Discovery Undercover: What's Next?

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CMIC Exploration Innovation Consortium
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Introduction

- **Context**
  - Exploration challenges remain acute in Canada
  - EIC Roadmap still relevant
  - Successor project needed by mid-2018
  - Tight timeframe to get something in place

- **Outline**
  - Update on Discovery Under Cover project
  - Highlight challenges
  - Other relevant national and international initiatives
  - Concluding remarks

CMIC Exploration Innovation Consortium

- **Created 2010 under CMIC**
  - Industry-driven
- **Vision**
  - Improve discovery rates
  - Through step-changing applied R&D and innovation
- **Objectives**
  - Define exploration challenges
  - Develop roadmap
  - Catalyst for relevant projects

- **~35 Partners**
  - Exploration companies
  - Service providers
  - Institutions
- **Approach**
  - Extensive consultation
  - Part-time consultant (Tosdal)
  - Full time CMIC person (Galley)
  - Dedicated Industry champions

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10-year Innovation / R&D Program

Deep Mature Camps	Remote & Covered Areas
1. Multi-parameter footprints and 3D vectoring • **Detecting edges and vectoring to ore**	1. Characteristics of fertile terranes and districts • *How to identify most fertile areas?*
2. Techniques to unravel deep 3D geology • *Deep penetrating detection and mapping techniques*	2. Techniques to map sub-surface geology • *Drilling, data integration* • *Data density for detection*
3. Real-time down-hole data collection • *Real-time decision*	**3. Secondary metal dispersion** • **Understand mechanisms** • **Develop techniques**

Why Discovery Under Cover?

- **Technical challenge**
  - 78% of Canada concealed by lakes and surficial deposits
  - Can detect "anomalies" but techniques not predictable

- **Focus**
  - Processes of migration to surface
  - Sampling & analytical techniques

- **Benefits**
  - Fewer barren holes (<$$$)
 - Reduced environment footprint!

Next big discovery = concealed

Where should you drill?

World-class toolkit needed!

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Project Status

- **Process to date**
  - Enlisted Canada's top 3 experts
  - Industry consultation Workshops (Q1)
  - Historical work reviewed

- **Where we are** (+/- on track)
  - Gap analysis completed
  - 6 key problems identified
  - 3 focus areas agreed upon

- **Next steps**
  - Develop relevant program for each focus area
  - Engage with other groups disciplines for novel ideas

- **Year-end target** (stretch!)
  - Identify funding vehicle(s) & management structure
  - Circulate high-level proposal to potential sponsors

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Program: Three Focus Areas

- **Processes of migration**
  - How elements move
  - Under which conditions

- **Tools & Technology**
  - Define techniques of choice
  - Develop new tools

- **Protocols**
  - Design efficient surveys
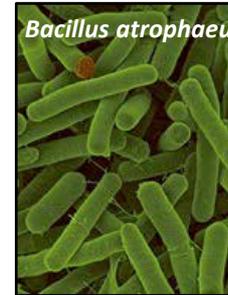 - Improved success

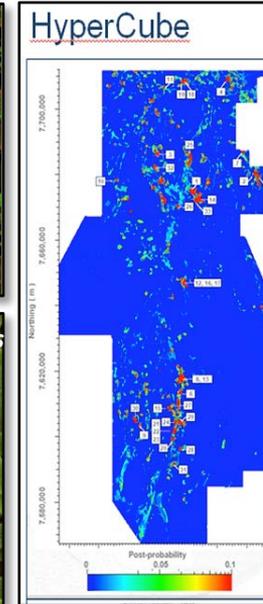**Metal migration is complex**
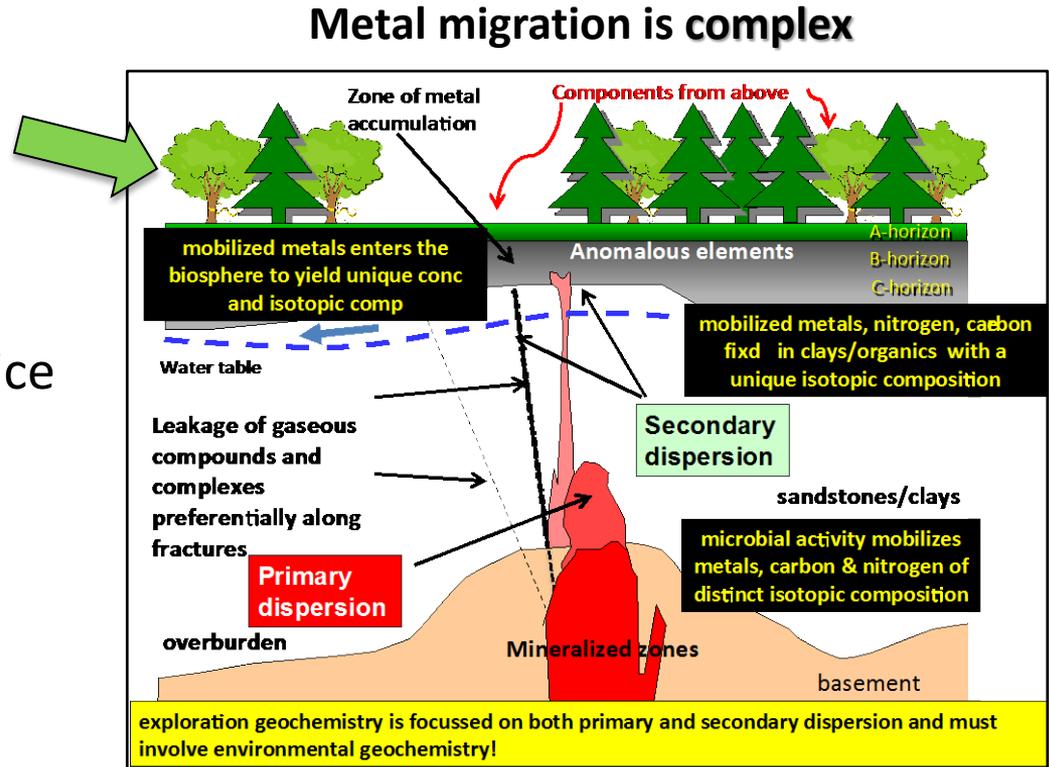
From Kyser (2017)

Project Approach

- **New disciplines for new ideas**
  - Nuclear storage, molecular biology
  - Soil, agricultural, and material sciences, etc.

- **New technologies & application**
  - Genomics/fingerprint bacteria
  - Lab simulation experiments
  - Analytics for data integration

- **...with geoscience partners**
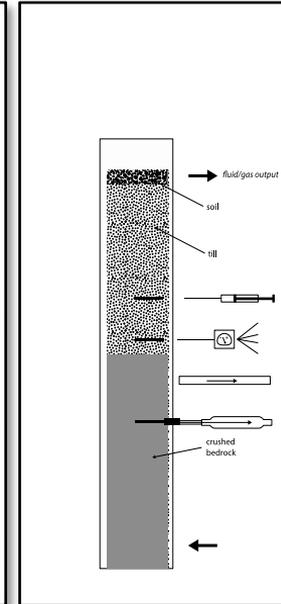
Bacteria Fingerprinting

Bacillus thuringiensis

Bacillus atrophaeus

Advanced Algorithms

HyperCube

Laboratory Simulation

fluid/gas output

soil

till

crushed bedrock

From Winterburn (2017)

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Anticipated Challenges

- **Access to expertise**
  - Limited national expertise in Exploration geochemistry
  - International collaboration required

- **Funding vehicle**
  - NSERC rules limiting (outside funding, open access)
  - Creative avenues to be explored

- **Project duration**
  - 5 years required for impact
  - 3 years preferred by Industry Partners

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Coordination with National Initiatives

- **Metal Earth**
  - Strategic consortium led by Laurentian
  - Canada First Research Excellence Fund
  - $104M / 7 years ($49M from CFREF)

- **Focus**
  - Fertility of terranes and districts
  - Craton, transects, thematic, analytics

- **Links with EIC**
  - Addresses key roadmap component
  - New Director = active member of EIC

Remote & Covered Areas
1. **Characteristics of fertile terranes & districts**
• *How to identify most fertile areas?*
2. Techniques to map sub-surface geology
• *Drilling, data integration*
• *Data density for detection*
3. Secondary metal dispersion
• *Understand mechanisms*
• *Develop techniques*

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Monitoring International Initiatives

Deep Mature Camps
Real-time down-hole data collection
• *Real-time decision*

Remote & Covered Areas
Techniques to map sub-surface geology
• *Drilling*, data integration

Reflex Lab-at-Rig

– Real-time data from drill muds & chips

– Mineralogy, geochemistry & processing for geology and orebody proxies

XRF & XRD

Processing

Photo courtesy of Reflex

DET CRC Coiled Tubing Drilling

– Cheaper, faster, safer, small footprint

– Can be used for "prospecting" drilling

50m/h, 500m depth, $50/m

<10 tonnes & small footprint

Photo courtesy of DET CRC

Other projects considered (2012-15)

- **Exploration-focused**
  - Permafrost drilling
  - Lightweight heli-portable drill
  - Muon technology
  - Exploration Simulator

- **CMIC working groups links**
  - Real-time portable analyzer
  - In-situ rock mass characterization
  - **NOW: Environment management working group**

No success at the time!

Exploration → Extraction → Processing → Tailings → Remediation

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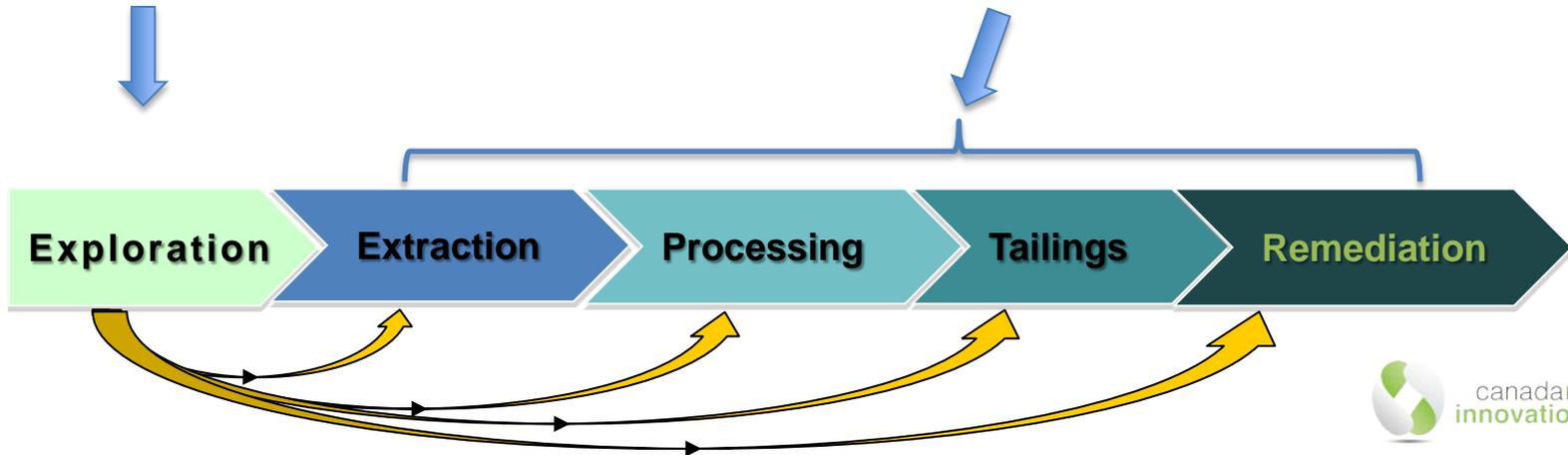
Concluding Statements

- Focus on next EIC project
  - Need to be ready in time

- Discovery Under Cover
  - Next significant challenge for discovery in Canada
  - Progressing; significant engagement from stakeholders
  - Combination of Applied R&D and Innovation
  - Synergies with Environment
  - …but funding and timeline will be challenging

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