SHARED LIGHT, SHARED SCIENCE WITH *LAAAMP*: EXPANDING PARTICIPATION IN MINERAL PHYSICS

Özgül Öztürk[1], Sekazi K. Mtingwa[2,3], and Michele Zema[4]

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X-ray beams from synchrotron light sources and X-ray free-electron lasers (XFELs) have become as essential to mineral physics studies as rock hammers once were to geology. Techniques like synchrotron X-ray diffraction, inelastic scattering, and X-ray absorption spectroscopy allow scientists to probe the atomic structure and elastic properties of minerals at depths once thought to be unreachable.

Modern mineral physics—and more broadly, much of the physical sciences—is shaped not only by ideas, but by infrastructure. Mineral physics has increasingly migrated to large-scale facilities: synchrotrons, neutron sources, X-ray free-electron lasers (XFELs). Experiments that were once theoretical or indirect—probing behavior at pressures exceeding a million atmospheres—are now performed routinely. Synchrotrons, neutron sources, and XFELs have transformed the way we study the deep Earth and planetary interiors. These powerful sources allow researchers to simulate conditions deep inside planetary interiors, observe phase transitions in real time, and refine their models of planetary evolution.

While the scientific reach of these tools has grown, access to them remains uneven across the globe. The majority of synchrotrons and XFELs are located in a handful of countries in North America (see Campbell 2026 this issue), Europe (e.g., ESRF, DESY), and East Asia (e.g., SPring-8). For many scientists in the Global South, access to these facilities remains limited. This geographic imbalance translates into limited access, slower research trajectories, and fewer opportunities to contribute meaningfully to the field's development. As a result, talented researchers in these regions often face barriers not just to light-source use, but also to training, collaboration, and visibility within the global scientific community. One effort to address these challenges is **Lightsources for Africa, the Americas, Asia, Middle East and Pacific (*LAAAMP*, https://laaamp.iucr.org/)**, established in 2016 by the International Union of Pure and Applied Physics (IUPAP) and the International Union of Crystallography (IUCr), and eventually partnered by the Abdus Salam International Centre for Theoretical Physics (ICTP) and the International Union of Pure and Applied Biophysics (IUPAB). With support from various organizations and major synchrotron light sources around the world, *LAAAMP* facilitates the science-policy debate about the development of new Advanced Light Source facilities in the Global South, and helps bridge the access gap through hands-on training, research exchanges, and in-country capacity building.

LAAAMP's flagship initiative, FAST (FAculty-STudent) Teams, enables research teams from targeted countries to spend two months in one of the partner light sources and get trained on the use of synchrotron radiation-based techniques, and conduct experiments. These visits include training in everything from experimental setup to data interpretation, with the goal of equipping researchers with expertise and tools to develop sustainable programs at their home institutions. In this context, initiatives like DAPHNE4NFDI (https://www.daphne4nfdi.de/english/) demonstrate how modern research infrastructures are evolving beyond pure data collection towards comprehensive data management, analysis, and interpretation frameworks. As experimental techniques produce increasingly complex and voluminous datasets, expertise in advanced data handling becomes essential—not only in terms of reducing and interpreting the data itself, but also in ensuring its compliance with FAIR (Findable, Accessible, Interoperable, Reusable) principles.

Looking ahead, data-driven methods such as machine learning (ML) and artificial intelligence (AI) will become integral to the scientific process, from experimental design to automated data analysis. Large-scale facilities like the Linac Coherent Light Source (LCLS) at the Stanford Linear Accelerator Center (SLAC) National Accelerator Laboratory and the European XFEL (EuXFEL) are already producing vast amounts of high-quality data, positioning them as future "data factories" ideally suited for the development and training of ML models tailored to complex scientific problems, including those in mineral physics. These developments will open new possibilities for pattern recognition, predictive modeling, and even real-time experiment steering—tools that can greatly benefit researchers from all regions, especially when supported by collaborative frameworks like DAPHNE4NFDI, which aim to democratize access to these capabilities.

To realize this potential on a global scale, training programs must increasingly address not only experimental techniques but also data literacy: encompassing data processing pipelines, metadata standards, and the responsible application of AI/ML algorithms. Such comprehensive skill development will empower researchers to fully exploit the opportunities presented by modern photon and neutron science facilities, ensuring that participation in frontier research is not limited by geography or resources.

Within the *LAAAMP* framework, other complementary efforts have contributed to the foundation of regional research and educational hubs, such as X-ray Techniques Laboratory (X-TechLab, https://www.xtechlab.co/) in Benin and the Caribbean Regional X-ray Science Toward Advancement Laboratory (crXstal, https://www.mona.uwi.edu/news/uwi-launches-cutting-edge-crxstal-laboratory-revolutionizing-caribbean-research) in Jamaica. Such facilities also contribute to this goal by providing localized training in crystallography and related disciplines, including mineral physics and materials science. These initiatives play a crucial role in building technical capacity and fostering regional expertise, further supporting the establishment of sustainable scientific programs in underrepresented regions.

These opportunities have already led to meaningful outcomes. In some cases, participants have returned home to establish new research groups. Their stories demonstrate what is possible when access and opportunity align.

Yet such examples, while inspiring, are still the exception. If we hope to make them the norm, we may need to think not only in terms of programs, but in terms of values like reciprocity, long-term partnerships, and shared scientific ownership. Collaborations can begin at a beamline, but their depths are defined by what comes before and after: co-developing research questions, interpreting data together, mentoring students, and maintaining networks over time.

Mineral physics is particularly sensitive to these issues. Experiments often require custom-built equipment, months of preparation, and close interaction with facility scientists. This makes sustained engagement—not one-time visits—all the more crucial. It also makes the field an important case study for broader discussions about equity in science.

The experience of the mineral physics community in the United States demonstrates the power of community-driven management of synchrotron resources (Campbell 2026 this issue). They have successfully coordinated shared access, invested in instrumentation, and trained generations of researchers. *LAAAMP* builds on this spirit and extends it globally, working to ensure that researchers in regions without established light source infrastructures can participate fully in frontier science. In this sense, *LAAAMP* serves as a complementary international counterpart to these national community models, broadening not only access to facilities but also participation in the scientific enterprise itself.

At its heart, *LAAAMP* is not just about training or beamline access, it is a model for science diplomacy and sustainable development. It fosters long-term partnerships between institutions, builds local capacity, and amplifies the voices of researchers who are too often excluded from the global conversation.

In the long term, the vision of *LAAAMP* is not just about using advanced light sources; by expanding access to light, we could expand access to collaborations and the free flow of knowledge across borders. For more information on *LAAAMP* and how to get involved, please visit https://laaamp.iucr.org/.

Read more about the authors on page 123.

1 University of Siegen, Germany

2 U.S. Nuclear Regulatory Commission, USA

3 TriSEED Consultants, USA

4 University of Bari, Italy

Mineralogical Society of Poland

www.ptmin.pl

It is my great pleasure and honor to present the Józef Morozewicz Medal, awarded by the Mineralogical Society of Poland for special merits in the development of mineralogical sciences. Józef Morozewicz (1865–1941) was an outstanding Polish petrographer and mineralogist, an organizer of scientific institutions, and an academic teacher whose legacy continues to inspire generations of Earth scientists.

The award ceremony in Kraków. Professor Janusz Janeczek (**LEFT**) with Professor Jarosław Majka, President of the Mineralogical Society of Poland (**RIGHT**).

In 2025, the Mineralogical Society of Poland honors Professor Janusz Janeczek in recognition of his outstanding scientific achievements, organizational activity, and long-standing service to the development of mineralogical sciences in Poland.

Professor Janusz Janeczek graduated in geology from the University of Wrocław in 1976 and obtained his doctoral degree there in 1983. Since 1984, he has been affiliated with the University of Silesia in Katowice, where he served in numerous academic and organizational roles, including two terms as Rector from 2002 to 2008. He was a Fulbright Fellow at the University of New Mexico (1989–1992), President of the Mineralogical Society of Poland from 1998 to 2004, Chair of the National Science Centre Council from 2016 to 2018, and Chair of the Mineralogical Sciences Committee of the Polish Academy of Sciences (most recently in the term of 2020–2023). Currently, he chairs the Advisory Board to the President of the Polish Atomic Agency. He is the author or co-author of more than 120 scientific publications.

Professor Janeczek's scientific interests are characterized by a remarkable ability to combine mineralogy with broader questions of geochemistry, environmental science, and nuclear physics. His research interests focus primarily on the mineralogy and geochemistry of uranium-bearing minerals, especially uraninite, studied as a natural analogue of spent nuclear fuel. In his research, he demonstrated that natural uraninite is a far better analogue of irradiated nuclear fuel than synthetic, non-irradiated UO_2. His work clarified the limits of uranium oxidation in uraninite, showing that higher uranium oxides postulated in the literature do not occur in nature. He also identified processes of uraninite transformation into coffinite as a possible pathway for the long-term alteration of spent nuclear fuel under reducing, silica-rich conditions. A major part of Professor Janeczek's research has also been devoted to the unique natural nuclear reactors of Oklo in Gabon. His studies revealed that uraninites within reactor cores underwent episodic dissolution, leaching, and coffinitization under reducing conditions, leading to the release of nuclear reaction products, including rare earth elements. Using isotope analyses, he showed that the migration of these elements was effectively halted by the in situ crystallization of rare-earth-bearing phosphates and uranium minerals.

Beyond nuclear mineralogy, Professor Janeczek was a pioneer in the mineralogical study of atmospheric aerosols in Poland. He conducted the first detailed investigations of mineral dusts in Upper Silesia and the Dąbrowa Basin, demonstrating that combined mineralogical and meteorological observations allow the identification of specific industrial sources of particulate pollution. His research also showed that mineral particles deposited in human lungs may act as nucleation sites for calcite and magnesium-rich calcite, leading to extensive calcification of lung tissues. Importantly, he established and led a research team devoted to the mineralogy of atmospheric aerosols.

Another significant area of his work concerns the pegmatites of the Strzegom–Sobótka Massif. Professor Janeczek identified minerals atypical for granitic pegmatites, such as stilpnomelane and fayalite, as well as mineral assemblages characteristic of banded iron formations. He demonstrated that these pegmatites contain exclusively iron-rich chlorites and described several minerals previously unknown or very rare in Poland, including babingtonite, milarite, minnesotaite, and niobium–tantalum–tin-bearing titanite.

Professor Janeczek has also made a lasting contribution to the development of young scientific staff. He supervised nine doctoral dissertations and provided scientific mentorship to several other doctoral students. Through his guidance and example, he helped shape the research paths of at least five young mineralogists and petrologists at the University of Silesia.

On behalf of the Mineralogical Society of Poland, we extend our warmest congratulations and sincere thanks to Professor Janusz Janeczek for his exceptional scientific achievements, his dedication to academic life, and his profound contribution to the advancement of mineralogical sciences in Poland.

ABOUT THE *TRIPLE POINT* AUTHORS (cont'd from page 121)

Özgül Öztürk is a research scientist at the University of Siegen, Germany, specializing in plasma physics, light–matter interaction, and ultrafast dynamics. She works with XFELs and synchrotron methods (GISAXS, GID) and contributes to international scientific initiatives including SESAME, LAAAMP, and DAPHNE4NFDI.

Sekazi K. Mtingwa is a judge with the U.S. Nuclear Regulatory Commission and Principal Partner of TriSEED Consultants. He played an important role in the design and construction of accelerator systems at Fermilab used to discover the top quark. He also has co-founded over 30 organizations and programs, including LAAAMP.

Michele Zema is a professor of mineralogy at the University of Bari, Italy, and Fellow of the African Academy of Sciences. He co-founded and chairs LAAAMP, serves on IMA and African Light Source executive committees, and studies intracrystalline processes in minerals and solid solutions.

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