

2022
Geologic Repositories Rock
Sample Digitization
Webinar Series
Alaska Geologic Materials Center



Geologic Repositories Rock Sample Digitization Webinar Series

The Spring 2022 **Geologic Repositories Rock Sample Digitization** webinar series is co-hosted by the *Alaska Geologic Materials Center* (GMC) and the *Alaska Geological Society* (AGS). Additional support is provided by the USGS National Geological and Geophysical Data Preservation Program (NGGDPP), Alaska Oil and Gas Association (AOGA), Alaska Miners Association (AMA), and American Association of State Geologists (AASG).

Presenters include technology providers, academia, and government bureaus with expertise and actual experiences in creating non-destructive analytical databases for rock sample archives.

Each presentation looks to extend the geologic community's use of repository collections through digitization of rock samples, including examples of cooperation and support across public, academic, and resource industry partnerships. The presentations also look to draw support from the geological community for the acquisition of technological capability and the opportunity to build modern regional integrated analytical rock sample datasets for the nation.

Geologic Repositories Rock Sample Digitization Webinar Series: Original Schedule

Date	Presenter	Organization	Title
2/23	Jacob Proctor	Ingrain - A Halliburton Service	Addressing reservoir challenges in the North Slope and non-destructive dual energy CT
3/9	Kurt Johnson	Alaska GMC	Promise and challenge of digital rocks
3/16	Katrina Cox	Core Laboratories	RAPIDZoom™ core and thin sections: Digitalization of Umiat and Square Lake energy core
3/23	Matthew Andrew	Carl Zeiss X-ray Microscopy, Inc.	Bringing petrography into the digital age: automating acquisition, analysis & quantification of thin sections using the Axioscan 7, advanced algorithms and machine learning
3/30	Dale Blue Caroline Mignot	Halliburton	Diskos 2.0: The National Digital Resource for exploration and production in Norway
4/13	Georgina Gordon Carsten Laukamp	Geological Survey of South Australia CSIRO Mineral Resources	Virtual Core Libraries: Implementation and the impacts of making this resource readily accessible. Insights from the Geological Survey of South Australia and AuScop's National Virtual Core Library
4/20	Marie-Christine Ferland	Photon etc.	Modular multi-sensor core scanning platform for geological applications
4/27	Philip Lypaczewski	College of the North Atlantic	Hyperspectral imaging as a public geoscience tool - Early results of a drill core digitization program in Newfoundland and Labrador, Canada
5/4	Gary Thompson Douglas Morrison	College of the North Atlantic Centre for Excellence in Mining	The Mining Innovation Commercialization Accelerator (MICA) and the role of Canadian colleges in advancing geosciences
5/18	Jacob Proctor	Ingrain - A Halliburton Service	Data acquisition campaign for Alaska reservoirs
5/25	Guy Oliver David McKnight	Geolog Americas Inc. Hitachi Vantara	A digital-cuttings drill-down, with examples from the Geolog Americas Nanushuk-Torok Regional Cuttings Consortium
6/1	Katrina Cox Patrick Huff	Core Laboratories	Non-Invasive Technologies for Reservoir Optimization (NITRO) on the Umiat Core Advanced Cuttings Collection and Reservoir Expression in Cuttings
6/8	Rainer Bärs Phil Harris	Spectral Imaging Ltd. TerraCore	A geological tool for digital transformation: The Sisurock Hyperspectral Scanner

Geologic Repositories Rock Sample Digitization Webinar Series: Published Chapters

This publication includes three chapters organized by the following topics:

Chapter A: Non-destructive scanning instruments

Chapter B: Public Agencies

Chapter C: Third-Party Support Services

Unless otherwise noted, each chapter includes presenter biographies, presentation abstracts, and presentation recordings.

Addressing Reservoir Challenges in the North Slope and Non-Destructive Dual Energy CT

Talk Date: February 23, 2022

Abstract: Demonstration of materials and methods of Ingrain's Digital Rock Analysis on Umiat core at the Alaska Geologic Materials Center to highlight solutions for challenges on the North Slope and demonstrate solutions included in a data acquisition campaign for Alaska Reservoirs. Results are presented from nondestructive, surface data logging method CoreHD+. This product addresses key challenges of rapid matrix heterogeneity analysis, and a thin bed-analysis using 0.3mm vertical resolution Bulk Density and Photoelectric factor logs and volumes.

Speaker: Jacob Proctor, Ingrain– a Halliburton Service | jacob.proctor@halliburton.com

Jacob Proctor is a carbonate geologist with his MSc from Rice University and a BSc in geological sciences and physical anthropology respectively, from University of Texas. Jacob began with Ingrain at its inception in 2007 and is now Product Champion for Ingrain Services at Halliburton. He has worked in the role of technical development, project manager, negotiator, international sales, and operational and project management functions. He has authored numerous technical papers. Jacob has worked on major carbonate plays, oil sands and unconventional organic rich mudrocks globally, but most actively in North America, Brazil, Argentina, Malaysia and the Middle East. He has worked in both the application and development of digital rock analysis methods for Geologists and Petrophysicists. He is currently focused on Digital Rock Analysis and its solutions relevant towards Geological and petrophysical challenges.

Link to Video: <https://doi.org/10.14509/30883>



Data Acquisition Campaign for Alaska Reservoirs

Talk Date: May 18, 2022

Abstract: Demonstration of materials and methods of Ingrain's Digital Rock Analysis on Umiat core at the Alaska Geologic Materials Center to highlight solutions for challenges on the North Slope and demonstrate solutions included in a data acquisition campaign for Alaska Reservoirs. Analysis from destructive sample preparation is presented along with additional data collected to validate CoreHD+'s ability to accurately calibrate clay volume fraction without collecting X-Ray Diffraction data. Five depth locations were chosen in the core using the machine-learning product FaciesML®, which chooses sample depths based on the user specified log inputs. The product successfully provided the framework to upscale reservoir quality indicators for deriving a permeability log at 0.3mm resolution. Three-dimensional pore scale measurements reveal pore shape, size and flow properties for illite clay; and the two-dimensional scanning electron microscopy reveal isolated versus effective porosity, (without clay bound water porosity correction) and pore shape insight. The data are delivered in the viewing package Lithovision® being offered through Ingrains "Data Acquisition Campaign for Alaska Reservoirs". This consortium looks to leverage public and private geologic resources to bring key technology to Anchorage to help increase certainty in evaluating production potential, to help find bypassed pay in your assets, and to support advanced preservation of public rock collections.

Speaker: Jacob Proctor, Ingrain– a Halliburton Service | jacob.proctor@halliburton.com



Link to Video: <https://doi.org/10.14509/30883>

A Digital-Cuttings Drill-Down, with Examples from the Geolog Americans Nanushuk—Torok Regional Cuttings Consortium

Talk Date: May 25, 2022

Abstract: Drill cuttings are an invaluable source of quality organic and inorganic geological data and yet are often underutilized.

This talk will focus on the importance and usefulness of cuttings data for hydrocarbon habitat understanding, with examples from Geolog's new Nanushuk-Torok Rock and Fluids Regional Cutting Dataset which when complete, will hold over 200 wells worth of Nanushuk-Torok cuttings data (circa 15,000 data points) across the entire 'North Slope Super Basin' (after Masterson & Holba, 2021). Key to the understanding of this petroleum play is more regional data and interpretation associated with reservoir and source rock, type and quality.

As part of this dataset Geolog Americas with the support of the GMC and AOGCC, recently collected and analyzed for organic and inorganic content, 98 drill cutting samples from the Nanushuk and Torok intervals of Umiat Test Well-11.

The data presented reveals some key, new findings regarding source rock type and facies, as well as interesting data relating to reservoir quality. For example, biomarker and source rock quality data suggest 2 different sources or source facies, a possible baffle zone may have inhibited the vertical migration of hydrocarbons, and reservoir quality data suggests differences in clay speciation across the Torok and Nanushuk Formations which may inhibit reservoir quality

These types of data from the Nanushuk – Torok Formations are currently being consistently measured across the entire North Slope Super Basin as part of Geolog's new Nanushuk-Torok Rock and Fluids Regional Cutting Dataset. This rich dataset when combined with other data such as 3D seismic will assist the Energy Industry in better understanding this potentially prolific Nanushuk-Torok Play and help to reduce some of the uncertainty surrounding source rock type & facies, and reservoir quality/facies.

Link to Video: <https://doi.org/10.14509/30883>

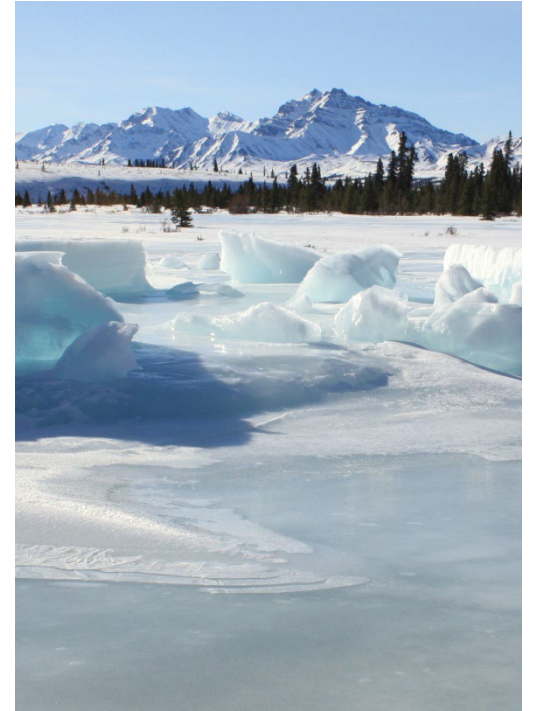
A Digital-Cuttings Drill-Down, with Examples from the Geolog Americans Nanushuk—Torok Regional Cuttings Consortium

Talk Date: May 25, 2022

Speaker: Guy Oliver, Geolog Americans Inc. | g.oliver@geolog.com
David McKnight, Hitachi Vantara | david.mcknight@hitachivantara.com

Dr Guy M. Oliver is the Director of Data Science & Energy Transfer at Geolog Americas, Houston and has been passionate about Drill Cuttings for the last 25 years, having written and presented many articles on the subject. Part of Guy's current role at Geolog centers around creating rich, consistently measured, digital and easily accessible regional databases utilizing cuttings data and Geolog's proprietary methodology for sample preparation and analyses. Key to this is a strong belief that cuttings provide a valuable source of information for reservoir and fluid analyses that are fundamental for petroleum systems understanding.

Guy received his BSc Geology Degree from Cardiff University, Wales in 1991, his MSc Petroleum Geology from Imperial College, London in 1992 and his PhD in High Resolution Sequence Stratigraphy & Early Diagenesis, Plymouth University, England in 1996.



Link to Video: <https://doi.org/10.14509/30883>

RAPIDZoom™ Core and Thin Sections: Digitalization of Umiat and Square Lake Energy Core

Talk Date: March 16, 2022

Abstract: RAPIDZoom™, Core Laboratories' virtual online ultra-high-resolution microscope, provides images of cores and thin sections to view, pan, zoom, measure, describe, toggle lights, and capture images with a dynamic scalebar. This online platform enables remote and collaborative descriptions of cores and thin sections and has wide acceptance through the energy industry. Additionally, Thin Section images can be imported into an award-winning artificial intelligence model, Advanced Rock Typing (ART), to provide timely petrophysical data from the analogs around the world. Rapid access, assessment, and digital archiving of rock images with RAPIDZoom™ are keys to reducing uncertainty and risks in reservoir evaluations.

Speaker: Katrin Cox, Core Laboratories | katrina.cox@corelab.com

Katrina Cox is a senior geologist and technical advisor with over 15 years of experience in oil, gas, and environmental industries. Her experience includes working at ExxonMobil in exploration, development, and research and currently at Core Laboratories focused on petrography, integration, and reservoir quality. Katrina has probably looked at over 20K thin sections from all over the world. Recently she joined the Digital Innovation Group at Core Laboratories to use her experience and knowledge to develop analytical programs and products. Currently she is using her petrologic knowledge advancing artificial intelligence applications to address challenging and routine samples.



Link to Video: <https://doi.org/10.14509/30883>

Non-Invasive Technologies for Reservoir Optimization (NITRO)

on the Umiat Core & Advanced Cuttings Collection and Reservoir Expression in Cuttings

Talk Date: June 1, 2022

Abstract: Non-invasive measurements on rock allow the ease of evaluating archived and new cores while preserving rock conditions. Our NITRO service includes Dual Energy Computed Tomography (DECT), Dual-detector Gamma, Continuous Scanning X-ray Fluorescence, profile permeameter (PDPKTM), and continuous sonic measurements and their integration, provide rapid reservoir characterization well in advance of time-honored laboratory analyses. The integration of this continuous information can reduce the need to travel, and cores can be “viewed” and for the most part, remotely. Furthermore, combined with XRD and Ultra High Resolution Thin Section Photography from small core chips, you can refine mineralogic modeling, address clay sensitivity, visualize grain, matrix, and pore distributions, and start to further understand your microscale to log features. X-ray fluorescence (XRF) is widely used for elemental analysis as well as chemical analysis. Capturing high-resolution elemental data is critical to characterizing heterogeneous reservoirs. Core Lab’s new truly continuous XRF measurement technology is currently optimized to output elemental data, from Sodium through Uranium, accumulated over 3mm steps, provides no-gap measurements on core slabs, as well as other variations on samples, such as core chips, cuttings, sidewall cores, hand samples, or powders. Combined with key selections of XRD and TOC from DECT facies, a XRF mineralogy log is extrapolated over the entire cored interval to further enhance your assessment.

Speaker: Katrin Cox, Core Laboratories | katrina.cox@corelab.com
Patrick Huff, Core Laboratories | patrick.huff@corelab.com

Link to Video: <https://doi.org/10.14509/30883>