?

These meetings are essential, but it is necessary to propose activities to include all the community partners, mainly students. In addition, the researchers and students need to feel valued and considered by the scientific societies. When students prepare a poster for presentation, for example, they want to show their work and not comply with a protocol.



Dr. Edenir R. Pereira Filho, Associate Professor in the Department of Chemistry at the Federal University of São Carlos (UFSCar).

What is the importance of awards in the development of science and new technologies?

All awards are important and healthy to the scientific community and can be used as an additional stimulus.

For you, what is the importance of the national funding agencies for the scientific development of Brazil?

These agencies are vital and need to receive regular investments for better support. On the other hand, the researchers also need the effort to obtain financial support from others, such as industry and international cooperation.

At the moment, the situation for scientific research in Brazil is one of decreasing investment. How do you see this situation, and what would you say to young researchers?

We need to pay more attention to our political representatives. The present government was established by the people that made an unthinkable and unhappy choice. Soon, we need to choose better and study the proposition of the candidates and see its commitment with the Science.

What advice would you give to a young scientist who wants to pursue a career in chemistry?

Treat your students with special care. They are your business card. Remember that you were a student a few years ago. Try to establish beneficial scientific collaborations. Answer your e-mails and be polite. Do not ignore your colleagues. Keep studying and observe which gaps need to be filled. Keep a distance from toxic (from the psychological point of view) people and organizations. Be authentic and do not pay attention to what others will think. Work hard!!!

How would you like to be remembered?

I would like to be remembered for contributing to solid sample analysis using LIBS and the bald guy with an interesting and useful YouTube channel.