

Forum Insights

PROJECT TITLE:

The Geoscience e-Laboratory (Ge-LAB): Developing Digital Teaching and Learning Resources for the Virtual Microscope.

Overview of the project

The **Geoscience e-Laboratory (Ge-LAB)** project is designed to deliver teaching and learning resources for new and existing Irish geoscience programmes with an optical microscopy and petrology component. The project will introduce novel methods to deliver technology enhanced learning (TEL) programmes at the main national geoscience centres. The **Geoscience e-Laboratory (Ge-LAB)** project will provide students with unlimited 24/7 access to high-quality digital rock thin sections and associated learning support guides to foster the development of essential petrological skills. The project is a collaboration of the four national third level geoscience centres in Ireland and The Open University.

Partners

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- Prof. Simon Kelley, Department of Environment, Earth & Ecosystems, The Open University. simon.kelley@open.ac.uk

Key outcomes of the project (link to any available material/resources)

The development of the Virtual Microscope for Earth Sciences (VMfES) by the Open University provides users with an effective technology enhanced learning (TEL) tool to examine the microscopic properties of rocks with flexible 24/7 access. The **Geoscience e-Laboratory (Ge-LAB)** project will assist instructors in Irish higher education geoscience centres to effectively integrate technology into their teaching practices. This will be a transformative change in the delivery of microscopy training for Irish geoscience students. The project will deliver an open library of digital petrologic and rock sample media along with e-tutorials on how to use the VMfES and how to develop petrological skills which are directly transferable to the 'real' petrological microscope.

The **Geoscience e-Laboratory (Ge-LAB)** project will have access to the Open University's thin section digitisation facility, cloud based infrastructure and Internet browser-based

system to serve the large data files required to simulate the traditional petrological microscope. The Open University's Virtual Microscope for Earth Sciences (VMfES) is a freely available digital library of rock collections from museums, universities and other institutions around the world. It is the most advanced digital repository of interactive rock thin sections and 3D rotatable rock specimens, many which are linked to online geological maps, and has been used by NASA, science museums and universities to serve important rock collections online.

By linking digital microscopic imagery and 3D hand specimens (Virtual Microscope) with high-resolution outcrop and landscape imagery and panoramas (GigaPan, Zoomify), and regional movies and interactive 3D maps (Google Earth), digital media can be harnessed to communicate the range of spatial (continental scale to microscope scale) that geoscientists are required to consider.

Outline how the project benefits the higher education sector nationally

This project will deliver open-access teaching and learning resources in the form of interactive exercises and assessment rubrics for the virtual microscope. This project will roll-out virtual microscopy nationally and develop open-access teaching and learning resources in the form of interactive exercises and formative and summative assessment rubrics for geoscience programmes with a strong petrological component. This will see a novel approach to the delivery of microscopy training in Irish higher education geosciences programmes, in that students and instructors will all have equal access to, and control of, the same digital learning media (thin sections, hand specimens and online maps). This will facilitate self-guided, collaborative and peer-to-peer learning, in a field of learning that is traditionally individual (where students examine unique thin section only visible through the lens of the petrological microscope). The issue of petrological microscope and slide availability, maintenance or replacement of both is overcome by the VMfES, with all content available freely, 24/7, via a standard Internet Browser (HTML5). (The cost of one standard petrological microscope is £5000 while the cost of preparation of traditional glass slides which are easily broken and require regular replacement, is at least £40 per slide.) The value of VMfES lies in its democratic provision of high-quality digital virtual microscope teaching resources for students.

Outline how the project benefits students

The VMfES provides students with a scientifically accurate and interactive tool for examining the microscopic properties of rocks and fossils. Through the new **Irish University Rocks** collection (**Geoscience e-Laboratory** deliverable) and the accompanying e-tutorials (movies, PDF use guides) and e-assessments (VLE-linked exercises and quizzes), every student will be able to access

the best quality rock thin sections, which are often traditionally kept safely in the hands of the instructor for demonstration purposes only, with students working with 'laboratory sets', which are susceptible to damage or are simply in short supply. Students will also be able to access the thin sections in their own time, allowing for inquiry-based, self-paced learning and revision, ultimately overcoming traditional limitations such as laboratory access or sample access.

Students and instructors can enrol in a free intermediate level course (duration ~ 8 hours) entitled *An Introduction to Minerals and Rocks under the Microscope* provided by the Open University. This course provides students with the essential skills to examine, identify and analyse rock and minerals under the petrological microscope and ultimately enhance their skills in petrology and mineralogy. The digitised rock thin sections collated by the **Geoscience e-Laboratory (Ge-LAB)** can be used in parallel with this free course, as well as the e-tutorials developed by the **Geoscience e-Laboratory (Ge-LAB)** project.

Other national/international development work that complements this project

The Open University's Virtual Microscope for Earth Sciences (VMfES) project has been growing steadily since its inception in the mid-1990s. The current UK VMfES platform represents over ten years of development and significant financial investment by the Open University. In the past five years, NASA's curation facility at Johnson Space Center (Houston, Texas) has commissioned the OU to serve over 500 Moon rock samples collected during the Apollo 11 and 12 missions. Further collections include rocks collected by Charles Darwin on his Beagle voyages and a collection of Martian and extra-terrestrial meteorites.

In 2013/14, the Department of Geology at Trinity College Dublin in collaboration with the OU established a collection 12 rock specimens for a 2nd year Microscopy module taken by 145 students. In response to very positive student feedback and examination results, TCD Geology was awarded a further funding in 2014/15 to expand the UK VMfES collection. TCD academic staff now use the UK VMfES to deliver more advanced 3rd year modules. According to the anonymous statistics, the level of engagement of students from TCD was highest of all universities currently participating in the UK VMfES project.

The project partners are members of the Science Foundation Ireland, funded consortium of Irish geoscience schools - Irish Centre for Research in Applied Geoscience (iCRAG; <http://icrag-centre.org/>), which is financed until 2020. The **Geoscience e-Laboratory (Ge-LAB)** project will provide instructional scaffolding to assist Irish higher education centre graduates to develop research careers in the geosciences sector in Ireland and internationally.

Who to contact for more information/next steps (if appropriate)

Any enquiries about the project or future collaborations can be made to any of the project partners. For more information on the **Geoscience e-Laboratory (Ge-LAB)** project, visit www.geolab.ie, <http://www.virtualmicroscope.org/>.