



Third International Workshop Hyperspectral Core Scanning Working Group

Day 1 - Saturday • May 23, 2026

**Attention: the venue for day 1 will be at the College of the North Atlantic Engineering Technology campus.
Lecture Hall ET310 - 153 Ridge Road, St John's NL A1B 5E7**

- 9:00 – 9:15 AM **Opening Remarks – Introduction & Welcome**
- 9:15 – 10:00 AM **Phil Harris** (Terracore, South Africa): Hyperspectral Core Scanning: Mainstream or Niche Technology?
- 10:00 – 10:30 AM **BREAK**
- 10:30 – 11:00 AM **Michel Rosener** (CNA, Canada): Design and automated detection of multimodal calibration targets for drill core imaging spectrometry.
- 11:00 – 11:30 AM **Sebastian Blais-Ouellette** (Photon etc., Canada): Advancing eSWIR and MWIR Hyperspectral Performance through Integrated Systems
- 11:30 – 12:00 PM **James Amato & Frankie Vogt** (University of Wyoming, School of Energy Resources, USA): Standing Up a Multi-Scale Hyperspectral Service Center: Drone, Field, and Lab Imaging with Transparent Rate Structures
- 12:00 – 1:30 PM **LUNCH**
- 1:30 – 2:00 PM **Chui Zeng** (GeologicAI, Canada): Integration of Multi-sensor Core Scanning Data in Mineral Mapping
- 2:00 – 2:30 PM **Matthew Svensson** (GeologicAI, Canada): Approaches for LIBS-Informed SWIR Mineral Identification

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- 2:30 – 3:00 PM **Sam Thiele** (Helmholtz Institute Freiberg (HIF), Germany): Upscaling mineralogy with hyperspectral drill core data: benchmark data and machine learning frameworks
- 3:00 – 3:15 PM **BREAK**
- 3:15 – 3:45 PM **Amber Zandanel (V)** (Division of Geological & Geophysical Surveys, Alaska): Digitizing the State of Alaska Geologic Sample Repository
- 3:45 – 4:15 PM **Kyle Hughes (V)** (Geologic Survey of New South Wales, Australia): McPhillamys – An NSW case study into the applications of hyperspectral data
- 4:15 – 5:00 PM **OPEN PANEL:** Looking back

Virtual presentations are marked with (V)



Third International Workshop Hyperspectral Core Scanning Working Group

Day 2 - Sunday • May 24, 2026

Attention: the venue for day 2 will be at the Co. Innovation Centre where the Hyperspectral unit is located.

Location - 710 Torbay Rd Suite A, St John's NL A1A 5G9 -

- 9:00 – 9:30 AM **Dr Jon Huntington (V)** (CSIRO Mineral Resources Discovery Program, Australia): HyLogger core logging strategies and products for everyone
- 9:30 – 10:00 AM **Dr Jo Miles** (CSIRO Mineral Resources, Australia): Leveraging Australia's NVCL to advance mineral systems understanding
- 10:00 – 10:15 AM **BREAK**
- 10:15 – 10:45 AM **Michael Treloar & Brigette A. Martini** (Anglo American, UK): Rock Characterization and Curation from Prospects to World Class Mines
- 10:45 – 11:15 AM **Halina Kondrasovas** (Veracio, USA): Delivering Value from Hyperspectral Core Scanning: Data, Interpretation, and Integration
- 11:15 – 11:45 PM **Juhani Ojala** (Geopool Oy, Vantaa, Finland): Application of hyperspectral drill core scanning to map alteration zones: Example from the Kittilä gold mine, Central Lapland Greenstone Belt, Finland
- 11:45 – 1:00 PM **LUNCH**
- 1:00 – 1:15 PM **Kele Miguel** (CNA, Canada): Operating the HSU – Lessons Learned
- 1:15 – 2:15 PM **Kele Miguel & Stewart Sharpe** (CNA, Canada): Mobile HSU Demonstration



2:15 – 2:30 PM **BREAK**

2:30 – 3:15 PM **OPEN PANEL:** Looking forward

3:15 – 3:30 PM **CLOSING REMARKS**

5:00 PM **NETWORKING EVENT** – Social Event at nearby venue

(V) Virtual presentations



Day 1 – 23 May 2026

9:15–10:00 AM

Phil Harris

Terracore, South Africa

Hyperspectral Core Scanning: Mainstream or Niche Technology?

As a group of avid practitioners and enthusiasts of Infrared Hyperspectral Core Imaging, we clearly feel that our technology has mainstream applications and have many case study examples that can support that argument. But is this really the case, or does our technology provide significant benefits for some applications, but less value in other cases? Does it fill out a more niche application for specific problems encountered in minerals industry, being a technology that is called upon selectively or for certain circumstances? While we all have strong opinions about this, the bottom line is that it is not up to us to make that judgement call. Rather, it is what the market believes and what they need to meet their requirements in high pressure industry positions. Other technologies offer similar solutions and may provide better overall value for the industry. This presentation will unpack the application of infrared imaging to drill core looking at the unique value of this application to the mining industry.

10:30–11:00 AM

Michel Rosener

College of the North Atlantic, Canada

Design and automated detection of multimodal calibration targets for drill core imaging spectrometry.

Imaging spectrometry of drill core is increasingly being used for mineral mapping and deposit characterization. At the College of the North Atlantic, we operate a container-based hyperspectral core scanner that integrates five imaging spectrometers (covering VNIR, SWIR, MWIR, and LWIR domains), a high-resolution RGB camera, and a 3D laser profiler. During acquisitions, a calibration panel runs every 40 minutes to account for drifts and changes in operational conditions. Past acquisition campaigns did not systematically embed reference materials within individual scans, and challenges in co-registering datasets acquired by sensors with different geometries and spatial resolutions were also observed. To address these limitations, we are developing calibration and referencing targets inspired by conventional imaging practices. These targets were designed with detection by all sensors in mind. They combine reference

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materials arranged in a structured layout for automated extraction and QA/QC, with purpose-built 3D binary markers that enable robust spatial detection and inter-sensor co-registration. A Python-based processing pipeline was implemented to automate target detection, reference spectrum extraction, and geometric alignment of multi-modal datasets. A first prototype was deployed during a 2025 acquisition campaign; preliminary results will be presented here.

11:00–11:30 AM

Sebastian Blais-Oullette

Photon etc., Canada

Advancing eSWIR and MWIR Hyperspectral Performance through Integrated Systems

As hyperspectral core scanning transitions from a research tool to a high-throughput industrial standard, the demand for system reliability and spectral breadth has never been higher. This presentation introduces a next-generation hyperspectral platform designed to maximize the potential of the eSWIR and MWIR (1.0–5.0 μm) ranges. The recent emergence of new infrared sensor technologies has fundamentally shifted the landscape of hyperspectral imaging. These sensors provide a unique trade-off between extreme sensitivity and rugged industrial operability, allowing for more precise detection of diagnostic mineral features. By consolidating spectral coverage from the Visible (VNIR) to the Long-Wave Infrared (LWIR) into a leaner hyperspectral system, this new generation of tools significantly lowers the barrier to entry for advanced mineralogy.

11:30–12:00 PM

James Amato & Frankie Vogt

University of Wyoming, USA

Standing Up a Multi-Scale Hyperspectral Service Center: Drone, Field, and Lab Imaging with Transparent Rate Structures

The University of Wyoming School of Energy Resources (SER) 3D Visualization Center is formalizing an official University Service Center to deliver repeatable hyperspectral imaging services across drone, field, and laboratory imaging workflows. This presentation will outline how we built the operational stack and how Service Center status is being used to streamline grant billing while ensuring sustainable cost recovery and reinvestment. A central focus will be our development of public, auditable rate structures that support transparent project scoping and budgeting across three user classes: internal (University of Wyoming researchers), academic (outside academic institutions), and external (private industry and other non-academic organizations). We will share lessons learned, decision points unique to high-end VNIR–SWIR hyperspectral programs, and a draft rate model that can serve as a template for peer institutions standing up similar capabilities.

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1:30–2:00 PM

Chui Zeng

GeologicAI, Canada

Integration of Multi-sensor Core Scanning Data in Mineral Mapping

Hyperspectral imaging plays a pivotal role in mineral exploration by offering high spectral resolution and enabling advanced analytical capabilities across various stages of the mining cycle. Its ability to capture diagnostic spectral features allows for precise mineral identification, classification, and abundance mapping. However, hyperspectral data alone often suffers from limitations including signal noise, coarse spatial resolution, and spectral variability, which can hinder mineral discrimination. To address these challenges, we integrate Short-Wave Infrared (SWIR) and Visible Near-Infrared (VNIR) hyperspectral data cubes with complementary sensor modalities, including RGB imagery and LiDAR acquired from indoor scans of drilled core. This multi-sensor fusion enhances the reliability and accuracy of mineral maps by leveraging the strengths of each modality.

2:00–2:30 PM

Matthew Svensson

GeologicAI, Canada

Approaches for LIBS-Informed SWIR Mineral Identification

In the core-scanning industry, the common application of shortwave infrared spectroscopy (SWIR) results in data that is blind to many rock forming minerals, but mineral identification can be made more holistic through applications of laser induced breakdown spectroscopy (LIBS). LIBS-informed interpretations of SWIR data can improve confidence in identifying complex mineral mixtures, minerals with strongly variable SWIR responses, minerals with poor SWIR response, and minerals that have easily conflated SWIR signatures, etc. Additionally, LIBS results can be multi-dimensional, including both atomic emissions spectra and semi-quantitative to quantitative elemental data that each provide distinct perspectives on the targeted mineralogy. In this presentation, we will review approaches for using LIBS to improve SWIR-based mineral interpretations, highlighting the strengths and weaknesses of both techniques and their applications in some deposit types.



2:30–3:00 PM

Sam Thiele

Helmholtz Institute Freiberg for Resource Technology, Germany

Upscaling mineralogy with hyperspectral drill core data: benchmark data and machine learning frameworks

We present and benchmark a workflow for integrating SEM-mineralogy data with large-scale multimodal hyperspectral imaging data. Building on previous work, supervised machine learning tools are applied to learn relationships between mineral abundance and hyperspectral features and applied to predict mineral abundance along entire drill cores. This workflow accounts for the unbalanced mineral composition typical of rocks and achieves reasonable accuracy for most rock-forming minerals. However, performance strongly depends on the representativity of the training data and is limited for rare and accessory minerals. We thus also propose innovative data-driven sampling strategies and a near-real-time processing and visualization framework to enable rapid valorization of data.

3:15–3:45 PM

Amber Zandanel

State of Alaska Division of Geological & Geophysical Surveys

Digitizing the State of Alaska Geologic Sample Repository

The Geologic Materials Center (GMC) in Anchorage houses Alaska's largest archive of geologic samples, including hundreds of thousands of feet of drill core and rock materials, as well as written records of prospect and sample histories. This repository is now being enhanced through a major digitization effort centered on hyperspectral imaging (VNIR-SWIR-MWIR-LWIR) of thousands of meters of core. The resulting dataset bridges gaps between existing sample characterizations, such as geochemical analyses and lithologic logs, creating an internally consistent and digitally accessible record of the State of Alaska's geologic sample library.

3:45–4:15 PM

Kyle Hughes

Geologic Survey New South Wales, Australia

McPhillamys – An NSW case study into the applications of hyperspectral data

Through its mineral systems work program, the Geological Survey of NSW has scanned and compiled 13 drillholes from the McPhillamys Au deposit. Using advanced hyperspectral methodology developed in house and across the National Virtual Core Library in Australia, hyperspectral characterisation of the deposit was undertaken. Some of these methodologies include; Advanced carbonate classification per Green et al. (2016), standardised exporting of hyperspectral data for analysis in 3rd party programs, mineral isolation

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geochemical correlations and 3D model applications. McPhillamys has been intensely altered which makes logging of the core very difficult. Hyperspectral scanning and analysis have allowed better characterisation of small-scale lithology changes, larger stratigraphic units and alteration facies associated with both enriched and barren zones of metal deposition. Petrographic work has been undertaken in many samples for validation purposes to ensure real mineral trends are being observed.



Day 2 – 24 May 2026

9:00–9:30 AM

Dr Jon Huntington *CSIRO Mineral Resources Discovery Program, Australia*
HyLogger core logging strategies and products for everyone

The HyLogging concept, embodied in the latest full wavelength HyLogger 4 instrument, targets rapid cm scale reconnaissance mineralogical logging using mineral unmixing and spectral feature mapping ideally suited to mass, pre-competitive data distribution by public agencies as well as competitive and proprietary logging. Case studies demonstrate the benefits of opensource delivery where clients of any expertise can either accept pre-processed results or delve deeply into their data to extract extra value at relatively low cost with tools for spectral discrimination, identification and Domaining or modelling associated data. Apart from the frequently quoted examples of hydrothermal alteration, the talk speaks extensively to unfamiliar methods and outputs applicable to a very diverse range of geologic environments.

9:30–10:00 AM

Dr Jo Miles *CSIRO Mineral Resources, Australia*
Leveraging Australia's NVCL to advance mineral systems understanding

We showcase hyperspectral core scanning case studies from across Australia, drawing on data from the National Virtual Core Library (NVCL). Using drill core-scale hyperspectral mineral classification integrated with geochemistry, the examples demonstrate how HyLogger-3 VNIR-SWIR data can resolve mineralogical variability, for example, REE host phases across heavy mineral deposits and carbonatite case studies. Collectively, they illustrate how standardised hyperspectral datasets enable reproducible interpretation, improve mineral system understanding, and support collaborative research across institutions within the international hyperspectral core scanning community.

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10:15–10:45 AM

Michael Treloar & Brigette A. Martini
Rock Characterisation and Curation from Prospects to World Class Mines

Anglo American, UK

Our capacity to gather geological data from boreholes has never been greater – and yet our ability to precisely integrate, process and ultimately leverage the resultant data and interpretations has lagged. This session dives into the challenges, lessons and successes of global Anglo American teams in their efforts to bring semi-automated, data-driven borehole curation and interpretation to exploration projects through to world class mine sites. The internally developed, agnostic, machine learning driven, Assisted Core Logging (ACL) tool provides a mutual rock language and data visualization platform that breaks down silos across the mining chain. The ACL (and supporting technology and services including image servers, LLM bots, bespoke databases and 3D modelling architectures and connections) is a nexus of this transformation and seeks to address several significant technological challenges on the road to the connected ternary of workflow, technology and human.

10:45–11:15 AM

Halina Kondrasovas
Delivering Value from Hyperspectral Core Scanning: Data, Interpretation, and Integration

Veracio, USA

This presentation examines approaches for disseminating hyperspectral core scanning data and derived products, with emphasis on distinguishing direct measurements from interpretative information. Hyperspectral workflows generate multiple data layers, including reflectance spectra, spectral feature parameters, mineral indices, and higher-level geological interpretations, which differ significantly in their assumptions and uncertainty depending on calibration and mineralogical complexity. Key sources of uncertainty in hyperspectral interpretation will be discussed, including spectral mixing, grain size effects, spectrally inactive components, and mineral chemistry, and their implications for mineral abundance results and geological interpretation. The goal is to spark discussion on practical ways to share hyperspectral data and products, so they are clearer, more consistent, and easier for end users to understand and apply. The talk also outlines how these challenges can be approached, including how limitations are communicated and how hyperspectral outputs can be integrated with geochemistry, core logging, and other datasets to produce products that are useful for interpretation and decision-making.

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11:15–11:45 AM

Juhani Ojala

GeoPool Oy, Finland

Application of hyperspectral drill core scanning to map alteration zones: Example from the Kittilä gold mine, Central Lapland Greenstone Belt, Finland

The Kittilä Mine (Suurikuusikko deposit) is an orogenic gold deposit located in the Central Lapland Greenstone Belt. Suurikuusikko host rocks are dominantly intensely deformed mafic volcanic rocks metamorphosed under greenschist facies condition. Ore is refractory with most of the gold hosted in arsenopyrite and pyrite. Based on visual core logging, gold mineralization is associated with intense pre-gold albite and syn-gold carbonate-sericite alteration. Toward ore zones, Hyperspectral imaging revealed changes marked by the disappearance of epidote, variations in carbonate, white mica and chlorite compositions, and variable sericite, silica, and albite abundances in proximal ore zones.

1:00–1:15 PM

Kele Miguel

College of the North Atlantic, Canada

Operating the HSU – Lessons Learned

Our operators will give some operational insight into unique challenges and practical solutions with operating a mobile Hyperspectral Scanning unit.

1:15–2:15 PM

Kele Miguel & Stewart Sharpe

College of the North Atlantic, Canada

Mobile HSU Demonstration

Hands on demonstration of the CNA mobile Hyperspectral Scanning Unit.

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