stayCERENA - Newsletter

World'Top 2% Scientists

Three CERENA researchers are part of the most-cited scientists worldwide at the World's Top 2% Scientists list released by Stanford University and Elsevier. Congratulations to Pedro M. Castro, João F. Gomes, and Moisés Pinto!

Projects starting

CERENA is beneficiary of two European projects starting in November.

The **MINOTAUR** project is an international research collaboration involving partners from the mining industry and universities, that aims to elevate exploration techniques for critical

raw materials in deep land deposits. CERENA will be responsible for the online geo-modelling and resource characterization part, with João Narciso, Leonardo Azevedo, Maria Amélia Dionísio e Gustavo Paneiro involved. https://cordis.europa.eu/project/id/101178775

The **CRITERIA** project is a Marie Skłodowska-Curie Doctoral Network project focussed in the recruiting and training of 13 Early Stage Researchers to work on the repurposing of mining waste. CERENA will contribute by recruiting 3 doctoral candidates and will serve as secondment institution of other researchers involved in the project. The team includes Gustavo Paneiro, Maria Amélia Dionísio and Leonardo Azevedo.

Tenure position for Assistant Researcher at FEUP

An international selection process is open for the recruitment of one (1) **Assistant Researcher** (permanent position) in **Environmental Engineering** with a focus on the subfields of **mining and mineral processing**. All the info available here.

The importance of science outreach

This may sound like a cliché, but we are indeed living through **challenging times**. Society is growing more divided and polarized, with heated factions forming around issues like **vaccines** and **climate change**. Each side fiercely defends its beliefs, convinced that they are right, and the others are wrong.

But where does the truth lie? **Science** is our most reliable tool for understanding complex, urgent societal challenges. Scientists are in a privileged position to find solutions, yet they also see the need for greater visibility and funding. Engaging with the public is key to bridging this gap, but the challenge remains: people receive scientific information from diverse sources, often coloured by biases like confirmation bias, which can influence their beliefs. Clear dialogue with **non-academic audiences** is essential.

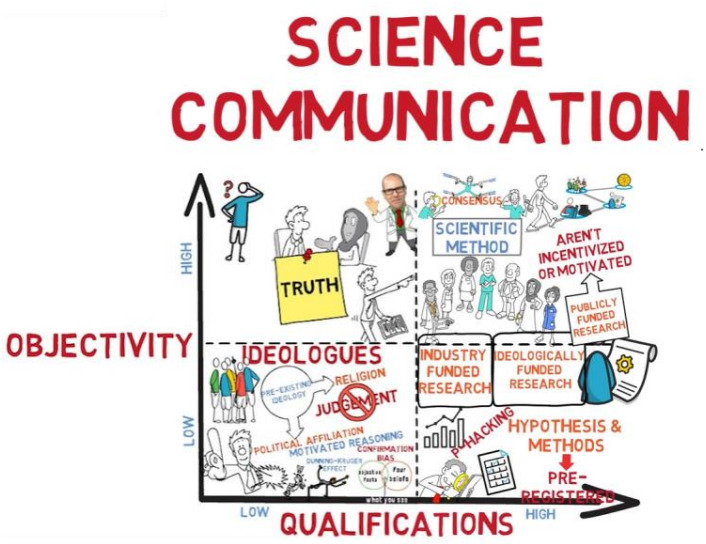

Figure 1 Graphical illustration by @gregmartin about science communication

This is where **science communication** becomes crucial. All humans (scientists included) tend to mistrust what we don't understand, so the goal is clear: empower everyone with the tools to understand science. This short explanatory video explores how to guide people toward trustworthy sources, like **publicly**

funded research, which offers expert, unbiased information. Though not flawless, these sources are less likely to exaggerate claims or manipulate data, adhering instead to the scientific method and undergoing rigorous peer review by other experts.

October in a nutshell

- October 9th, 2024 | Establishment of "AI for Climate and Energy" laboratory between Insituto Superior Técnico and China University of Petroleum – Beijing (CUPB)
- October 31st, 2024 | CERENA Seminar by Ana Filipa Duarte "**Advanced Methods for Ocean Climate Modelling**"

Figure 2 CERENA seminar #2 and the visit of the CUPB at IST

Our people

Tânia Frade Costa – Postdoctoral researcher for RawMatG

If you get there early enough, you might see the sun rising above Lisbon through the large east-facing window in the Researchers' Room on the 4th floor of the South Tower at IST. Tânia's energy matches the brightness of her office. A massage therapist by vocation and a chemist by background, she joined CERENA to contribute with her expertise in physical and electrochemistry, as well as her passion for sustainable materials.

Her enthusiasm is contagious as she explains how she feels actively involved in working towards Sustainable Development Goal 13 (Climate Action). Her research is helping to protect the environment and guiding the industry toward meeting the Net Zero goal by 2050, she explains, while "A Thousand Years" by Christina Perri plays softly in the background.

In your view, what does a researcher do?

T: "A researcher investigates and discovers things that have not yet been found or invented. We can explore the reason behind things."

What are you working on at the moment?

T: "I am studying and developing materials that can selectively capture molecules from fluids. Some applications of this research include CO_2 capture from industrial emissions before they reach the atmosphere, as well as wastewater purification"

João Fortunato, PhD in Chemical Engineering

João has just entered the second year of his PhD journey. He joined CERENA within the GrAPHy project framework one year ago under the supervision of Pedro Castro and Henrique Matos. So far, so good, he says. His usual workplace is the Labsop Room, an open space with incredible views of the Tejo estuary and Lisbon downtown on the 5th floor of the South Tower of the IST. Preferred communication channels for João are Portuguese and English, although he admits that his Portuñol is not too bad either.

What work are you doing at the moment?

J: “I am creating computer models to simulate ammonia plants. Ammonia is produced from two main constituents: nitrogen and hydrogen. While nitrogen is extracted from the air, hydrogen is obtained from methane, so it is unsustainable. Our goal is to use water electrolysis powered by renewable energy. These computer models will help us develop a long-term strategy for green hydrogen production.”

What results do you expect from your work?

J: “To reduce the carbon footprint of the ammoniac production processes, and eventually reach the total use of renewable energy and non-fossil raw material in the industrial process.”

What would you like to do when you finish your PhD?

J: “I would like to work in a company, maybe a refinery, or somewhere where I can integrate fieldwork into my work routine.”

Alina Vladicescu, Lab Technician

Meet our kind, knowledgeable and empathetic ChemLab technician Alina. She has worked for CERENA for about six months now. Her childhood dream of being a singer can be considered in stand-by, as she's now found her passion in the world of science and research. With a background in criminal forensic sciences, Alina admits that she has always felt happy in the lab, which is where will find her: Alina manages two of the ChemLab facilities in the South Tower of the Alameda IST Campus. When the elevators are running smoothly between the basement (floor -2) and the 10th floor, Alina says she enjoys this challenging task, especially because she keeps learning and exploring new equipment and techniques from her multi-functional team.

Alina loves the research environment, where she met passionate people who look beyond the surface of things and uncover what lies beneath. She is also a strong advocate for better communication between scientists and the public, believing that science is essential to a healthy society. She feels scientists need to make their work

more accessible and relatable, helping people understand the everyday importance of science. These views deeply resonate with Alina's values, being a big supporter of the UN's Sustainable Development Goal number 3 - Good Health and Wellbeing:

What is the challenge of science today?

A: "I think science is still self-developing. There are a lot of scientists looking and researching different things but there is a lack of outwards communication. People outside the research realm don't realize that scientists are actually working *for* the society. They don't fully understand what researchers do, and stop listening when they hear words they don't understand (*ed* as most of us do). This creates a barrier between science and society that is linked to the usual struggle for funding of scientific projects. When scientists communicate more clearly, translating complex ideas into simpler language, science is seen as something of our daily life, contributing to the well-being of our society."

International visitors

Fostering cross-border collaboration is a core value of scientific research and a cornerstone of its success. By exchanging ideas, perspectives and expertise we can accelerate innovation and discovery, and plant seeds of meaningful human connections across the globe. At CERENA we are fortunate to host a vibrant group of international visitors. Our current student body include:

Name	**Programme – Institution**	**Total Stay**	**Field**
Salma Dehhaoui	PhD – Instituto Superior Técnico	6 months	Chemical Eng.
Juliana Sanchez	PhD – FEUP	5 months	Environmental Eng.
Marco Sorrentino	MSc – Instituto Superior Técnico	3 months	Earth Resources
Shu Yuan	Msc – Instituto Superior Técnico	1 year	Earth Resources
Torstein Nordgard	PhD – Instituto Superior Técnico	2 months	Earth Resources
Yasmine Andrade	PhD – Instituto Superior Técnico	6 months	Chemical Eng.

Science Story

The SOLAR2CLEAN project developed an advanced photocatalytic system using solar energy to purify wastewater by degrading micro plastics and other pollutants, such as antibiotic residues. Photocatalytic nanoparticles are materials that, by absorbing light, initiate chemical transformations in other substances without being consumed or altered in the process. When these particles are embedded in porous microspheres (MICROSCAFS) and exposed to sunlight, they break down toxic pollutants and contaminants into non-toxic molecules, purifying the water. They can then be easily recovered from the purified water, and recycled. The anticipated outcome of SOLAR2CLEAN is the development of a continuous-flow solar reactor for wastewater treatment. With the project nearing completion, the current challenge is to scale up from a laboratory scale (2L reactor) to a pilot scale. The follow-up to this project could serve as a launching platform for pioneering a greener future in industrial water treatment.

https://groups.tecnico.ulisboa.pt/solar2clean/

*1 - **Graphical idealization of the SOLAR2CLEAN project. The nanoparticles embedded in the MICROSCAFS turn toxic pollutants into non-toxic elements, cleaning the water.***

Dates to diary

- November 4-5th 2024 | PhD Open Day, Instituto Superior Técnico Lisbon
- November 5th 2024 | 8:30-15:45 European Innovation Council (EIC) online informative session for potential applicants

- November 8th 2024 | 9:30 event "Research and Innovation Challenges and Opportunities for the Portuguese Manufacturing Industry" at Instituto Superior Técnico hosted by the *Agência Nacional de Inovação* (ANI) and European Factories of the Future (EFFRA)
- 18-22nd November 2024| Técnico go to Schools: Science and Technology Week
- 28th November 2024 | 12:30 CERENA Seminar by Zaid Al-Shomali "**Impact of naturally occurring radioactive materials in water treatment facilities"**

Publications

Jesus, S., Ventura, M., Assunção, R., Gueifão, S., Delgado, I., Rego, A., & Coelho, I. (2024). Study around the Barroso Mine (Portugal): Baseline levels of lithium for assessing future exposure and risks from Li mining activity. *Food and Chemical Toxicology*, 114825.

Silva, T. A., Marques, A. C., Shakoor, R. A., Montemor, M. F., & Taryba, M. (2024). Biopolyurethane coatings with silica-titania microspheres (MICROSCAFS®) as functional filler for corrosion protection. *Surface and Coatings Technology*, 131376.

Narciso, J., Van De Vijver, E., & Azevedo, L. (2024). Geostatistical Inversion of Frequency-Domain Electromagnetic Data for Near Surface Modelling. *Geophysics*, *90*(1), 1-71.

Pinto, R. V., Cao, C. C., Lyu, P., Dovgaliuk, I., Shepard, W., Rivière, E., et al. (2024). Ultra-Microporous Fe-MOF with Prolonged NO Delivery in Biological Media for Therapeutic Application. *Small*, 2405649.

Dias, A. P. S., Saraiva, N., Rijo, B., Pereira, M. F. C., Santos, L. F., Galhano, R., & Paulo, I. (2024). Sugar derived hydrochar catalysts for enhanced biodiesel production via esterification. *Fuel*, *374*, 132459.

Ozkan, S., Sousa, H., Gonçalves, D., Puna, J., Carvalho, A., Bordado, J., ... & Gomes, J. (2024). Unlocking Nature's Potential: Modelling Acacia melanoxylon as a Renewable Resource for Bio-Oil Production through Thermochemical Liquefaction. *Energies*, *17*(19), 4899.

Matos, P., Rocha, B., Pinho, P., Miranda, V., Pina, P., Goyanes, G., & Vieira, G. (2024). Microscale is key to model current and future Maritime Antarctic vegetation. *Science of the Total Environment*, *946*, 174171.

Cultural Tips

O melhor dos mundos (The best of all worlds) – Movie

Lisbon, 2027. Three years after the installation of new submarine communication cables between mainland Portugal, the Azores, and Madeira, a group of scientists is fighting to secure funding for their research...

Health and Wellbeing

The ever-growing demands of **teaching and reaserch work** in Portuguese Higher Education Institutions combined with the pressure to get funding have normalized mental health issues like anxiety, stress and burnout (Calainho et al., 2022). Burnout involves three dimensions, but depersonalization (a distant attitude toward work) is often ignored, leading to underestimating its prevalence.

Here are **three quick breathing exercises** to reduce workplace stress:

1. *Squeeze and Release*: Inhale, tense all muscles, hold for three seconds, then exhale and relax.
2. *4-7-8 Breathing*: Inhale for a count of four, hold for seven, exhale for eight. Repeat.
3. *Bellows Breath*: Inhale, raise arms; exhale, lower arms. Repeat to feel refreshed.

Know more about: burnout in Portuguese higher education institutions and how to combat stress at work.

Quote of the month