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The Use of Corescan Images in Predicting Breakage Characteristics

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The traditional visual drill core logging:

- Time consuming
- Prone to inconsistencies (between different logging geologists, different drilling phases / campaigns)
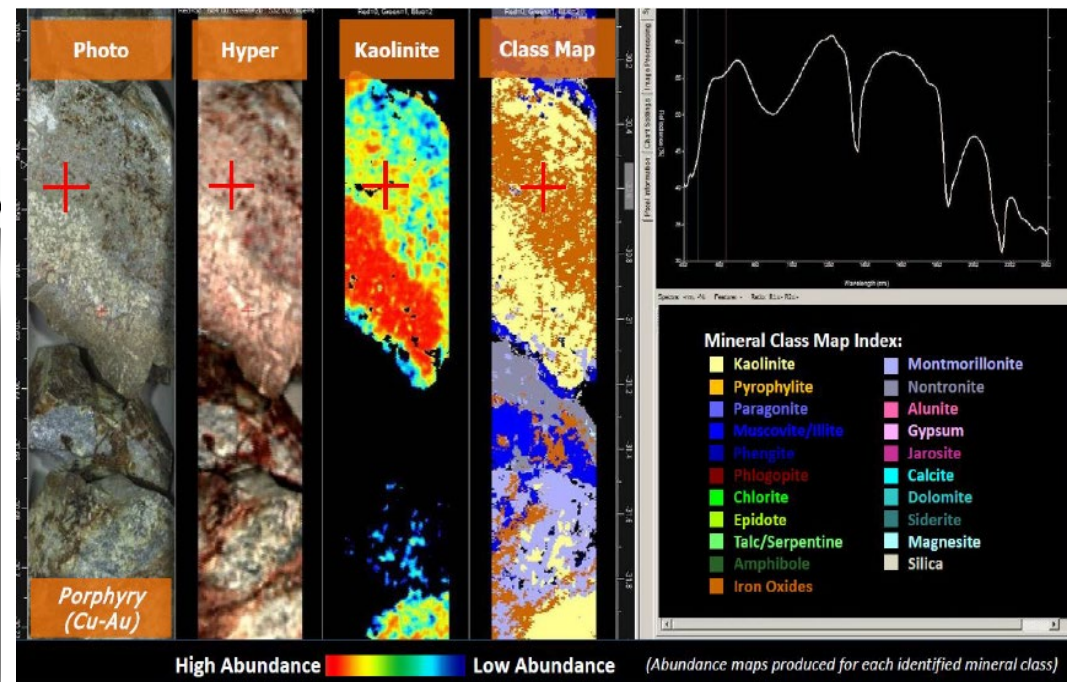- Poor understanding of processing behaviours

The industry has been moving towards more automated and systematic drill core logging

Finally

HYPERSPECTRAL DRILL CORE IMAGING

- Hyperspectral drill core scan systems use VNIR, SWIR and TIR parts of the electromagnetic spectrum to identify minerals
- Each pixel of the digital image contains a reflectance spectrum
- Rapid generation of mineral class map by matching pixel spectrum with mineral spectra library

VNIR	SWIR	TIR
400nm – 1,000nm	1,000nm – 2,500nm	5,000nm – 14,000nm
Fe-oxides	Hydroxyls	Carbonates
Mn-oxides	Water	Silicates
Hydroxides	Carbonates	Olivines
REEs	Sulphates	Pyroxenes
	Micas	Garnets
	Amphiboles	
	Tourmalines	

Mineral Class Map Index:
- Kaolinite
- Pyrophylite
- Paragonite
- Muscovite/Illite
- Phengite
- Phlogopite
- Chlorite
- Epidote
- Talc/Serpentine
- Amphibole
- Iron Oxides
- Montmorillonite
- Nontronite
- Alunite
- Gypsum
- Jarosite
- Calcite
- Dolomite
- Siderite
- Magnesite
- Silica

High Abundance — Low Abundance   (Abundance maps produced for each identified mineral class)

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- Individual core boxes scanned row by row
- Visible RGB camera, hyperspectral scanner and 3D laser profilometer
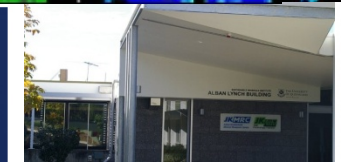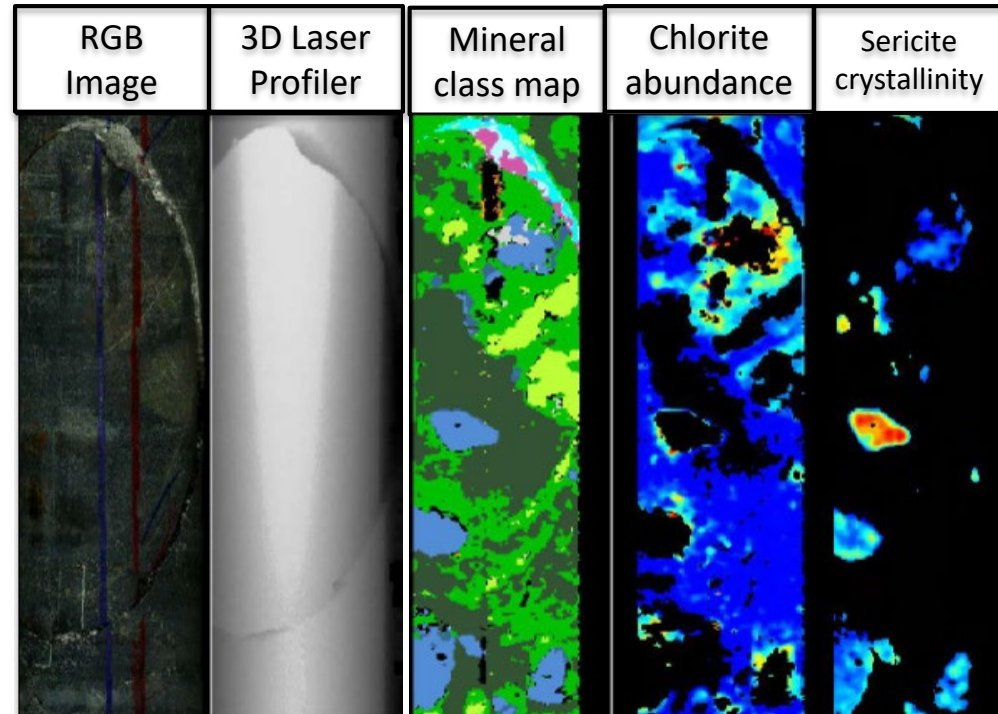- Delivery: web-based imagery (in Coreshed) and composited interval data (csv)

| Wavelength range	VNIR and SWIR
Spatial resolution	500 um (spectra) 60 um (RGB visible camera) 150 um (3D laser profiler)
Spectral bands	510
Capacity	~ 5 min / meter

- High resolution hyperspectral imagery

- Core RGB image

- 3D Laser Profiler

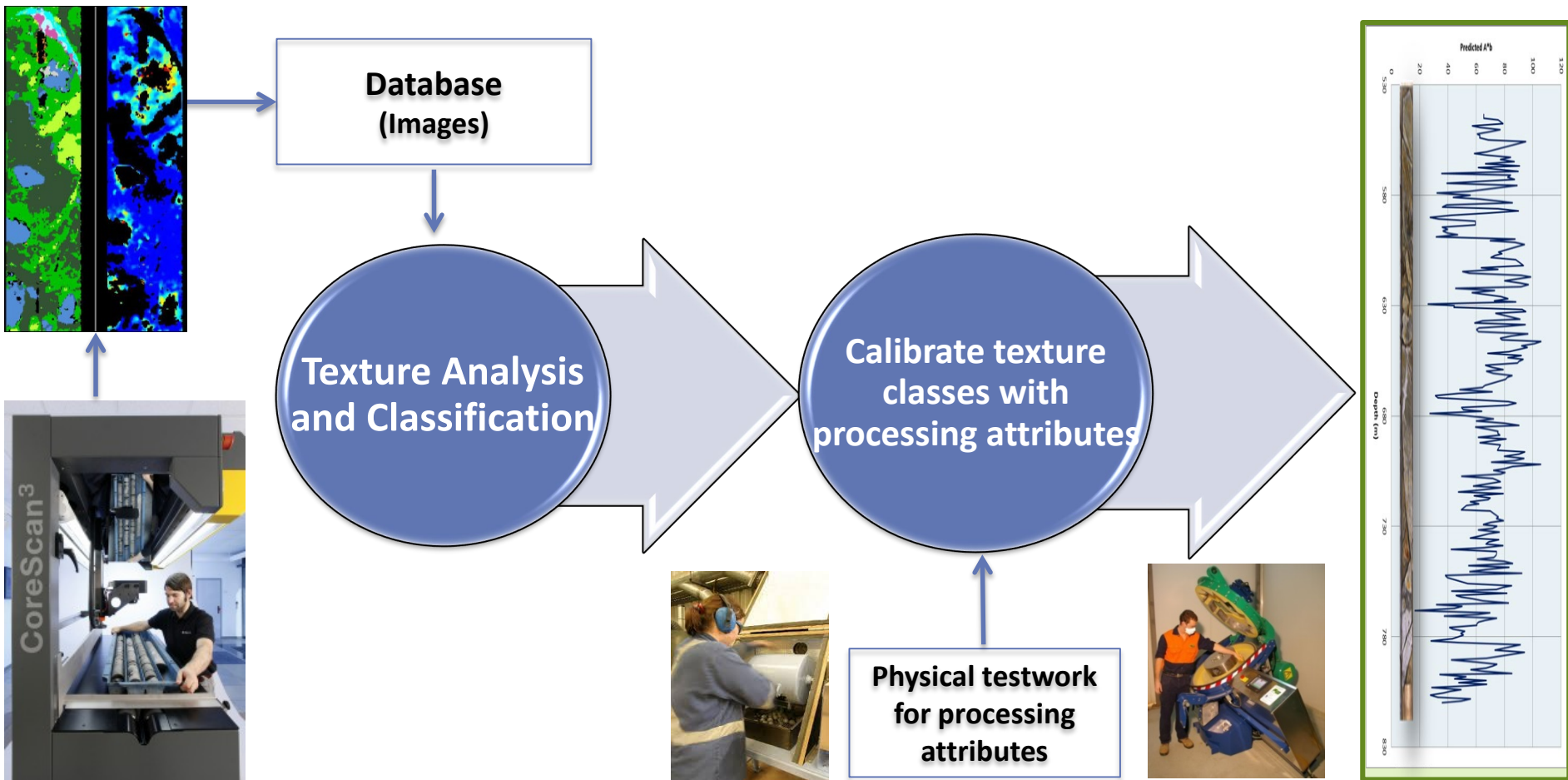- Mineral class map

- Individual mineral maps

- Crystallinity maps

RGB Image	3D Laser Profiler	Mineral class map	Chlorite abundance	Sericite crystallinity

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- A range of images for investigation
- Albedo-550nm image can be used to distinguish bright, dull and stone bands
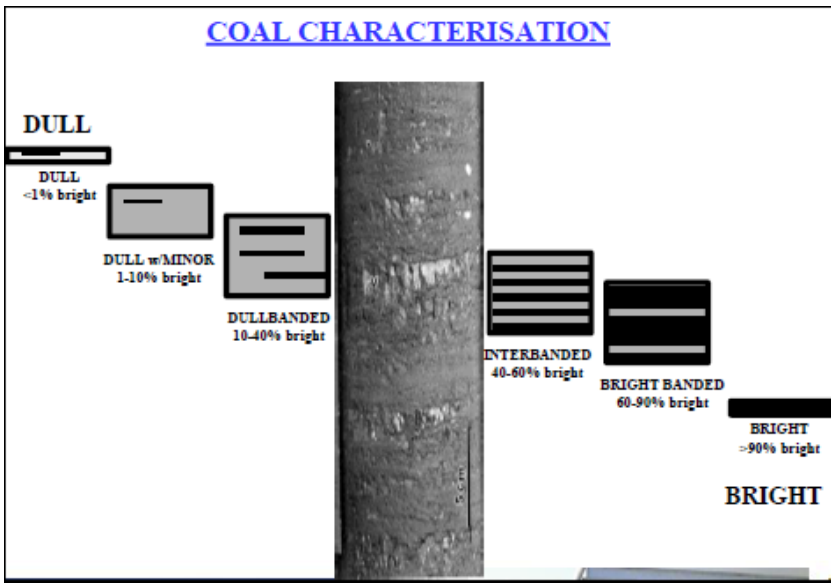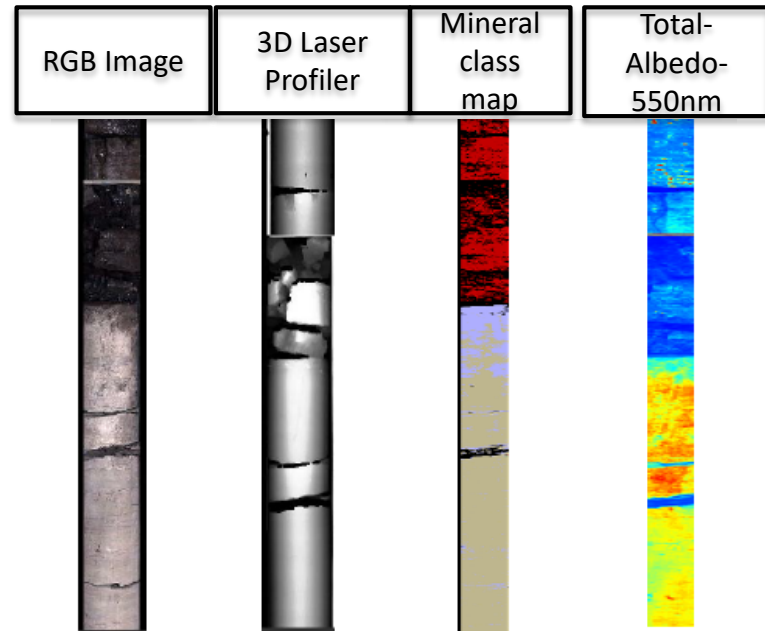
- Matching a classified texture type against a reference (training texture)
- Similar to the process used in remote sensing, facial recognition, etc.

Database (Images)

Texture Analysis and Classification

Calibrate texture classes with processing attributes

Physical testwork for processing attributes

- Texture analysis potentially provides a more accurate method to capture processing variability compared to using data from visual drill core logging
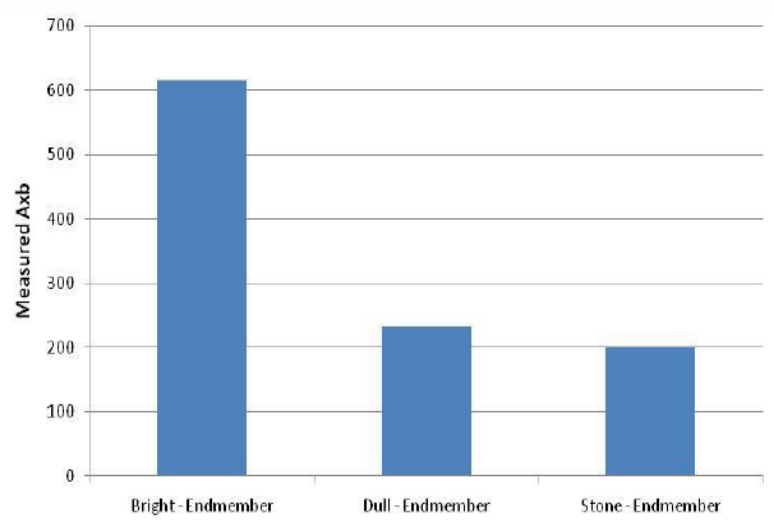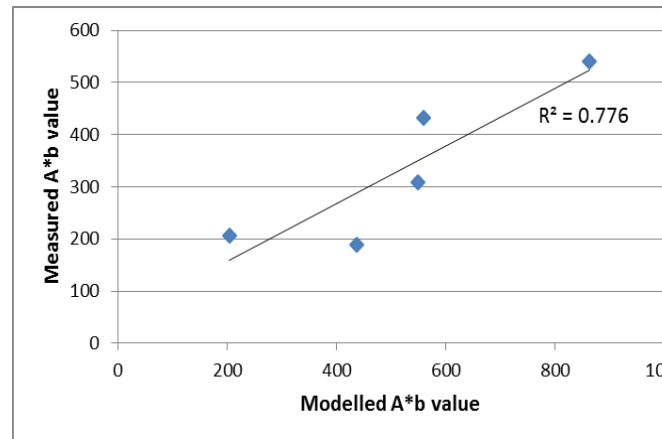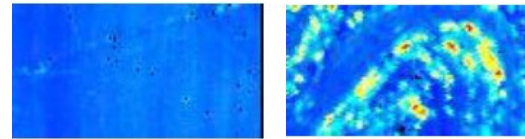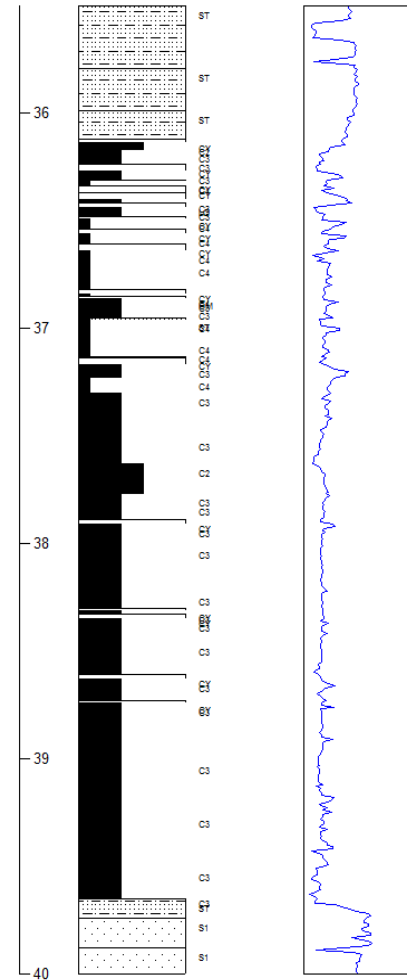- With less amount of physical testwork
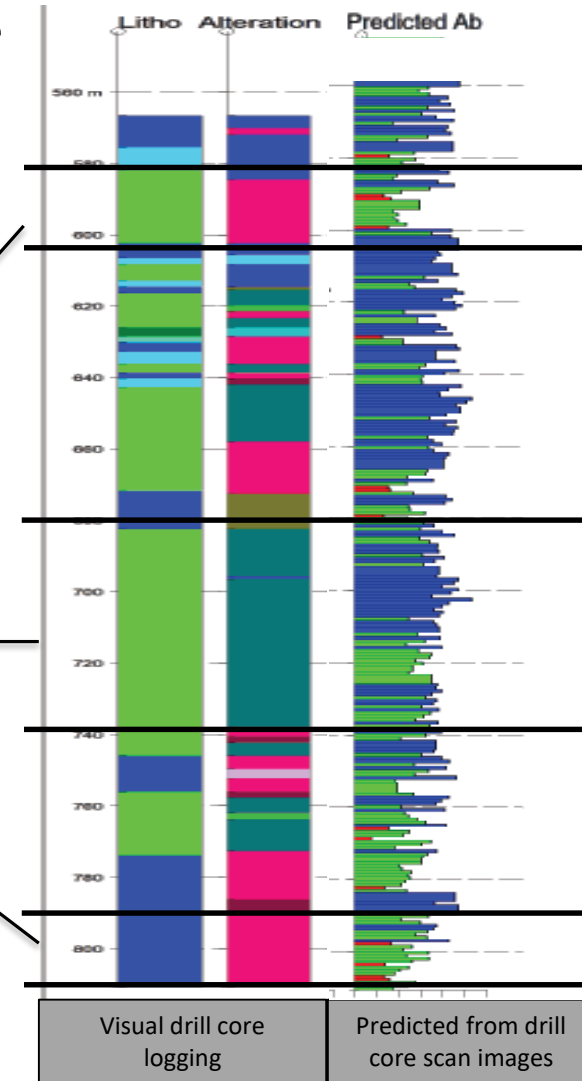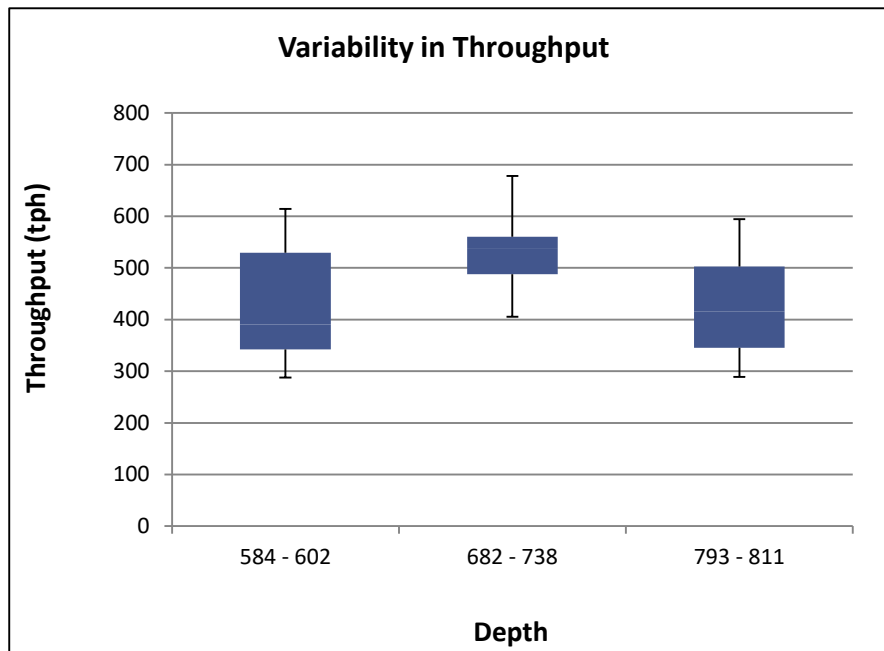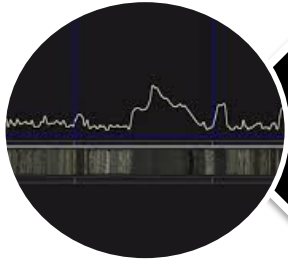
Predict Coal Breakage Characteristics

- Use albedo values to distinguish stone and coal
- Use texture analysis to quantify banding components:
  - Homogeneous and smooth texture: dull
  - Rough and less homogeneous: bright
- The abundance of bright, dull and stone bands quantified will be used to predict breakage characteristics

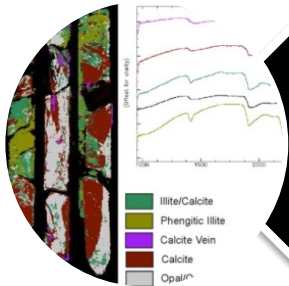The industry is moving from visual drill core logging to advanced automated drill core scanning systems

The new hyperspectral drill core scan systems offer

- Rapid, near real-time data to support geologists
- High resolution core photographs, core profiler, mineral map
- Systematic and unbiased data for standardized procedures

Many opportunities that can be considered in the mineral processing space. This presentation explores one area of application of Corescan images in mineral processing (prediction of breakage characteristics)

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QUESTIONS?