[](https://www.unsw.edu.au/)

**Facilities设施**

Check out our high-class research facilities and laboratories.查看我们一流的研究设施和实验室。



**At UNSW Minerals and Energy Resources Engineering, our facilities are designed with multidisciplinary research in mind. We are proud of our investment in high-class research facilities and laboratories to support our staff and students to work on innovative research and technology.**

**在新南威尔士大学矿产与能源资源工程学院，我们的设施在设计时充分考虑了多学科研究。我们为投资于一流的研究设施和实验室而感到自豪，以支持我们的员工和学生从事创新研究和技术。**

**Our facilities include the Tyree X-Ray, mine water and mineral processing laboratories, in-situ site waste monitoring and sensor system, a virtual reality room and much more. These spaces allow us to go beyond the textbook and deliver high-impact, immersive and practical learning experiences.**

**我们的设施包括 Tyree X 射线、矿井水和矿物加工实验室、现场废物监测和传感器系统、虚拟现实室等等。这些空间使我们能够超越教科书，提供高影响力、身临其境和实用的学习体验。**

A person in a lab coat holding a flask

Description automatically generated

**[Advanced Geochemistry Laboratory高级地球化学实验室](https://xpnhcnsh.github.io/UNSW/Advanced.html" \t "_self)**

Research activities conducted in the Geochemistry Laboratory are related to our flagship research on Transformative Technologies. By developing novel electrochemical-based techniques for the extraction and recovery of precious and critical metals from low-grade materials and waste streams, we aim to transform how the resources industry and society.

地球化学实验室进行的研究活动与我们关于变革性技术的旗舰研究有关。通过开发基于电化学的新型技术，从低品位材料和废物流中提取和回收贵金属和关键金属，我们的目标是改变资源行业和社会的方式

A person wearing a vr headset

Description automatically generated

**[Immersive Technology Laboratory沉浸式技术实验室](https://xpnhcnsh.github.io/UNSW/Immersive%20Technology%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

The Immersive Technology Lab houses a variety of virtual reality (VR), augmented reality (AR), and holographic technologies that are designed to push the boundaries of innovative education.

沉浸式技术实验室拥有各种虚拟现实 （VR）、增强现实 （AR） 和全息技术，旨在突破创新教育的界限。

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A person working in a lab

Description automatically generated

**[Mine Geomechanics Lab矿山地质力学实验室](https://xpnhcnsh.github.io/UNSW/Mine%20Geomechanics%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

Geomechanics research studies the mechanics of rocks and materials with application in the mineral resources industry. The facility provides laboratory equipment required to advance the technologies for a sustainable and safe mining practice that is essential to meet future mineral needs.

地质力学研究岩石和材料的力学，并在矿产资源行业中的应用。该设施提供所需的实验室设备，以推进可持续和安全的采矿实践的技术，这对于满足未来的矿物需求至关重要。

A group of people in white coats

Description automatically generated

**[Mine Ventilation Laboratory](https://xpnhcnsh.github.io/UNSW/Mine%20Ventilation%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[矿井通风实验室](https://xpnhcnsh.github.io/UNSW/Mine%20Ventilation%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

Mine ventilation laboratory aims to provide teaching and research capacities to study the fundamentals of air movement and underground working environment for the mining industry. Ventilation provides a comfortable working environment for underground workforces, which is the ‘blood circulation system’ for mines.

矿井通风实验室旨在提供教学和研究能力，以研究采矿业空气流动和地下工作环境的基本原理。通风为地下工人提供了舒适的工作环境，这是矿山的“血液循环系统”。

A person in a lab coat and gloves

Description automatically generated

**[Mineral Processing Laboratory](https://xpnhcnsh.github.io/UNSW/Mineral%20Processing%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[矿物加工实验室](https://xpnhcnsh.github.io/UNSW/Mineral%20Processing%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

Mineral processing is concerned with the extraction of valuable minerals and metals from orebodies. Our facilities are equipped to conduct research to better understand how mineral particles can be recovered efficiently, which is crucial in our needs of critical minerals and the electrification of our society.

矿物加工涉及从矿体中提取有价值的矿物和金属。我们的设施配备了进行研究的设备，以更好地了解如何有效地回收矿物颗粒，这对于我们对关键矿物的需求和社会电气化至关重要。

A robot with wheels and a sign on it

Description automatically generated

**[MIoT & IPIN Lab](https://xpnhcnsh.github.io/UNSW/MIoT%20&%20IPIN%20lab%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[MIoT & IPIN实验室](https://xpnhcnsh.github.io/UNSW/MIoT%20&%20IPIN%20lab%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

MIoT & IPIN Lab is Australia's premier academic group focus on Mine Internet of Things and Indoor Positioning Indoor Navigation research applications.

MIoT & IPIN实验室是澳大利亚首屈一指的学术团体，专注于矿山物联网和室内定位室内导航研究应用。

A few men in lab coats

Description automatically generated

**[Multiphysics Geomechanics Laboratory](https://xpnhcnsh.github.io/UNSW/Multiphysics%20Geomechanics%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[多物理场岩土力学实验室](https://xpnhcnsh.github.io/UNSW/Multiphysics%20Geomechanics%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

Multiphysics geomechanics research seeks to understand and analyse the processes affecting rock deformation such as mechanical, thermal, hydraulic, and chemical loading and characterise such deformations using techniques such as optical, thermal, and acoustic tracking.

多物理场地质力学研究旨在了解和分析影响岩石变形的过程，例如机械、热、液压和化学载荷，并使用光学、热和声学跟踪等技术表征这些变形。

A person in a lab coat working on a computer

Description automatically generated

**[NMR Low-Field Laboratory](https://xpnhcnsh.github.io/UNSW/NMR%20Low-Field%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[NMR低场实验室](https://xpnhcnsh.github.io/UNSW/NMR%20Low-Field%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

Work performed in the NMR laboratory relate to our Geoenergy and transformative technology flagships. The laboratory works in sync with the Petrophysics laboratory and micro-CT laboratory and is well suited to quantify physical properties in the context of geochemical or geomechanical change as occurs in geostorage and geoenergy applications.

核磁共振实验室开展的工作与我们的 Geoenergy 和变革性技术旗舰有关。该实验室与岩石物理学实验室和显微 CT 实验室同步工作，非常适合在地质储存和地质能源应用中发生的地球化学或地球力学变化背景下量化物理特性。

A person working on a machine

Description automatically generated

**[Petrophysics Laboratory](https://xpnhcnsh.github.io/UNSW/Petrophysics%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[岩石物理实验室](https://xpnhcnsh.github.io/UNSW/Petrophysics%20Laboratory%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

Petrophysics research is related to the study of flow and transport in rocks and their physical and chemical properties. Our facilities drive research related to the development of subsurface engineering technologies that are critical for the energy transition and future demands for energy and minerals.

岩石物理学研究与岩石中的流动和运移及其物理和化学性质的研究有关。我们的设施推动了与地下工程技术开发相关的研究，这些技术对于能源转型以及未来对能源和矿产的需求至关重要。

A few men in a lab

Description automatically generated

**[Tyree X-Ray](https://xpnhcnsh.github.io/UNSW/Tyree%20X%20ray%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[Tyree X射线](https://xpnhcnsh.github.io/UNSW/Tyree%20X%20ray%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

The Tyree X-Ray facility offers the latest in CT imaging technology to the study of porous media along with data processing software to support imaging and data research.

Tyree X 射线设施为多孔介质的研究提供最新的 CT 成像技术，以及支持成像和数据研究的数据处理软件。

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A person writing on a computer

Description automatically generated

**[ViMINE: UNSW’S innovative mine planning](https://xpnhcnsh.github.io/UNSW/ViMINE%20UNSW's_%20innovative%20mine%20planning%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

**[ViMINE:新南威尔士大学的创新矿山规划](https://xpnhcnsh.github.io/UNSW/ViMINE%20UNSW's_%20innovative%20mine%20planning%20_%20Minerals%20and%20Energy%20Resources%20Engineering%20-%20UNSW%20Sydney.html" \t "_self)**

ViMINE is a tool for students to experience various aspects of a mining operation in an integrated simulation environment, giving them access to a fully "operational" mine to experiment with.

ViMINE 是一款工具，让学生在集成仿真环境中体验采矿作业的各个方面，使他们能够进入完全“运营”的矿山进行实验。

**Advanced Geochemistry Laboratory**

**高级地球化学实验室**



The study of electrochemistry and hydrometallurgy are both important in the extraction and recovery of valuable metals from their ores. This laboratory has the capabilities to develop novel electrochemical-based techniques for the processing of not only primary ores but also secondary sources like tailings, acid mine drainage and electronic wastes for a sustainable future.

电化学和湿法冶金的研究对于从矿石中提取和回收有价金属都很重要。该实验室有能力开发基于电化学的新型技术，不仅用于加工原生矿石，还用于加工尾矿、酸性矿山排水和电子废物等二次来源，以实现可持续的未来。

Research activities conducted in the GeoChemistry Laboratory are related to our flagship research on transformative technologies. By developing novel electrochemical-based techniques for the extraction and recovery of precious and critical metals from low-grade materials and waste streams, we seek to transform how the resources industry and society manage our finite resources for the benefit of all.

地球化学实验室进行的研究活动与我们对变革性技术的旗舰研究有关。通过开发基于电化学的新型技术，从低品位材料和废物流中提取和回收贵金属和关键金属，我们寻求改变资源行业和社会管理有限资源的方式，以造福所有人。

* Equipment

设备

* + Metrohm Autolab PGSTAT302N

瑞士万通 Autolab PGSTAT302N

* + Thermostat Water Bath Shaker

恒温水浴摇床

* + Leaching Reactor Setup

浸出反应器设置

* + pH and ORP (Oxidation Reduction Potential) meters

pH 和 ORP（氧化还原电位）测量仪

* + Recirculating water bath

循环水浴

* + Oven

烤箱

* + High Sensitivity Balance

高灵敏度天平

* + Retch Vibratory Disc Mill

Retch 振动盘式研磨机

* + Column Setup with Fraction Collector

使用 Fraction Collector 进行色谱柱设置

* + Titrator

滴定仪

**Immersive Technology Laboratory**

**沉浸式技术实验室**



The Immersive Technology Lab at UNSW houses a variety of virtual reality (VR), augmented reality (AR), and holographic technologies that are designed to push the boundaries of innovative education.

新南威尔士大学的沉浸式技术实验室拥有各种虚拟现实 （VR）、增强现实 （AR） 和全息技术，旨在突破创新教育的界限。

The equipment includes a floor-to-ceiling, 360-degree, 3D VR theatre also referred to as the Advanced Visualisation and Interaction Environment (AVIE), a holographic simulator, and mobile-based AR and consumer VR headsets. These devices are used to immerse students in site environments, to explain complex four-dimensional concepts and to conduct interactive virtual group assessments.

该设备包括一个从地板到天花板的 360 度 3D VR 剧院，也称为高级可视化和交互环境 （AVIE）、全息模拟器以及基于移动设备的 AR 和消费类 VR 耳机。这些设备用于让学生沉浸在现场环境中，解释复杂的 4D 概念并进行交互式虚拟小组评估。

We simulate various mine environments - from open-cut to underground, from hard rock to gas reservoirs. By using 3D simulation, potential hazards are safely experienced, designs are tested, and feasibility studies consolidated. Additionally, concepts and theories can be tested and challenged like never before.

我们模拟各种采矿环境 - 从露天开采到地下开采，从坚硬的岩石到天然气储层。通过使用 3D 仿真，可以安全地体验潜在危险，测试设计并整合可行性研究。此外，概念和理论可以以前所未有的方式进行测试和挑战。

The Immersive Technology Laboratory represents so much of what is important to us here at the School: innovation, high-quality education, and industry partnerships. This technology has been developed in collaboration with our industry partners to provide training material for our students who have reaped the benefits ever since.

沉浸式技术实验室代表了对我们学院来说非常重要的大部分内容：创新、高质量教育和行业合作伙伴关系。这项技术是与我们的行业合作伙伴合作开发的，旨在为我们的学生提供培训材料，他们从那时起就从中受益。

These innovations culminate in a vision that creates industry-relevant experiences, which travel far beyond the textbook - and directly to the heart of experiential learning.

这些创新最终形成了一个愿景，即创造与行业相关的体验，这些体验远远超越了教科书，直接进入体验式学习的核心。

Holographic simulator

全息模拟器

Our Hologram table features holographic technology displaying 3D images in real time, allowing researchers and students to interact with virtual 3D representations of mining sites. IR tracking technology provides each eye with a specific image, and two external 98-inch TVs offer extended content view.

我们的全息图桌采用全息技术，可实时显示 3D 图像，使研究人员和学生能够与采矿现场的虚拟 3D 表示进行交互。红外跟踪技术为每只眼睛提供特定图像，两台外部 98 英寸电视提供扩展的内容视图。

The technology can visualise mines as a hologram, showing the position of mine workers to provide navigation. Using a RealWear Navigator 500 head mounted tablet (HMT) mounted on safety helmet, with a built-in camera, screen, mic, speaker, positioning sensor and 4G network, it offers two-way communication.

该技术可以将矿井可视化为全息图，显示矿工的位置以提供导航。使用安装在安全帽上的 RealWear Navigator 500 头戴式平板电脑 （HMT），内置摄像头、屏幕、麦克风、扬声器、定位传感器和 4G 网络，提供双向通信。

The ability to bring site inspection data from a remote mine into 3D hologram context allows a diverse group of stakeholders to align understanding and problems. This is an important step toward real time disaster management and the operations control rooms of the future.

将远程矿山的现场检查数据导入 3D 全息图环境的能力使不同的利益相关者群体能够使理解和问题保持一致。这是迈向实时灾害管理和未来运营控制室的重要一步。

Advanced Visualisation & Interaction Environment

高级可视化和交互环境

The AVIE is our 3D VR theatre that can host up to 30 visitors at any time and has a closing door that provides a full 360-degree image. This image is useful to quickly immerse a group of students in a virtual world.

AVIE 是我们的 3D VR 剧院，可随时容纳多达 30 名游客，并设有一个关闭的门，可提供完整的 360 度图像。此图像可用于将一组学生快速沉浸在虚拟世界中。

Currently, there are more than 20 modules available in the school. Some examples of our modules include:

目前，学校有 20 多个模块可供选择。我们的模块示例包括：

* + Coal Burst: A simulated coal burst to allow the viewer to experience the event and then explore the aftermath to view animated videos of 8 contributing factors to a high coal burst prone environment

煤爆：模拟煤爆，让观众体验事件，然后探索后果，观看导致高煤爆环境的 8 个因素的动画视频

* + Petroleum Awareness: A virtual field trip to a simulated coal seam gas wellhead and oil wellhead with a cross-section explanation of the reservoir geology and well-established process. Then a visit to a series of offshore oil rigs for a 360o walkaround tour of the layout

石油意识：对模拟煤层气井口和油井口的虚拟实地考察，对储层地质和成熟过程进行横截面解释。然后参观一系列海上石油钻井平台，进行 360 度布局导览

* + Laboratory Rock Testing: A basic simulation of a UCS rock testing machine where a user can insert samples into a virtual testing machine and observe the results.

实验室岩石测试：UCS 岩石试验机的基本模拟，用户可以将样品插入虚拟试验机并观察结果。

VR and AR Technology

VR和AR技术

We pride ourselves on being a world leader in developing interactive VR/AR visualisation tools to enhance the student experience. We use the latest VR headset technology such as the Oculus Rift, Oculus Go and Oculus Quest, which are selected for different types of media and experiences. We also have several multiplayer VR headset activities where the students can be guided by an expert or in teams to problem solve a design issue.

我们以成为开发交互式 VR/AR 可视化工具以增强学生体验的全球领导者而自豪。我们使用最新的 VR 头戴式设备技术，例如 Oculus Rift、Oculus Go 和 Oculus Quest，这些技术被选中用于不同类型的媒体和体验。我们还提供多项多人 VR 头戴式设备活动，学生可以在专家或团队的指导下解决设计问题。

Students also have access to the latest AR hardware such as the Microsoft Hololens and mobile-based AR using iPads and Android devices to place virtual objects within the physical world that they can interact with and walk around. VR and AR are exciting fields as they open the possibility for students to have their own virtual mine models and equipment to take home and place on their desk to examine using their mobile device.

学生还可以使用最新的 AR 硬件，例如 Microsoft Hololens 和基于移动设备的 AR，使用 iPad 和 Android 设备将虚拟对象放置在他们可以与之交互和四处走动的物理世界中。VR 和 AR 是令人兴奋的领域，因为它们为学生提供了拥有自己的虚拟矿山模型和设备的可能性，他们可以带回家放在桌子上，使用他们的移动设备进行检查。

Capabilities

能力

We regularly host visitors from other mining universities show how our latest developments are making a difference in our students’ improvements. We specialise in developing engaging learning experiences that go beyond the pages of a textbook to help teach some of the more complex engineering concepts.

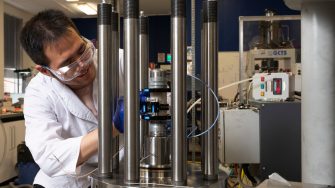
我们定期接待来自其他矿业大学的访客，展示我们的最新发展如何对学生的进步产生影响。我们专注于开发引人入胜的学习体验，这些体验超越了教科书的页面，以帮助教授一些更复杂的工程概念。

A tailored training program can be developed for anyone without a mining background. We’ll work with you to develop or tailor the topic areas based on our current modules. A simple assessment plan can also be developed and tailored to your needs.

可以为没有采矿背景的任何人制定量身定制的培训计划。我们将与您合作，根据我们当前的模块开发或定制主题领域。也可以根据您的需求制定和定制一个简单的评估计划。

**Mine Geomechanics Laboratory**

**矿山地质力学实验室**



Geomechanics research studies the mechanics of rocks and materials with application in the mineral resources industry. The facility provides laboratory equipment required to advance the technologies for a sustainable and safe mining practice that is essential to meet future mineral needs.

地质力学研究岩石和材料的力学，并在矿产资源行业中的应用。该设施提供所需的实验室设备，以推进可持续和安全的采矿实践的技术，这对于满足未来的矿物需求至关重要。

Work performed in the Mine Geomechanics Laboratory drives our research flagship in geomechanics. The lab allows for simulating extreme in-situ conditions. The lab is the centre of many of our experimental programs for our industry and government-funded research programs.

在矿山地质力学实验室进行的工作推动了我们在岩土力学方面的研究旗舰。该实验室允许模拟极端的原位条件。该实验室是我们许多行业实验项目和政府资助的研究项目的中心。

Equipment

设备

* + 815 Rock Test System Load frame

815 岩石试验系统负载框架

* + GCTS RDS300 Shear System with RDS-300 System (Water shear capabilities)

GCTS RDS300 剪切系统与 RDS-300 系统（水剪切能力）

* + High Pressure Water System

高压水系统

* + High pressure Triaxial Cell 120MPA

高压三轴电池 120MPA

* + Hi resolution Spectroradiometer

高分辨率光谱辐射计

* + Linear rock cutting

线性岩石切割

* + Moog Controller and Load Frame

穆格控制器和负载框架

* + AE-8 Measurement System

AE-8 测量系统

* + Triaxial Ultrasonic Meas. Syst

三轴超声测量系统

* + Triaxial Temp. Control System

三轴温度控制系统

* + Permeability Measuring Cabinet

磁导率测量柜

* + ZEB\_REVO Laser System

ZEB\_REVO 激光系统

* + Flowtrac II Triaxial frame and flow pump

Flowtrac II 三轴框架和流量泵

* + ULTRASONIC VELOCITY TESTER

超声波测速仪

* + Pundit PL-200 Seismic System

Pundit PL-200 地震系统

* + Surface Grinder RIC-1545H

平面磨床 RIC-1545H

* + Crown Forklift - SHR55416TT-39

科朗叉车 - SHR55416TT-39

**Mine Ventilation Laboratory**

**矿井通风实验室**



Mine ventilation laboratory aims to provide teaching and research capacities to study the fundamentals of air movement and underground working environment for the mining industry. Ventilation provides a comfortable working environment for underground workforces, which is the ‘blood circulation system’ for mines.

矿井通风实验室旨在提供教学和研究能力，以研究采矿业空气流动和地下工作环境的基本原理。通风为地下工人提供了舒适的工作环境，这是矿山的“血液循环系统”。

Work conducted in the Mine Ventilation Laboratory is related to understanding the air movement in underground airways, e.g., pressure drop, airway resistance, and air quantity. We are equipped with a miniature of the underground ventilation ducting system. The air conditioning unit can create any underground ventilation environment at a specific psychrometric condition.

在矿井通风实验室进行的工作与了解地下气道中的空气流动有关，例如压降、气道阻力和空气量。我们配备了地下通风管道系统的微型。空调机组可以在特定的湿度条件下创建任何地下通风环境。

**Equipment**

**设备**

* Air conditioning training unit

空调实训机组

* Laboratory Mill MiniPur

实验室研磨机 MiniPur

* Ventilation duct simulator

通风管道模拟器



**Mineral Processing Laboratory**

**矿物加工实验室**



Mineral processing is concerned with the extraction of valuable minerals and metals from orebodies. A range of physical and chemical techniques are employed depending on the ore/mineral. Our facilities are equipped to conduct research to better understand how mineral particles can be recovered efficiently, which is crucial in our needs of critical minerals and the electrification of our society.

矿物加工涉及从矿体中提取有价值的矿物和金属。根据矿石/矿物的不同，会采用一系列物理和化学技术。我们的设施配备了进行研究的设备，以更好地了解如何有效地回收矿物颗粒，这对于我们对关键矿物的需求和社会电气化至关重要。

The work conducted in our facilities is related to transformative technologies. Our laboratories house standard equipment as well as custom-built equipment to study 3-phase phenomena. Much of the work is concerned with understanding bubble-bubble and bubble-particle interactions.

在我们的设施中开展的工作与变革性技术有关。我们的实验室拥有标准设备以及用于研究 3 相现象的定制设备。大部分工作都与理解气泡-气泡和气泡-粒子相互作用有关。

* Equipment

设备

* + Cole-Palmer Vacuum Oven 1.5CU ft 230V

科尔-帕尔默真空烤箱1.5CU英尺230V

* + Welch Vacuum pump

Welch 真空泵

* + Peristaltic pump

蠕动泵

* + QSONICA Probe sonicator

QSONICA 探头超声仪

* + BECKMAN Multisizer 4e Coulter Counter

BECKMAN Multisizer 4e 犁刀计数器

* + PHOTRON HS CAMERA-Ultim RS-FC

PHOTRON HS 相机-Ultim RS-FC

* + Bubble coalescence setup (custom-made)

气泡聚结设置（定制）

* + SINTERFACE PAT Analyzer

SINTERFACE PAT 分析仪

* + Krüss DFA100 Analyzer

Krüss DFA100 分析仪

* + Denver flotation cell (2×)

丹佛浮选机 （2×）

* + Bottom driven flotation cell (custom-made)

底部驱动浮选机（定制）

* + BECKMAN Allegra X-30nCentrifuge

BECKMAN Allegra X-30n 离心机

* + Foam column (custom-made)

泡沫柱（定制）

* + Bubble viewer (custom-made)

气泡查看器（定制）

* + Pressure filter (custom-made)

压力过滤器（定制）

* + Dewatering unit (custom-made)

脱水装置（定制）

* + MERCK Milli-Q water system

MERCK Milli-Q 水系统

* + LABEC furnace

LABEC 炉

* + Drying oven

烘箱

* + Ball mill

球磨机

* + Rod mill

棒磨机

* + Retsch BB 200 Jaw Crusher

Retsch BB 200 颚式破碎机

* + Low Intensity Wet Drum

低强度湿鼓

* + Magnetic Wet Tube Tester

磁吸湿管测试仪

* + Sieves

筛

* + Sieve shakers (2×)

筛分仪 （2×）

* + Riffle splitter

Riffle 分流器

**MIoT & IPIN Lab**

**MIoT & IPIN 实验室**



MIoT & IPIN Lab is Australia's premier academic group, focusing on Mine Internet of Things and Indoor Positioning Indoor Navigation research applications.

MIoT & IPIN实验室是澳大利亚首屈一指的学术团体，专注于矿山物联网和室内定位室内导航研究应用。

Mining is key for global socio-economic growth and is linked to nearly every industry value chain. The mining industry globally is suffering from high costs and increasingly difficult conditions including deeper and steeper deposits, lower ore grade, extreme geotechnical and geological challenges, isolated mine sites and infrastructure challenges, and a range of social and environmental challenges including diverse community responses to mining activities. IoT based “Digital Mine” promising a new age of data analytics delivering unmatched levels of safety, operational and productivity information along with a shift to higher automation levels. According to Location, information is the key of IoT applications, without satellite signals, positioning and navigation in indoor environment including underground mine is challenging. However, the global indoor positioning and indoor navigation market was valued at $2,642 million in 2017 and is projected to reach $43,511 million by 2025.

采矿是全球社会经济增长的关键，几乎与每个行业价值链都息息相关。全球采矿业正遭受着高成本和日益困难的条件，包括更深更陡的矿床、更低的矿石品位、极端的岩土工程和地质挑战、孤立的矿区和基础设施挑战，以及一系列社会和环境挑战，包括社区对采矿活动的不同反应。基于物联网的“数字矿山”有望开启数据分析的新时代，提供无与伦比的安全、运营和生产力信息，并转向更高的自动化水平。根据位置信息，信息是物联网应用的关键，如果没有卫星信号，在包括地下矿井在内的室内环境中进行定位和导航具有挑战性。然而，2017 年全球室内定位和室内导航市场价值为 26.42 亿美元，预计到 2025 年将达到 435.11 亿美元。

We have been working on MIoT since 2017. Our research includes indoor position technologies such as WiFi, BLE, UWB, RFID; communication technologies such as LoRa, BLE, NBIoT, eMTC; mobile robots for underground application; LiDAR for underground 3D modelling; AI for underground applications etc. In 2020, working closely with industry partners, we have secured a 5.31m CRC-P project which will take our research on MIoT and IPIN to a new level.

自 2017 年以来，我们一直在研究 MIoT。我们的研究包括 WiFi、BLE、UWB、RFID 等室内定位技术;LoRa、BLE、NBIoT、eMTC 等通信技术;用于地下应用的移动机器人;用于地下 3D 建模的 LiDAR;用于地下应用的 AI 等2020 年，我们与行业合作伙伴密切合作，获得了一个 5.31m CRC-P 项目，这将使我们对 MIoT 和 IPIN 的研究更上一层楼。

**Multiphysics Geomechanics Laboratory**

**多物理场岩土力学实验室**



Multiphysics geomechanics sits in the centre of many challenges faced by societies today such as sustainable water and energy resources extraction, safe disposal of energy waste, subsurface gas storage, and natural hazards (earthquake, etc). This is because geomaterials deformation and its associated damage/failure is caused by several processes occurring in subsurface formations such as fluid pressure, chemical reaction, temperature variation, and mechanical loading.

多物理场地质力学是当今社会面临的许多挑战的中心，例如可持续的水和能源资源开采、能源废物的安全处置、地下天然气储存和自然灾害（地震等）。这是因为土工材料变形及其相关的损坏/失效是由地下地层中发生的几个过程引起的，例如流体压力、化学反应、温度变化和机械载荷。

Multiphysics geomechanics research seeks to understand and analyse the processes affecting rock deformation such as mechanical, thermal, hydraulic, and chemical loading and characterise such deformations using techniques such as optical, thermal, and acoustic tracking. This provides a unique opportunity to address industry challenges using their already collected data such as downhole geophysical logs.

多物理场地质力学研究旨在了解和分析影响岩石变形的过程，例如机械、热、液压和化学载荷，并使用光学、热和声学跟踪等技术表征这些变形。这为利用他们已经收集的数据（如井下地球物理测井）来应对行业挑战提供了独特的机会。

* Equipment
  + Sample preparation equipment

样品制备设备

* + Triaxial system with temperature and pore pressure controlled and ultrasonic enabled capabilities

具有温度和孔隙压力控制功能以及超声功能的三轴系统

* + Ultrasonic and flow enabled, temperature-controlled X-ray transparent triaxial system

支持超声波和流量的温控 X 射线透明三轴系统

* + X-ray transparent direct shear system

X 射线透明直剪系统

* + High resolution surface profile scanner

高分辨率表面轮廓扫描仪

* + High pressure and high temperature variable frequency ultrasonic system

高压高温变频超声波系统

* + Optical and infrared tracking system for damage analysis

用于损伤分析的光学和红外跟踪系统

* + Ultrasonic tomography system

超声断层扫描系统

* + Nano scale resolution interferometer-optical system coupled with high pressure and high temperature micro-shear cell

纳米级分辨率干涉仪-光学系统耦合高压高温微剪切池

* + Controlled temperature-humidity oven

温湿度烘箱

* + 100 T servo-controlling loading frames

100 T 伺服控制装载框架

* + 50 T creep test frames

50 T 蠕变试验框架

* + Vacuum ovens

真空烘箱

* + 3D printers

3D 打印机

**NMR Low-Field Laboratory**

**NMR 低场实验室**



Low-field Nuclear Magnetic Resonance (NMR) relaxometry and diffusion measurements provide fluid properties, the geometric environment of fluids in porous media, and are influenced by the wetting behaviour of saturating fluids. This allows for the estimation of key physical quantities controlling multi-phase fluid flow and reservoir performance in porous rocks. The laboratory is well suited to quantify physical properties in the context of geochemical or geomechanical change as occurs in geostorage and geoenergy applications.

低场核磁共振 （NMR） 弛豫测量和扩散测量提供流体特性、多孔介质中流体的几何环境，并受饱和流体润湿行为的影响。这允许估计控制多孔岩石中多相流体流动和储层性能的关键物理量。该实验室非常适合在地质存储和地质能源应用中发生的地球化学或地质力学变化背景下量化物理特性。

Work performed in the NMR laboratory relate to our geoenergy and transformative technology flagships. The laboratory works in coordination with the Petrophysics Laboratory and Micro-CT Laboratory, enabling a strong integrated approach to petrophysical property interpretation by combining experiment and simulation.

核磁共振实验室所做的工作与我们的地质能源和变革性技术旗舰有关。该实验室与岩石物理实验室和显微 CT 实验室合作，通过将实验和模拟相结合，实现了岩石物理特性解释的强大综合方法。

* Equipment

设备

* + Magritek 2MHz Rock Core Analyser equipped with P54 and P29 RF probes and gradient unit

Magritek 2MHz 岩心分析仪，配备 P54 和 P29 射频探头和梯度装置

* + Magritek 13MHz profile NMR mouse, PM25 system with 100mm depth resolution

Magritek 13MHz 轮廓 NMR 鼠标，PM25 系统，深度分辨率为 100 毫米

* + Magritek 43MHz Spinsolve Carbon with gradient and variable temperature capability

Magritek 43MHz Spinsolve Carbon，具有梯度和可变温度功能

* + ISCO-Teledyne E65DM continuous flow setups (4 pumps, 2 controllers)

ISCO-Teledyne E65DM 连续流量设置（4 个泵，2 个控制器）

* + AMS-900 Acoustic Phase Separator; 10,000 psi

AMS-900 声相分离器;10,000 磅/平方英寸

* + ErgoTech instrumented NMR tri-axial core flow cell & straining frame assembly; 5,000 psi, 38mm core diameter

ErgoTech仪器化NMR三轴芯流动池和应变框架组件;5,000 psi，38mm 芯径

* + Daedalus DCH Auto Circulation Kit for NMR spectroscopy; 10,000 psi, 150°C

用于 NMR 波谱的 Daedalus DCH 自动循环套件;10,000 磅/平方英寸，150°C

* + Daedalus overburden rock core cell kit; 10,000 psi, 150°C, 25.4 mm core diameter

Daedalus 覆盖岩芯细胞套件;10,000 psi，150°C，25.4 mm 纤芯直径

* + Labec humidity chamber M-LC-40; -40°C - 150°C temperature range

Labec 湿度箱 M-LC-40;温度范围 -40°C - 150°C

* + Mettler Toledo S-479-KIT “SevenExcellence” PH/cond./DO bench meter

梅特勒托利多 S-479-KIT “SevenExcellence” PH/电导率/溶解氧 （DO） 台式仪表

**Petrophysics Laboratory**

**岩石物理实验室**



Petrophysics research is related to the study of flow and transport in rocks and their physical and chemical properties. Our facilities drive research related to the development of subsurface engineering technologies that are critical for the energy transition and future demands for energy and minerals.

岩石物理学研究与岩石中的流动和运移及其物理和化学性质的研究有关。我们的设施推动了与地下工程技术开发相关的研究，这些技术对于能源转型以及未来对能源和矿产的需求至关重要。

Work conducted in the Petrophysics Laboratory is related to our geoenergy research flagship. We are equipped with high-pressure and high-temperature experimental systems to measure petrophysical properties at reservoir conditions. Other bespoke experimental systems are common for many of our industry and government funded projects including fluid equipment coupled to high-resolution X-ray computed microtomography imaging.

岩石物理实验室进行的工作与我们的地质能源研究旗舰有关。我们配备了高压和高温实验系统，用于测量储层条件下的岩石物理特性。其他定制的实验系统在我们的许多行业和政府资助项目中很常见，包括与高分辨率 X 射线计算机显微断层扫描成像相结合的流体设备。

* Equipment
  + BELSORP HP Isotherm Analyzer

BELSORP HP 等温线分析仪

* + Probe Permeameter – PROPERM

探头渗透仪 – PROPERM

* + Microscope Axio Zoom.V16

显微镜 Axio Zoom.V16

* + M6500 SpinningDrop Tensiometer

M6500 SpinningDrop 表面张力仪

* + Pendant Drop Interfacial Tension Meter

悬滴界面张力计

* + High-Temperature High-Pressure Contact Angle Setup

高温高压接触角设置

* + Core flooding Units (5, 10, 60, and 80mm core diameter) High-Temperature High-Pressure

岩心填充装置（岩心直径 5、10、60 和 80 毫米）高温高压

* + Laser Particle Counter

激光粒子计数器

* + Pump 33 Dual Drive System

Pump 33 双驱动系统

* + Harvard Syringe Pumps

Harvard 注射泵

* + VP-12k Vindum Pumps

VP-12k Vindum 泵

* + Teledyne ISOC D-Series Pumps

Teledyne ISOC D 系列泵

* + Enerpac High-Pressure Saturation System

Enerpac 高压饱和系统

* + Diner Electronic Plasma Surface Cleaner

Diner Electronic 等离子表面清洁剂

* + Vacuum System for Core Saturation

用于芯饱和的真空系统

* + Beckman L8-60M/P Ultracentrifuge

贝克曼 L8-60M/P 超速离心机

* + Drying Oven Ambient Temperature

烘箱环境温度

* + Drying and Vacuum Oven

干燥和真空烘箱

* + High-Temperature Furnace

高温炉

* + Soxhlet Core Cleaner

索氏芯清洗机r

* + Gas Diffusion Setup

气体扩散设置

* + High-Temperature High-Pressure Triaxial Cells

高温高压三轴电池

* + Hydraulic Press

液压机

* + 250 Kg Crane

250 公斤起重机

* + CoreTest System OEP-706 Overburden Electrical Properties

CoreTest System OEP-706 覆盖层电气特性

* + Milli-Q Water System

Milli-Q 纯水系统

* + Automated Permeameter and Porosimeter

自动渗透仪和孔隙计

**Tyree X-Ray**

**Tyree X射线**



Part of our commitment to solving the world’s greatest challenges is supporting the research of our academic community through our investment in world-class facilities. Tyree X-ray Facility is a leader in applying X-ray CT imaging to the study of porous media. The facility offers the latest technology combined with our expert know-how and award-winning analysis.

我们致力于解决世界上最严峻的挑战，其中一部分是通过投资世界一流的设施来支持我们学术界的研究。Tyree X 射线设施是将 X 射线 CT 成像应用于多孔介质研究的领导者。该设施提供最新的技术，并结合了我们的专业知识和屡获殊荣的分析。

The Tyree X-ray CT Facility is built on the technology developed over more than a decade of research and development at UNSW Sydney and ANU Canberra. One of the most important things we provide is quality control – ensuring that our clients get the imagery and data that they need.

Tyree X 射线 CT 设施建立在新南威尔士大学悉尼分校和澳大利亚国立大学堪培拉分校十多年的研发技术之上。我们提供的最重要的服务之一是质量控制 - 确保我们的客户获得他们需要的图像和数据。

[Virtual lab tour](https://immersivetechnologies-dev.teaching.unsw.edu.au/projects/deploy/ImmersiveEditor/?p=kx_WB-aq" \t "_blank)

[虚拟实验室导览](https://immersivetechnologies-dev.teaching.unsw.edu.au/projects/deploy/ImmersiveEditor/?p=kx_WB-aq" \t "_blank)

**Our history**

**我们的历史**

This technology was commercialised when Digital Core Pty Ltd merged with Numerical Rocks AS in 2013 to form Lithicon. The following year, Lithicon was acquired by FEI for AUD$76 million. The commercialisation of the technology has led UNSW’s Professors Val Pinczewski and Christoph Arns to be awarded with Eureka and NSW Premier's prizes. They were also named in the 2015 Engineers Australia Top 100 Engineers and numerous UNSW innovation prizes, along with many high impact publications and research projects.

当 Digital Core Pty Ltd 于 2013 年与 Numerical Rocks AS 合并成立 Lithicon 时，这项技术被商业化。次年，Lithicon 被 FEI 以 7600 万澳元的价格收购。该技术的商业化使新南威尔士大学的 Val Pinczewski 和 Christoph Arns 教授获得了尤里卡奖和新南威尔士州州长奖。他们还入选了 2015 年澳大利亚工程师 100 强工程师和众多新南威尔士大学创新奖，以及许多高影响力的出版物和研究项目。

The first Heliscan micro-CT was installed inside a lead-lined room in 2015. As part of a long-term strategy to make the facility more accessible to a wider user base outside of the School of Mineral and Energy Resources Engineering (MERE), the lab became part of the UNSW Network Labs in 2017. Along with MERE, the facility is supported by the School of Mechanical and Manufacturing Engineering (MECH) and the School of Civil and Environmental Engineering (CVEN).

第一台 Heliscan 显微 CT 于 2015 年安装在衬铅室内。作为使矿物与能源资源工程学院 （MERE） 以外的更广泛用户群更容易使用该设施的长期战略的一部分，该实验室于 2017 年成为新南威尔士大学网络实验室的一部分。与 MERE 一起，该设施还得到了机械与制造工程学院 （MECH） 和土木与环境工程学院 （CVEN） 的支持。

In 2021, the facility will be part of the Mark Wainwright Analytical Centre.

2021 年，该设施将成为 Mark Wainwright 分析中心的一部分。

**ViMINE: UNSW’S innovative mine planning**

**ViMINE：新南威尔士大学的创新矿山规划**



If you’re a UNSW Mining Engineering student, ViMINE enables you to experience various aspects of a mining operation by integrating several types of simulation into one environment. In scenario-based learning activities, you can access information from multiple simulations and make decisions throughout the whole life of a simulated mine.

如果您是新南威尔士大学采矿工程专业的学生，ViMINE 通过将多种类型的模拟集成到一个环境中，使您能够体验采矿作业的各个方面。在基于场景的学习活动中，您可以访问来自多个模拟的信息，并在模拟矿山的整个生命周期内做出决策。

This platform takes you from initial exploration to final site rehabilitation and evaluates their effectiveness for building systems thinking skills. Essentially, you’ll have access to a fully "operational" mine to experiment with.

该平台将带您从最初的探索到最终的场地修复，并评估它们对构建系统思维技能的有效性。从本质上讲，您将可以使用一个完全“可操作”的矿井进行试验。

 The aims of using ViMINE are to:

使用 ViMINE 的目的是：

* Give you access to authentic experiential learning in which you can place technical decision-making in a socio-economic and environmental context

让您获得真实的体验式学习，在其中，您可以将技术决策置于社会经济和环境背景下

* Develop ViMINE as an integrated simulation environment that combines use of technical, environmental and socio-economic simulation tools

将 ViMINE 开发为综合仿真环境，结合使用技术、环境和社会经济仿真工具

* Establish effective designs for learning activities in mining engineering with a view to developing these further in mining engineering and in other engineering disciplines

为采矿工程的学习活动建立有效的设计，以期在采矿工程和其他工程学科中进一步发展这些活动

Specific educational objectives of the ViMINE are:

ViMINE 的具体教育目标是：

* To develop an authentic 4D experience for students to build their understanding of complex mining operations throughout a mine life cycle

为学生开发真实的 4D 体验，以建立他们对整个矿山生命周期中复杂采矿作业的理解

* To provide a framework to allow students to build a simulation model of an authentic mining operation

提供一个框架，让学生能够构建真实采矿作业的模拟模型

* To give you experience of the consequences of their technical decisions using different simulation scenario

让您体验他们使用不同的模拟场景做出技术决策的后果

* To allow you to learn from mistakes in virtual environments without causing any loss of life and damage to property

让您从虚拟环境中的错误中吸取教训，而不会造成任何生命损失和财产损失

* To engage you as a more active and powerful participant in the learning process

让您成为学习过程中更积极、更强大的参与者

ViMINE has the capability to be used at different levels of sophistication for study to give you an overall picture of various mining activities and processes. Both the facility and the learning designs could also be easily adapted for other engineering disciplines where multiple simulation tools are already available.

ViMINE 能够用于不同复杂程度的研究，让您全面了解各种采矿活动和过程。设施和学习设计也可以轻松适应已经有多种仿真工具的其他工程学科。

ViMINE allows you to carry out several mine design projects where they link separate mine planning and design simulation software packages, as part of one simulation exercise – i.e. the results from one simulation tool will flow through to another. Currently there are two modules that have been developed in the first stage of ViMine 1 – ViMine 1A: Introduction to Mining Methods and ViMine 1B: Mining Method Selection.

ViMINE 允许您执行多个矿山设计项目，它们将单独的矿山规划和设计仿真软件包连接起来，作为一次仿真练习的一部分，即一个仿真工具的结果将流向另一个仿真工具。目前，ViMine 1 的第一阶段已经开发了两个模块——ViMine 1A：采矿方法介绍和 ViMine 1B：采矿方法选择。

[Download here](https://www.unsw.edu.au/content/dam/pdfs/engineering/minerals-energy-eng/resources/vimine-unsw-innovative-mine-planning/2021-10-mere-vimine-manual.pdf" \t "_blank)

[点击此处下载](https://www.unsw.edu.au/content/dam/pdfs/engineering/minerals-energy-eng/resources/vimine-unsw-innovative-mine-planning/2021-10-mere-vimine-manual.pdf" \t "_blank)

**Get in touch**

**联系我们**

ViMINE is currently offered to individuals free of charge for academic uses and personal research upon request. We hope this offering will provide feedback to both improve the software and develop new functionality as such your feedback is integral to our future.

ViMINE 目前可应要求免费提供给个人用于学术用途和个人研究。我们希望此服务能够提供反馈，以改进软件和开发新功能，因此您的反馈对我们的未来不可或缺。

To use these modules, please complete the end user licence agreement below.

要使用这些模块，请填写下面的最终用户许可协议。

[Access ViMINE 1A](https://www.unsw.edu.au/engineering/our-schools/minerals-and-energy-resources-engineering/our-research/facilities/vimine-unsw-innovative-mine-planning/vimine-1a-introduction-mining-methods" \t "_self)

[访问 ViMINE 1A](https://www.unsw.edu.au/engineering/our-schools/minerals-and-energy-resources-engineering/our-research/facilities/vimine-unsw-innovative-mine-planning/vimine-1a-introduction-mining-methods" \t "_self)

[Access ViMINE 1B](https://www.unsw.edu.au/engineering/our-schools/minerals-and-energy-resources-engineering/our-research/facilities/vimine-unsw-innovative-mine-planning/vimine-1b-introduction-mining-methods" \t "_self)

[访问 ViMINE 1B](https://www.unsw.edu.au/engineering/our-schools/minerals-and-energy-resources-engineering/our-research/facilities/vimine-unsw-innovative-mine-planning/vimine-1b-introduction-mining-methods" \t "_self)

For more information, contact  [Professor Serkan Saydam , opens in a new window , opens in a new window](https://www.unsw.edu.au/staff/serkan-saydam) .

如需了解更多信息，请联系  [Serkan Saydam教授 , opens in a new window , opens in a new window](https://www.unsw.edu.au/staff/serkan-saydam) .

Should you wish to implement the software on a wider scale or for commercial purposes, UNSW’s technology transfer office NewSouth Innovations would be happy to discuss this with you. Please contact us for more details and to arrange a discussion with NewSouth Innovations. We welcome any feedback and comments regarding ViMINE on the web.

如果您希望在更广泛的范围内实施该软件或用于商业目的，新南威尔士大学的技术转让办公室 NewSouth Innovations 将很乐意与您讨论。请联系我们了解更多详情，并安排与 NewSouth Innovations 进行讨论。我们欢迎在 Web 上对 ViMINE 提出任何反馈和意见。