Science on Wheels: How EMBL's Advanced Mobile Lab Powered Research on Campus

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In March 2025, students and staff at the University of Malta noticed something unusual parked in Car Park 6 – a high-tech truck that resembled a spaceship more than a vehicle. This was the Advanced Mobile Laboratory of the European Molecular Biology Laboratory (EMBL). From cutting-edge technology to new international collaborations, EMBL's Advanced Mobile Lab brought with it more than just microscopes and instruments – it brought a glimpse of the future of collaborative science.

The European Molecular Biology Laboratory (EMBL) is Europe's life sciences laboratory with headquarters in Heidelberg, Germany, and five further sites across Europe. It is known for its cutting-edge research, provision of experimental and data services, and training in the life sciences. The Traversing European Coastlines (TREC) expedition was born from EMBL's ambition to better understand the complex and dynamic ecosystems along Europe's coastlines. TREC saw the institute, together with its many partners, study life in the context of European coastlines, with three clear and pressing core scientific aims in mind:

- To unveil the biodiversity on land and at sea which is not readily visible, while also understanding how environmental changes affect the interactions within and between ecosystems.
- To study how humans and the planet interact.
- To highlight the importance of collaboration, scientific training, and public engagement.

THE SOLUTION: A MOBILE LABORATORY

For this endeavour, EMBL developed a one-of-a-kind mobile lab. Dr Niko Leisch, the head of the mobile laboratory services, describes the Advanced Mobile Lab (AML) as a self-contained, high-tech research facility on wheels. This travelling laboratory ensures that every sample can be processed and analysed shortly after sampling, directly at the collection site. By bringing standardised equipment and expert personnel to each coastal location, this approach helps to eliminate inconsistencies that arise from using different methods and labs in different countries.

The AML is not a stopgap. It is a full-scale, cutting-edge research centre. Inside, science happens in real time:

- A **wet lab** handles initial sample processing the moment they are collected.
- A **large-particle sorter** uses laser imaging to gently isolate individual organisms without damaging delicate microbial communities.
- **Confocal microscopes** produce high-resolution, 3D time-lapse images to observe behaviour and interactions.
- For the highest-resolution analysis, samples can be cryopreserved on-site for **electron microscopy** back at EMBL's fixed facilities.

This ability to act fast is what sets the AML apart. As Leisch explains, 'Once you remove organisms from their environment, they start to

change.' Timing is everything. Whether it's observing symbiotic behaviour, assessing how microbes break down pollutants, or simply documenting what species are present, the opportunity to bring the lab close to where samples are being taken allows researchers to preserve the biological integrity of each sample.

The lab not only ensures high-quality, consistent data across all sampling sites, but it also extends EMBL's capabilities to scientists and students in every member state it visits, creating a bridge between local communities and world-class science.

THE JOURNEY TO MALTA

Preparations for the AML's visit to Malta took shape through the dedication of Prof. Melissa Marie Formosa and Prof. Jean Paul Ebejer, working in line with the vision of Parliamentary Secretary Hon. Keith Azzopardi Tanti to bring this state-of-the-art facility to Malta and strengthen the nation's research landscape. The process was set in motion with a visit to EMBL's Headquarters in Heidelberg in early 2024, where Formosa was joined by Hon. Azzopardi Tanti and Perit Karmenu Vella, former EU Commissioner for Environment, Maritime Affairs and Fisheries.

This visit set the wheels in motion for the AML's arrival at the UM Campus. With 70,000 samples having already been collected from coastlines across Europe by the end of summer 2024, the lab's visit was eagerly anticipated. With Rector Prof. Alfred Vella's support, EMBL was granted space on campus, giving UM researchers unprecedented access to top-tier scientific tools and expertise. Equipment previously available only in major European centres was now within reach of local scientists and students.

WHY THE BUZZ?

The arrival of the EMBL's AML in Malta brought an immediate and transformative boost to the local scientific community. Researchers and students had direct access to advanced instruments and the necessary expertise – such as large-particle sorters, confocal microscopes, and cryo-preparation for electron microscopy. This meant samples could be analysed within hours of collection, using gentle, non-invasive techniques that preserved the integrity of living organisms.

Offering the opportunity for skill development and training through a one-week course which blended theory with hands-on lab experience, academics and students alike had the opportunity for training with state-of-the-art equipment and techniques.

As part of the TREC mission, EMBL's Advanced Mobile Laboratory

Top: Hands-on research in action – Amy Marie Vella, a M.Sc. student from UM's Department of Applied Biomedical Science working alongside EMBL's mobile team.

Middle: A glimpse into the state-of-the-art EMBL AML.

Bottom: Diverse leaves from across Malta, ready for testing.

Photos by Kristov Scicluna

teamed up with the Department of Geosciences to study marine biodiversity along Malta's coasts.

Reaching out to the broader community, sixth-form students were engaged and given a tour of the facility, while university academics explored new avenues for collaboration during dedicated open days. Ongoing UM projects gained momentum, with researchers completing work that would have otherwise required them to travel abroad.

More importantly, the lab became a bridge to EMBL's broader network, paving the way for long-term partnerships and enabling Maltese students and scientists to connect with world-class research hubs across Europe. Researchers and students can now build on this experience by conducting further experiments at EMBL's sites in Barcelona, Grenoble, Hamburg, Heidelberg, Hinxton near Cambridge, and Rome, or other locations, depending on their research focus.

WHAT COMES NEXT?

The AML continues to provide its services to researchers across Europe, with one of its latest stops having been in Vigo, Spain. There, researchers

EMBL's AML team (From Left: Dr Niko Leisch, Paulina Cherek, Dr Tina Wiegand, Dr Michael Bonadonna), accompanied by Malta's delegates for EMBL, Prof. Melissa M Formosa and Prof. Jean Paul Ebejer.
Photos by James Moffett

utilised a mesocosm facility designed to simulate large volumes of water under controlled environmental conditions. This allowed the EMBL team to transfer their data to study how ecosystems respond to changes under controlled conditions. This is all in the hope of understanding how cells change and to answer questions such as: How does a marine heatwave impact fundamental cellular processes like photosynthesis? How do such heatwaves impact the community composition, particularly in the context of climate change?

Although the AML is only one part of EMBL's vast portfolio, its impact is significant. As Leisch puts it, the lab-on-wheels helped 'make EMBL tangible'. Instead of imagining a faraway lab in Germany, students and scientists in Malta could walk into one, ask questions, and envision a future involving EMBL's core services.

Formosa and Ebejer see the lab's visit as a starting point, not an endpoint. The aim now is to build a sustained pipeline of collaboration: UM researchers may send samples to EMBL for specialised analysis, or travel to its campuses for advanced training. With the option of training, one can have the chance to work independently with the equipment. In other cases, especially with highly sensitive instruments, closer partnerships with EMBL staff may be essential, further deepening international collaboration.

Exposure to EMBL's tools and protocols can inspire the development of new capabilities locally, potentially transforming Malta's research infrastructure. EMBL is committed to open-access data, allowing local researchers to contribute and benefit from one of the largest scientific datasets in the world. The mobile lab initiative has opened new doors, but the real opportunity lies in embedding Malta deeper into the European scientific landscape.

A LASTING IMPRESSION

The EMBL AML has now rolled on to its next destination, but its visit to our islands has left more than tire tracks. It has sparked curiosity, opened opportunities, and built bridges between local researchers and one of Europe's top scientific institutions.

As Leisch said, 'It's been fantastic to work here with the colleagues at the University of Malta and with the students. Their excitement gives us a lot of energy.' That mutual inspiration may be the most valuable outcome of all. T

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Learn more: embl.org/about/info/trec