

WIL@Western: Mining Undergraduate Talent

Showcasing the MiHR Gearing Up Program

Felix Lee, Shayna Kay, Carmen Venier,
and Jenna Veugen (Integrated Science)

Jennifer Wright (MiHR)



The Showcase...

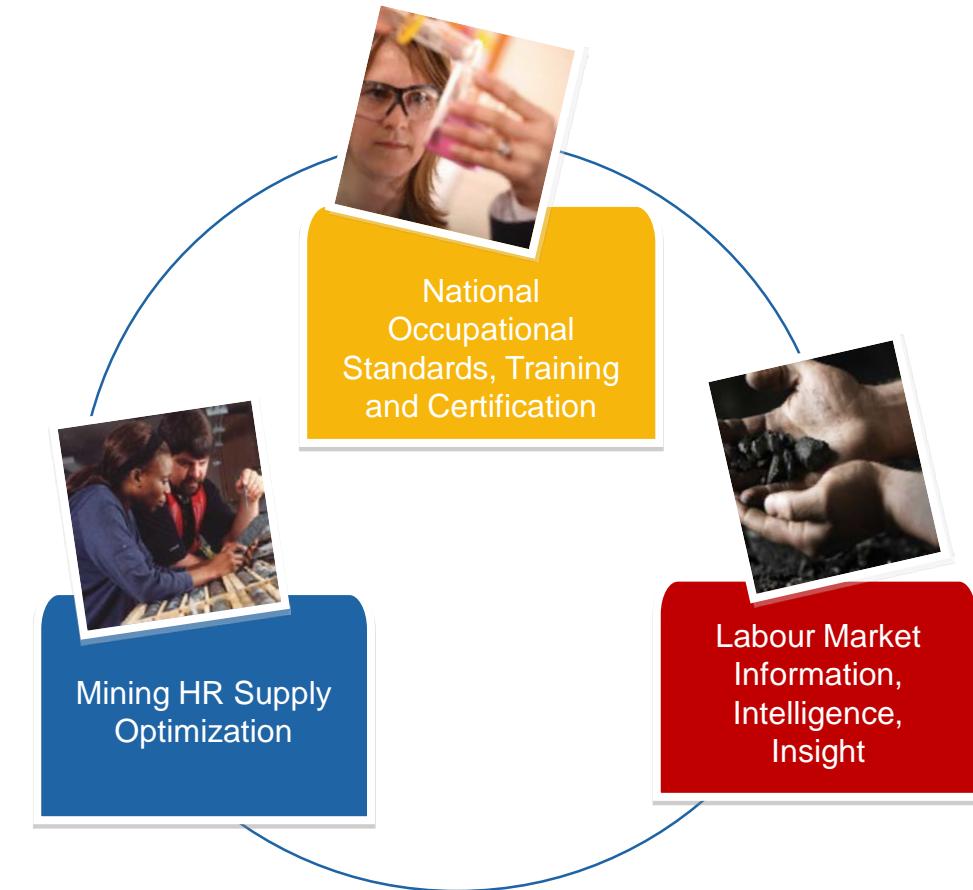
1. MiHR and Gearing Up (Jennifer Wright)
2. Integrated Science Program (Felix Lee)
3. Project Management (Carmen Venier)
4. Student Project (Shayna Kay)
5. Student Project (Carmen Venier)
6. Moving Forward: Expanding WIL (Jenna Veugen)

About MiHR

- National HR Council for the minerals and metals industry.

What we do:

- Identify national HR challenges and opportunities for the minerals and metals industry.
- Create national solutions through collaboration, partnerships and synergy with stakeholders.



MiHR Board of Directors





Labour Market Challenges



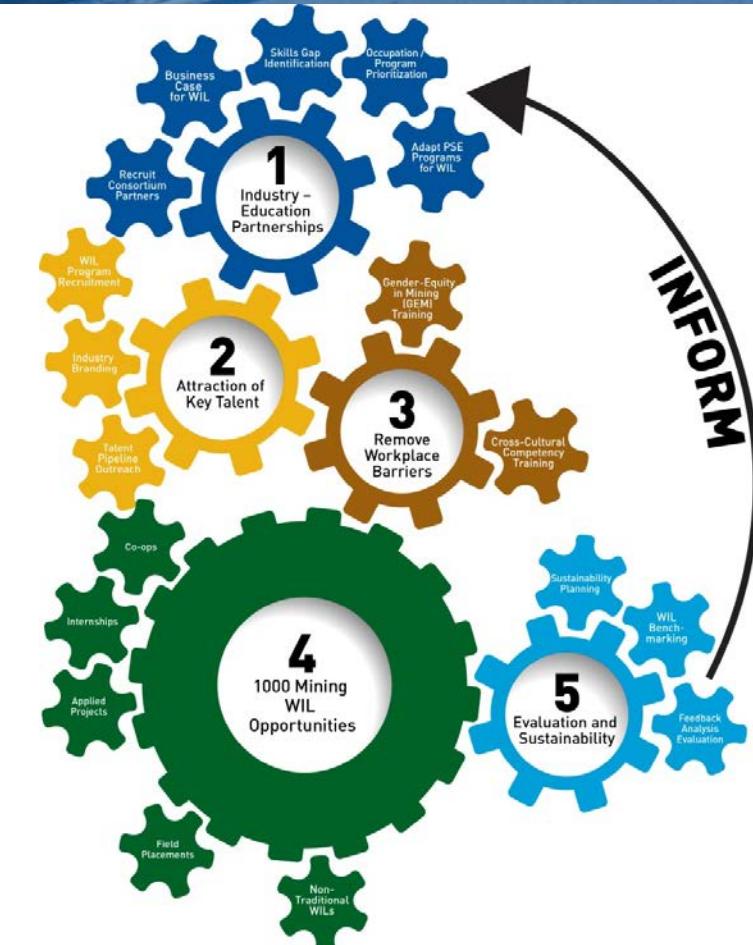
- Mining is volatile, leading to labour supply/demand imbalances
- Aging labour force (50k+ workers retiring)
- Need to recruit the next generation of workers (up to 130,000 new hires in 10 years)
- Hiring challenge is intensified by a tight labour market:
 - Rural and remote location of mines
 - Challenges with attracting / retaining women and new Canadians
 - Historically low unemployment in mining
 - Youth continue to hold negative perceptions of the sector
 - PSE students struggle to find co-ops / work-integrated learning

MiHR Priority: Increase Worker Supply

1. Canadian Mining Certification Program (CMCP)
- 2. Gearing Up Program**
3. Gender Equity in Mining Works (GEM Works)
4. Green Jobs Program
5. Mining Essentials (ME)
6. Mining Professional Immigrant Network (M-PIN)

Gearing Up: Developing Mining Talent Through WIL

Objective: To change the way students perceive, pursue and acquire the skills needed for in-demand careers in the mining sector.



Gearing Up

- MiHR has secured 7.8 Million dollars for the Gearing-Up project
- Provide a wage subsidy to employers who create **NEW WIL opportunities (target of 850)** in mining:
 - Up to \$5,000, or 50% of the wages, for regular 2nd year students and above
 - Up to \$7,000, or 70% of the wages, for under-represented students (women, Indigenous peoples, new Canadians, 1st year students)
 - Subsidies available for students in STEM or Business programs

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Integrated Science Program (WISc)

- Honours Integrated Science with a chosen discipline
 - Biology
 - Chemistry
 - Computer Science
 - Earth Sciences
 - Environmental Science
 - Genetics
 - Mathematics
 - Physics / Astrophysics



Student Goals

Acquire a broad understanding of science in general, plus discipline-specific skills

Appreciate the sciences generally “forgotten” by year-1 students

Make connections between the different sciences

Develop and refine professional skills

Program Structure

Year-1

Fall

Chemistry

Physics

Calculus

Biology

WISc 1000Z

Winter

WISc 1001X

WISc 1000Z

Years 2, 3, and 4

Courses from chosen discipline

Additional WISc courses

Environment & Sustainability

Philosophy of Science

Big Data & Mathematical Modelling

Science and the Community

Materials & Biomaterials

Leadership & Peer Mentoring

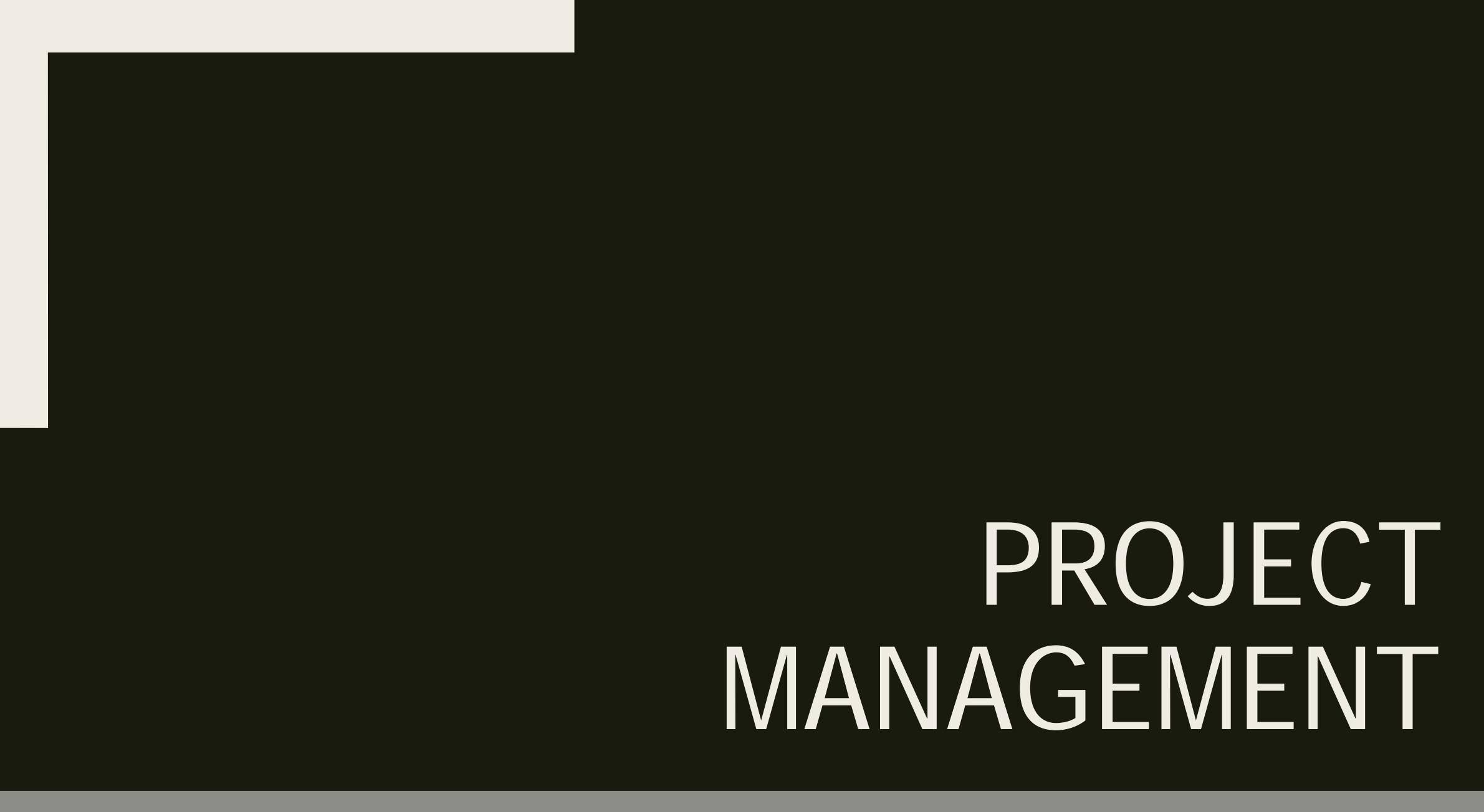
Interdisciplinary Research Project

WISc and MiHR



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PROJECT MANAGEMENT

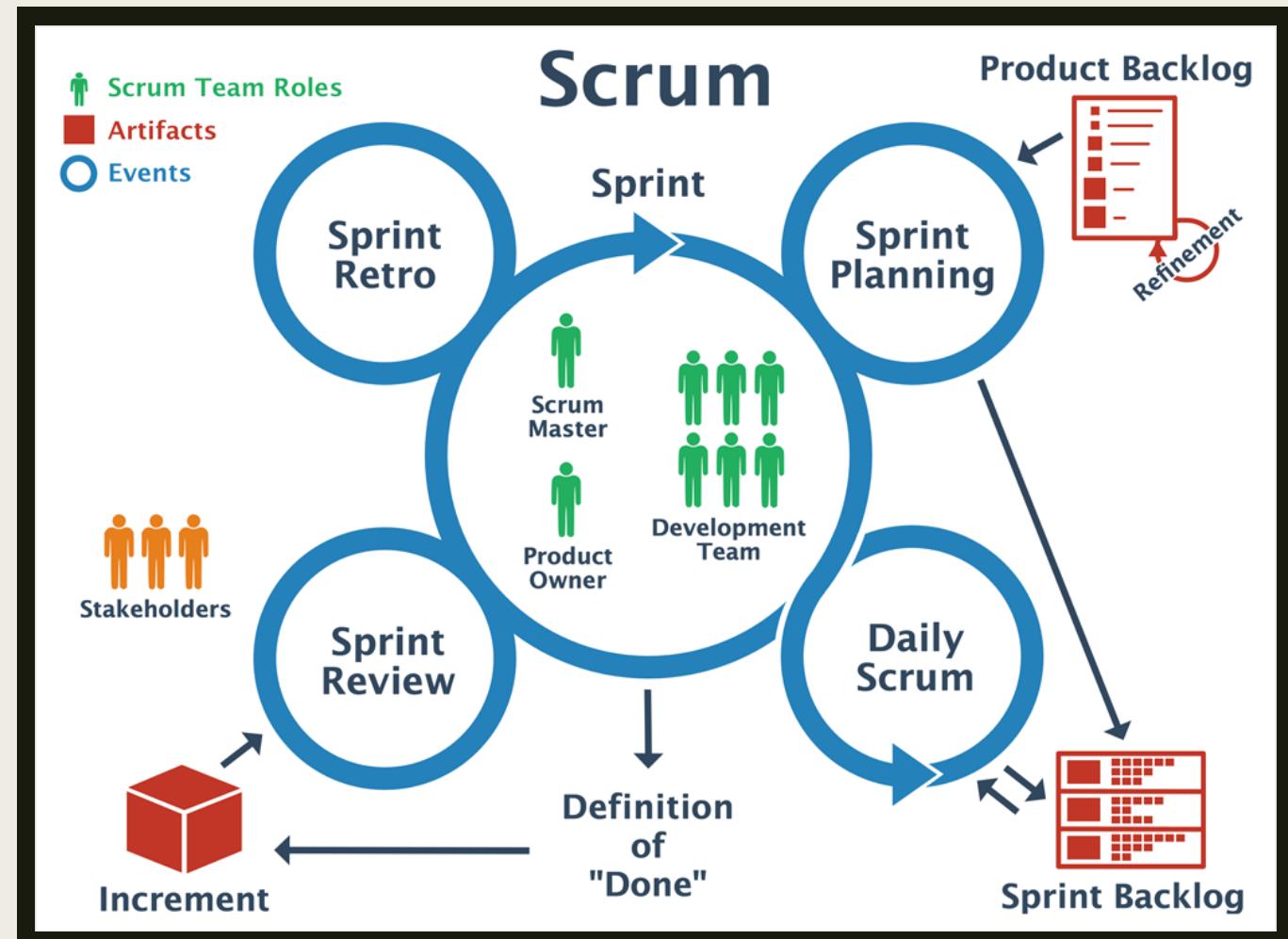
Team Working Environment

Scrum Roles

- Product Owner
- Associates
- Scrum Master

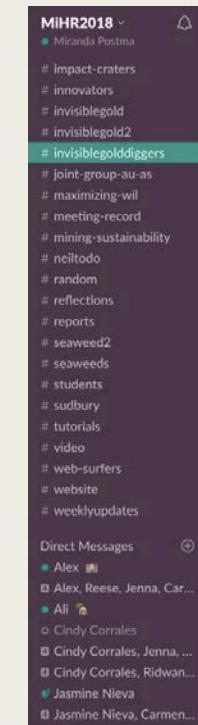
Scrum Principles

- Sprints
- Deliverables
- Daily Standups



Team Working Environment

The image shows two Trello boards side-by-side. The top board, titled '14 Innovative Mining Technologies', contains several lists: 'Story Board', 'To Do + Time Estimate', 'Doing + Actual Time', 'For Review + Reflection', and 'Done + Velocity Estimate'. Each list has several cards with tasks and time estimates. The bottom board, titled '39 Invisible Goldiggers', contains lists for 'TEAM #IG', 'Contact Info', 'Sprint Setup', and 'Story Board'. The 'Story Board' list on this board also includes cards for tasks and time estimates.

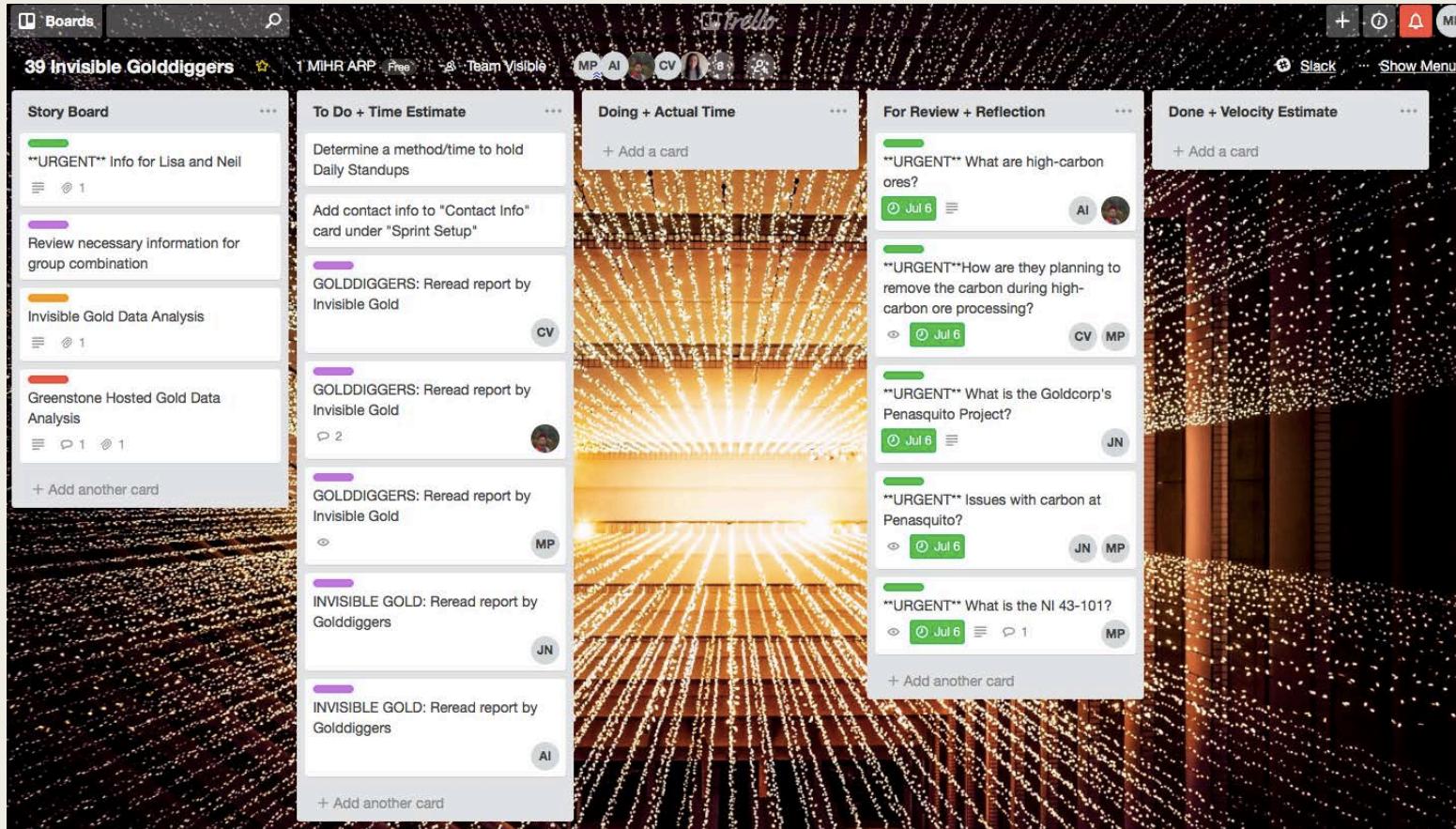


A screenshot of a Slack channel named '#invisiblegolddiggers'. The channel has 10 members. A pinned message from 'Miranda Postma' at 1:12 PM links to a Google Drive document titled 'Tutorial for XRF Analysis (APS Beamline)' with the title 'PEAKABOO TUTORIAL FOR XRF ANALYSIS (APS BEAMLINE)'. The document has a revision history entry for July 16, 2018, at 10:00 AM. Below the pinned message, there are several messages from users like 'Jasmine Nieva', 'Miranda Postma', and 'Ali' discussing the tutorial and availability for a Hangout.

Trello

Slack

Invisible Golddiggers: The First 24 Hours



The Trello board is organized into four columns:

- To Do + Time Estimate:**
 - Determine a method/time to hold Daily Standups
 - Add contact info to "Contact Info" card under "Sprint Setup"
 - GOLDDIGGERS: Reread report by Invisible Gold
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 - GOLDDIGGERS: Reread report by Invisible Gold
 - INVISIBLE GOLD: Reread report by Golddiggers
 - INVISIBLE GOLD: Reread report by Golddiggers
- Doing + Actual Time:**
 - + Add a card
- For Review + Reflection:**
 - **URGENT** What are high-carbon ores?
Jul 6
 - **URGENT** How are they planning to remove the carbon during high-carbon ore processing?
Jul 6
 - **URGENT** What is the Goldcorp's Penasquito Project?
Jul 6
 - **URGENT** Issues with carbon at Penasquito?
Jul 6
 - **URGENT** What is the NI 43-101?
Jul 6
 - + Add another card
- Done + Velocity Estimate:**
 - + Add a card

Micro-Sprint: 18 hours from team creation to first deliverable!

OVERVIEW (for Lisa and Neil)

1. What is the Goldcorp Penasquito Project?

LOCATION: North-eastern corner of the state of Zacatecas, Mexico
(780km northwest of Mexico City)

MINE TYPE: Open pit
(2 pits - Penasco and Chilé Colorado)
(Mexico's biggest open pit mine!)

PRODUCTS: Gold, silver, zinc, lead

PROCESSING: Flotation and grinding

PROCESSING CAPACITY: 130,000 tonnes/day

POWER DEMAND: 147 megawatts

NUMBER OF EMPLOYEES/CONTRACTORS: 3500

GOLD PRODUCTION: 310,000 ounces

ALL-IN SUSTAINING COST: \$250/ounce

GOLD RESERVES* "Proven/Probable": 8.95 million ounces

GOLD RESOURCES "Measured/Indicated": 2.35 million ounces

GOLD RESOURCES "Inferred": 220,000 ounces

DEPOSIT:

- Bracca pipe
- Formed by intrusion-related hydrothermal activity

GEOLOGY:

- Carbonaceous, calcareous turbidic siltstones
- Interbedded sandstones

MINERAL TYPE:

- Oxides
- Sulphides

2. Issues with carbon at Penasquito?

EFFECTS OF HIGH CARBON:

- Impedes standard gold recovery during flotation
- Conventional cyanide leaching ineffective due to 'preg robbing'
- Increases plant operation costs

CONSEQUENCES:

- Requires a revised processing plan
 - 1. Extract gold more efficiently
 - 2. Neutralize organic carbon

3. What are high-carbon ores?

HIGH-CARBON MINERALIZATION:

- Sediments trapped in carbon formation (Nickname: 'Mudstones')
- Relatively high carbon vs relatively low gold content
- Gold occurs in close association with carbon
- Organic carbon sufficiently high that a revised treatment scheme is required

DEFINITION OF HIGH-CARBON:

ORGANIC CARBON COMPONENT: C, H, O, N, and S

ELEMENTAL CARBON COMPONENT: Predominantly C
(Impurities may include S, Ti, Al)

GOLD IN HIGH-CARBON MATERIALS:

- Generally associated with:
 - Sulphide minerals
 - Carbonaceous matter
 - Siliceous minerals

4. How are they planning to remove carbon during high-carbon ore processing?

MENTIONED ON THE GOLDCORP WEBSITE:

- \$420 million Pyrite Leach Project, which aims to make higher carbon sulphide processing more efficient.
- No further mention of this project on the website

POSSIBLE TREATMENTS:

1. Removal of carbonaceous matter via flotation or depression
2. Desolvation of carbonaceous matter via blanking or chemical/bacteria oxidation
3. Decomposing carbonaceous matter via roasting

PYRITE LEACHING:

- Ferric leaching
- Bacterial leaching
- Used to increase gold recovery from carbonaceous ore

PYRITE LEACHING PROJECT:

- Reprocessing zinc tailings to increase gold and silver recovery
- Approved by Goldcorp in July 2016
- Expected to come into effect in 2019

CARBON PRE-FLOTATION:

- Processing prior to zinc and lead flotation
- Shows lower gold loss than carbon depression

CARBON DEPRESSION:

- Additional step in lead flotation circuit and/or zinc flotation circuit
- Various reagents added to mixture as required
 - ex) Cromalux 251 used for carbon depression in lead flotation circuit

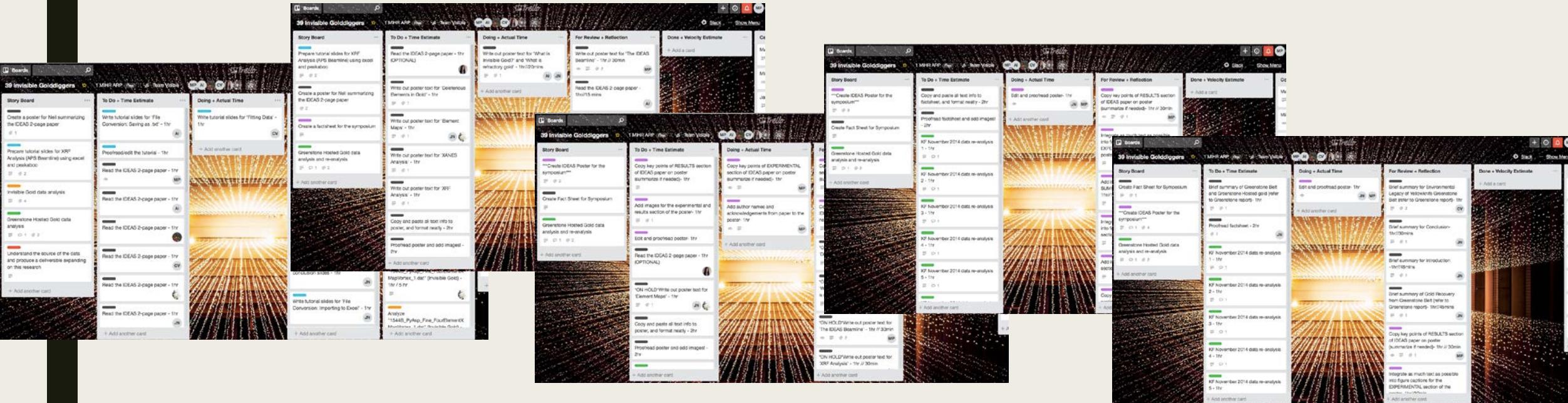
Invisible Golddiggers: *Tasks and Productivity*

Sprint 3: (2 weeks)

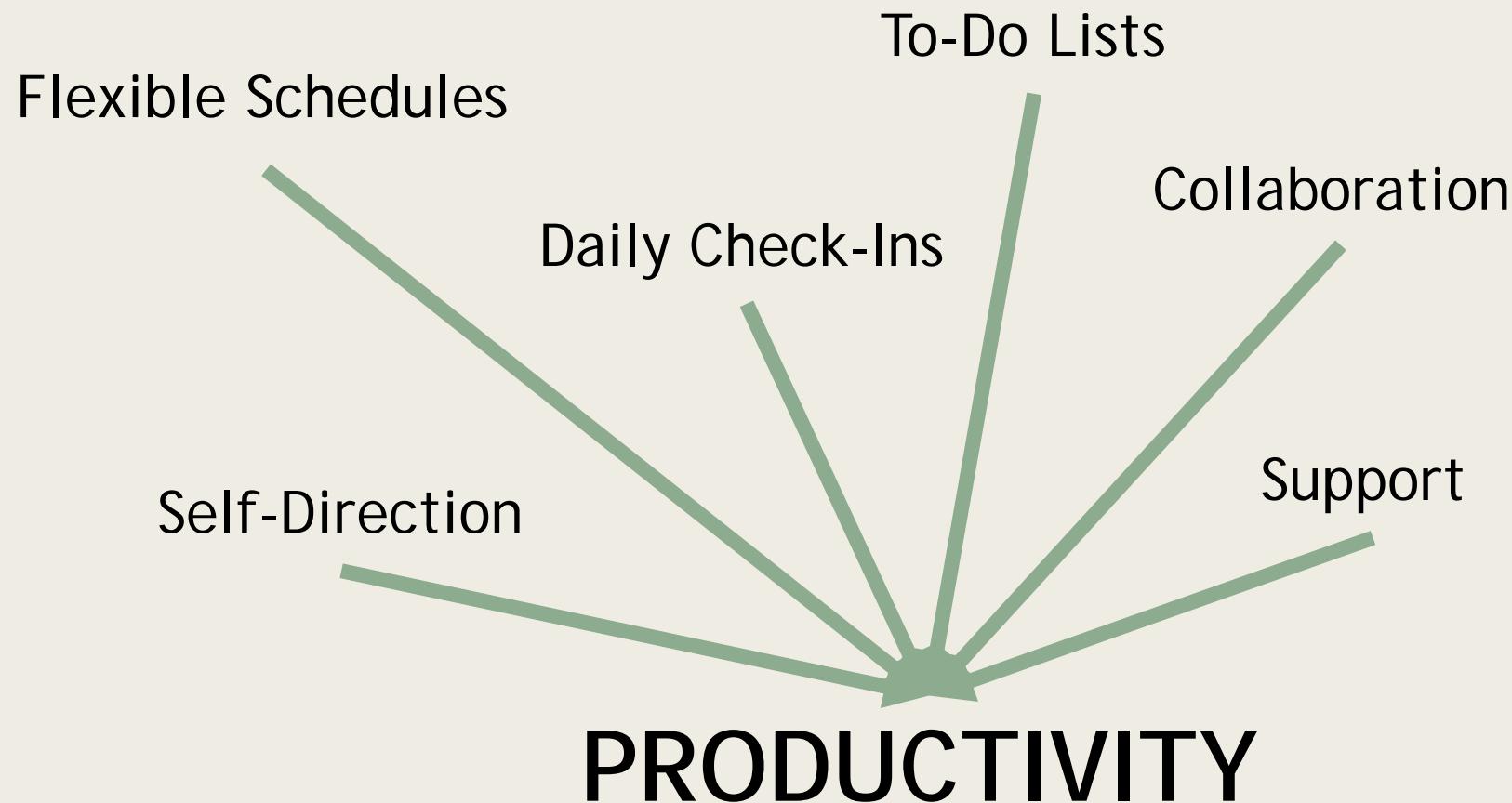
- Company data processing
- SOP for data processing method

Sprint 4: (2 weeks)

- Brochure for gold information
- Poster for synchrotron use in mining



Summary: *What Works?*



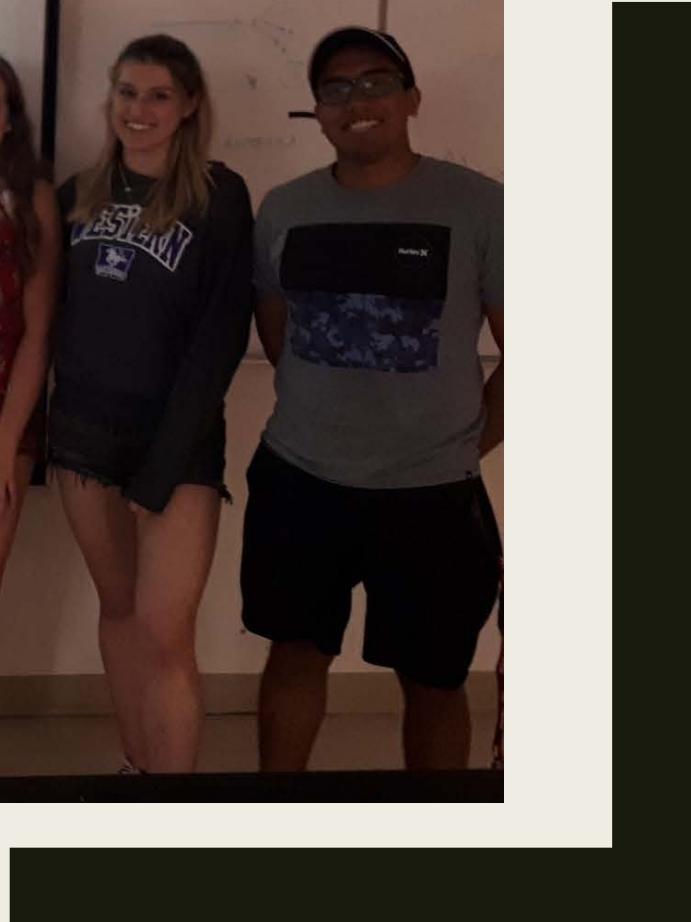
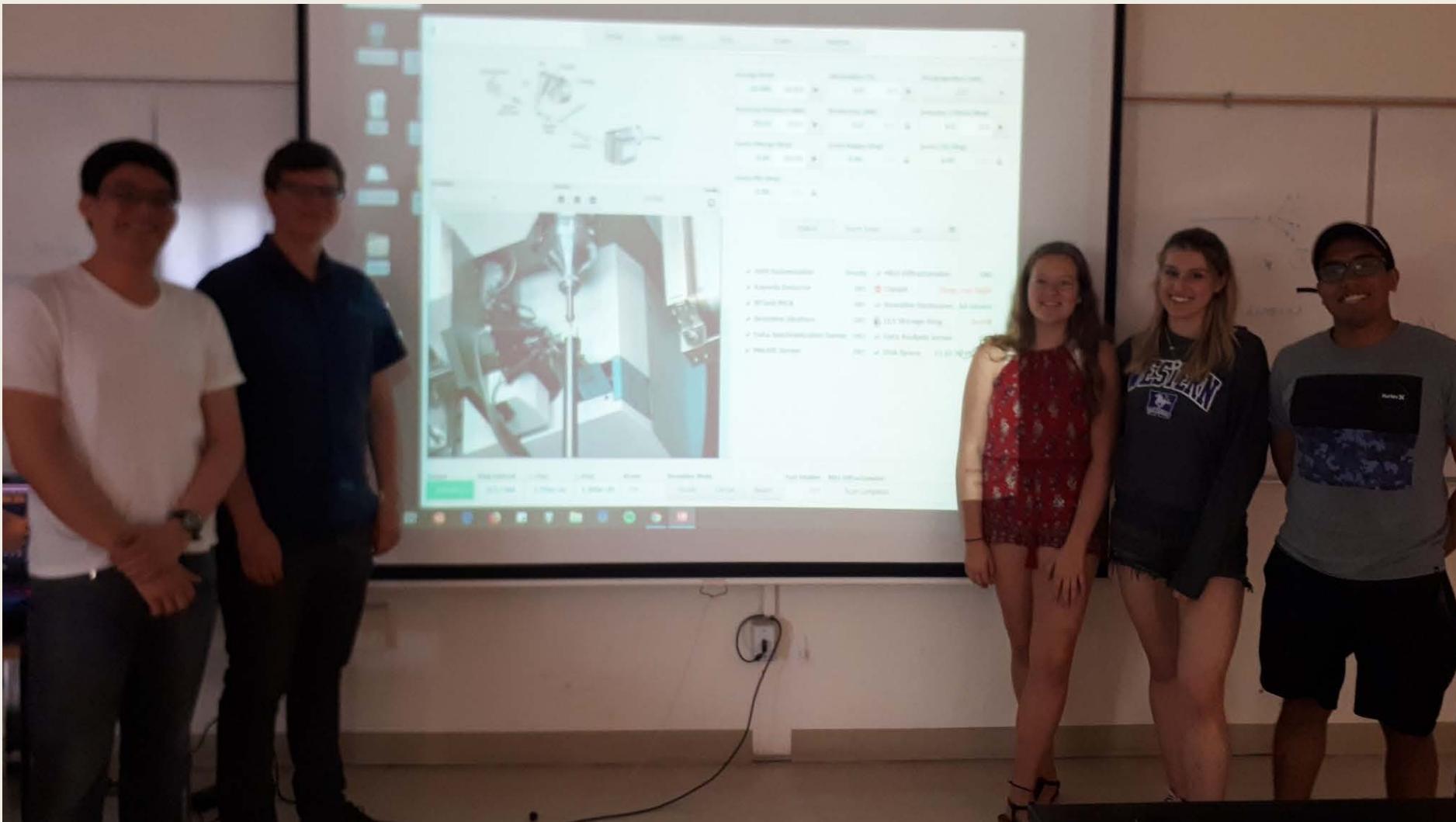
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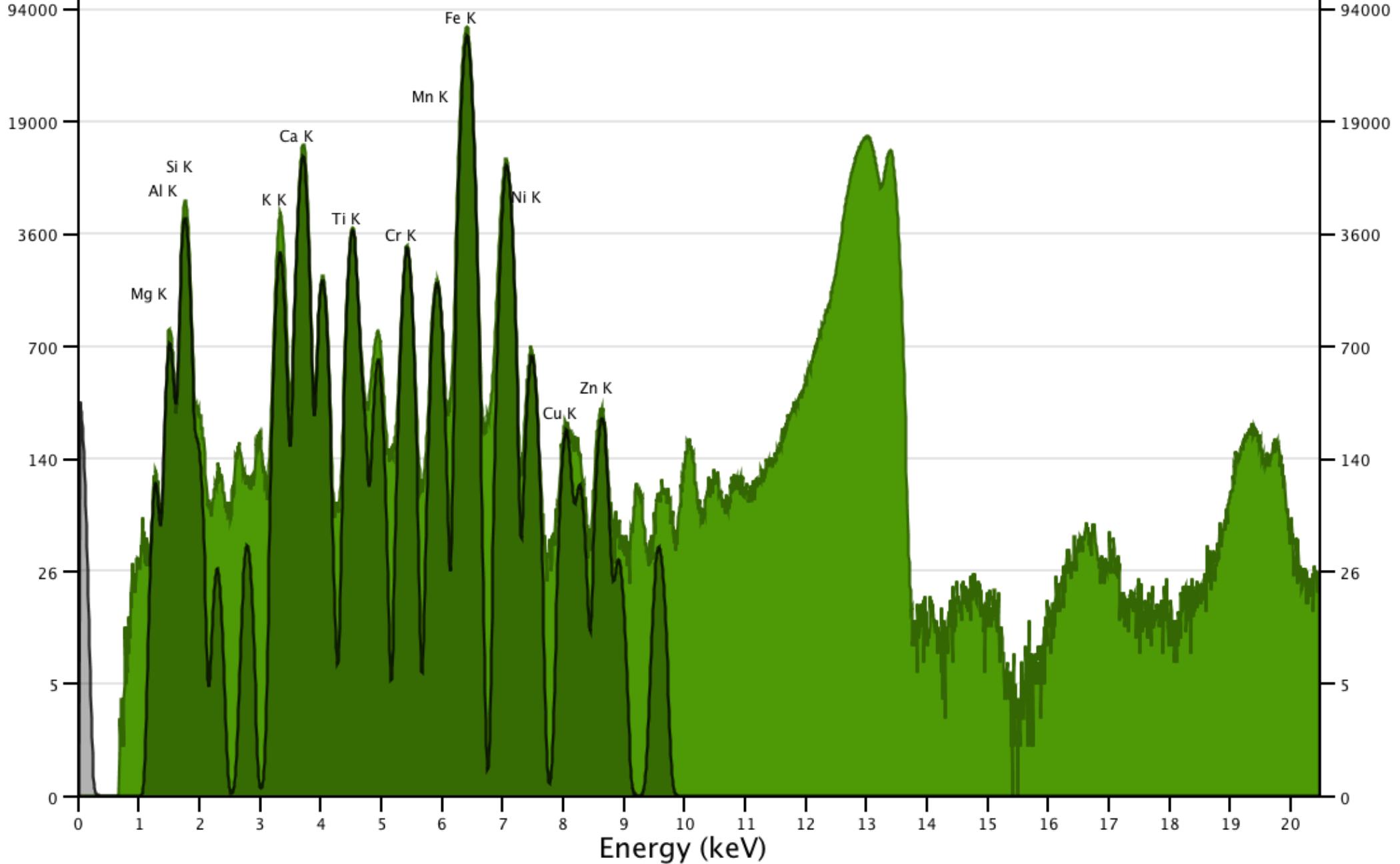
METALS IN SOILS

Anthropogenic Sources in Kamloops, British Columbia

Shayna Kay



Relative Intensity



Energy (keV)



MINING INDUSTRY
HUMAN RESOURCES COUNCIL
CONSEIL DES RESSOURCES HUMAINES
DE L'INDUSTRIE MINIÈRE

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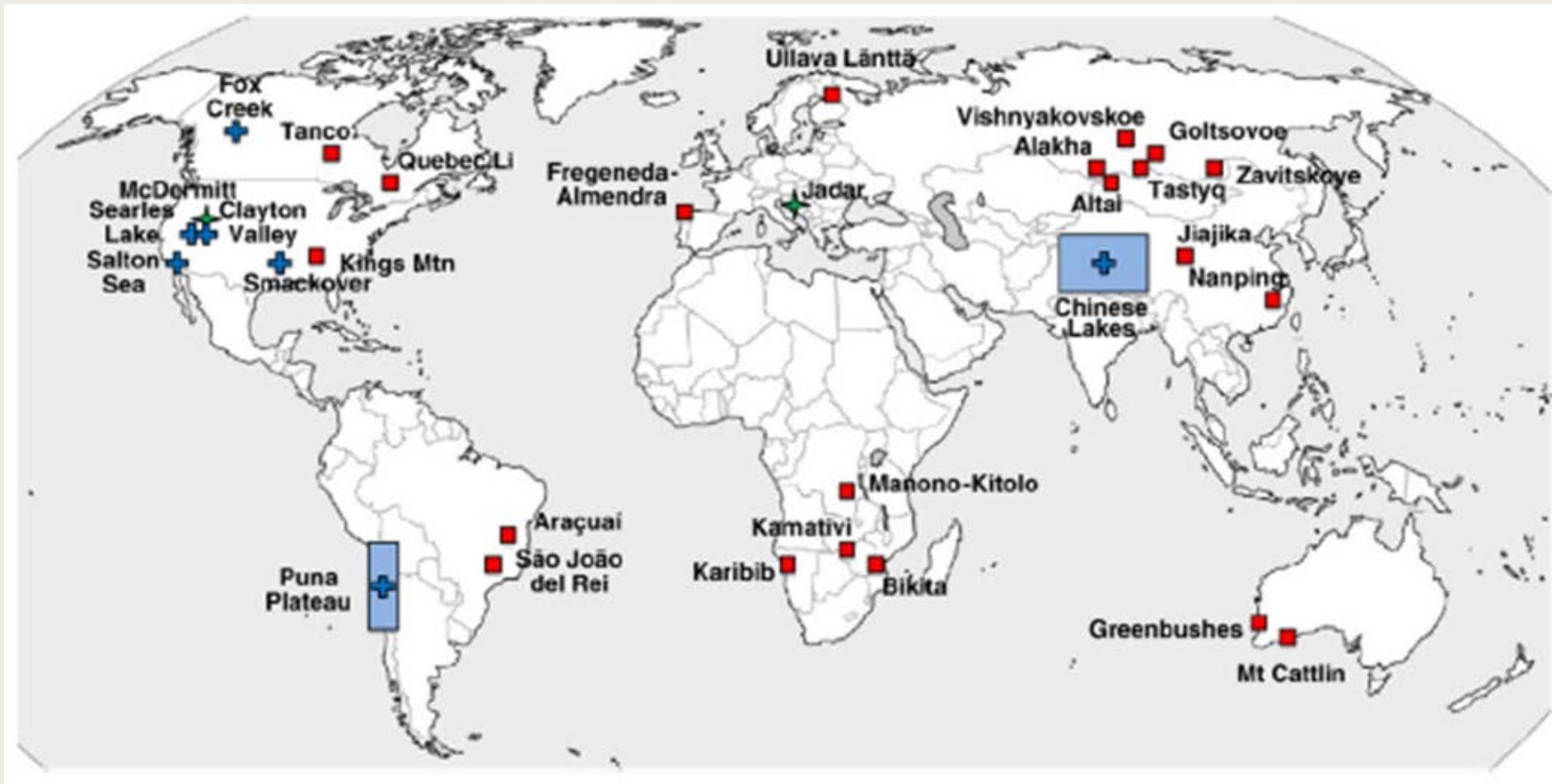
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LITHIUM PEGMATITES

An alternative resource for clean energy
storage

Carmen Venier

Where do we get our lithium from?



Location of major lithium pegmatite (square) and brine (cross) deposits. Source: Kesler, S. E., et.al. (2012).

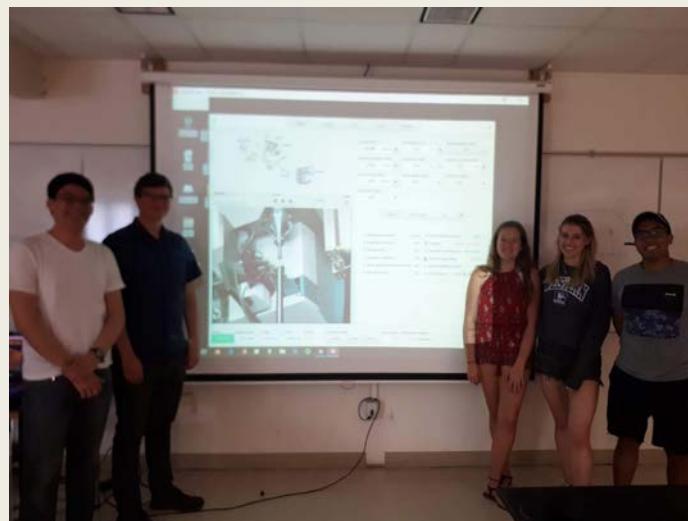
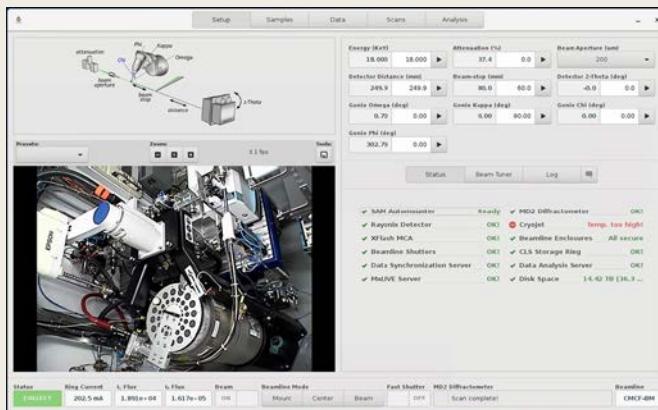
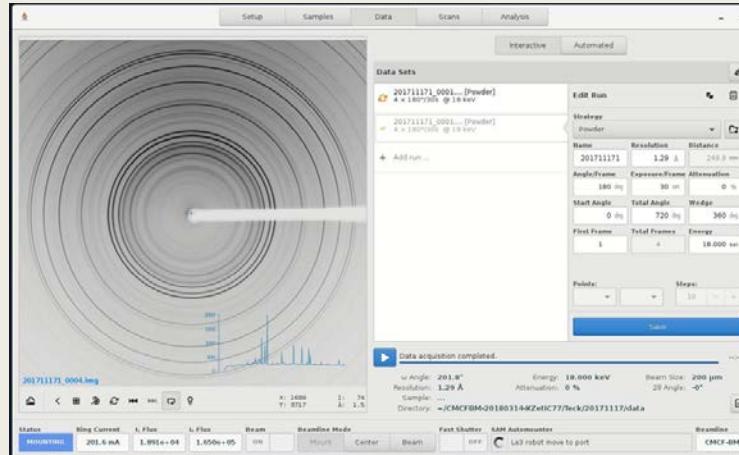
Transition metals in pegmatites

- Iron
- Cobalt
- Copper
- Manganese
- Nickel
- Magnesium

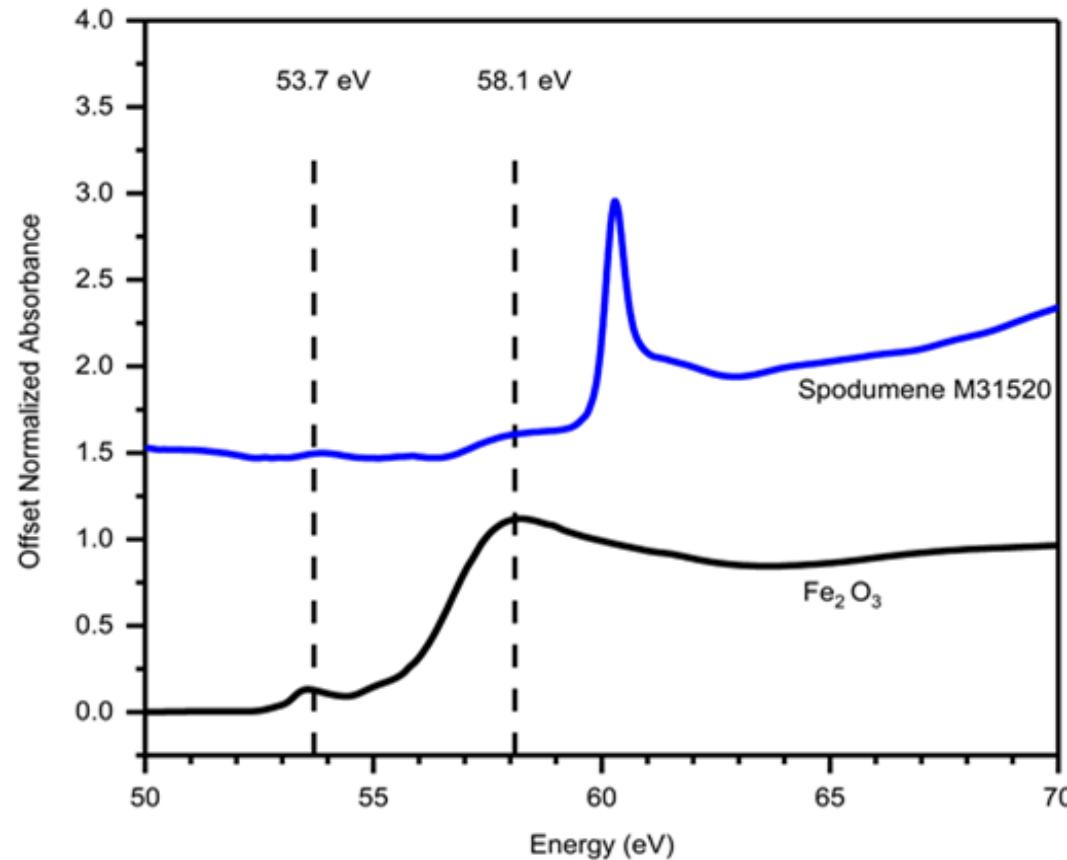


Lithium pegmatite from Potax Property in Quebec
Source: <http://strialithium.com/pontax-lithiumquebec/>

Collecting the Data

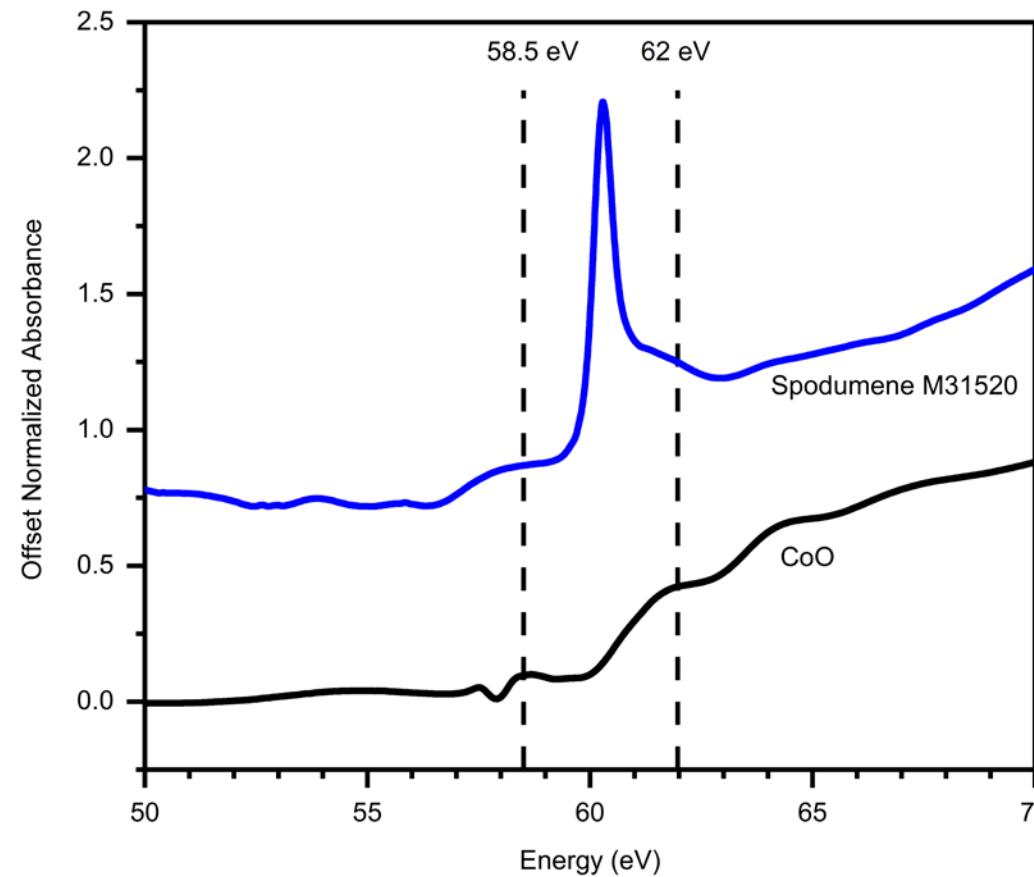


XANES Data



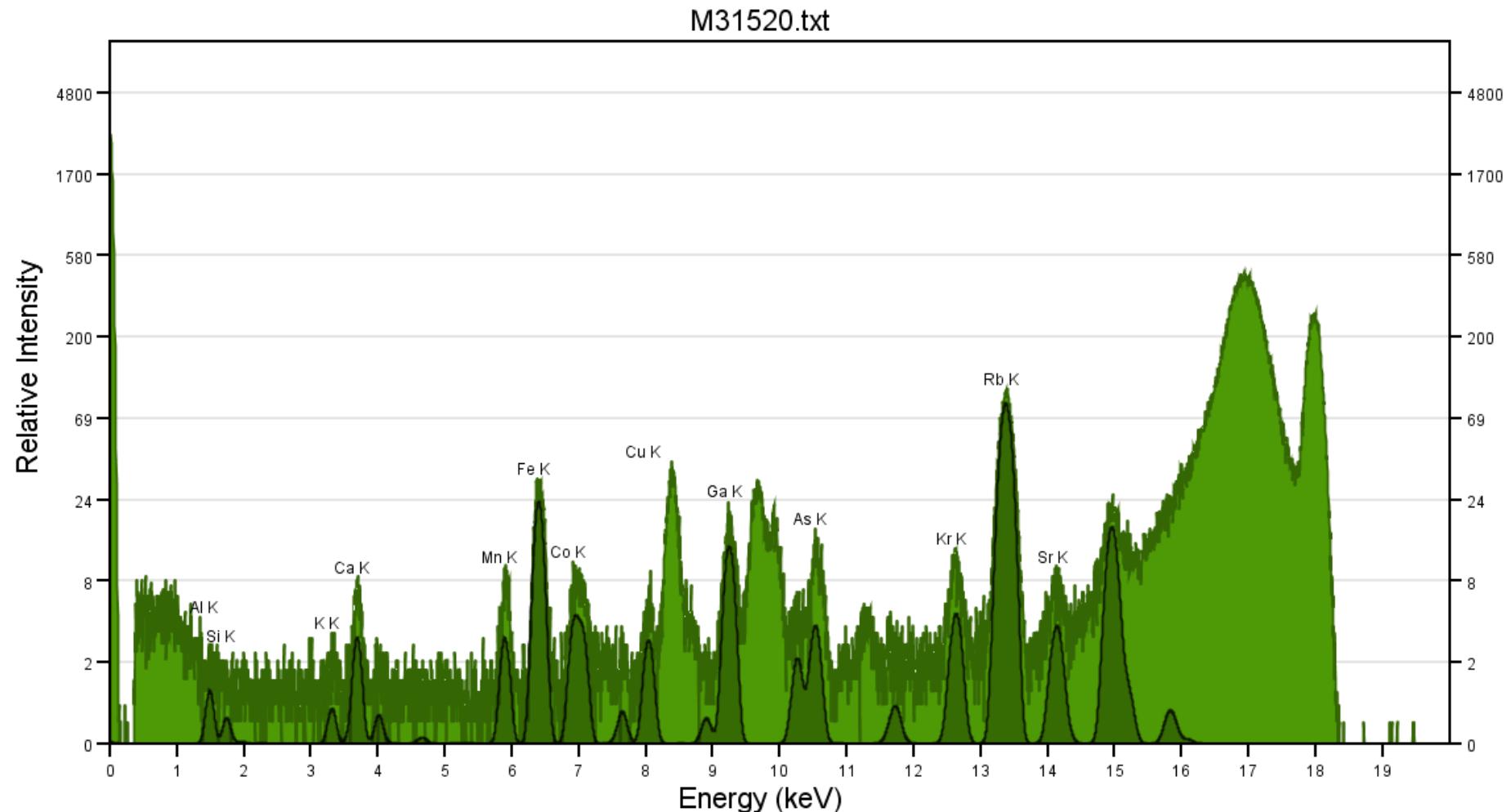
Fe₂O₃ with two energy peaks at 53.7 eV and 58.1 eV, indicating the presence of iron in the sample

XANES Data

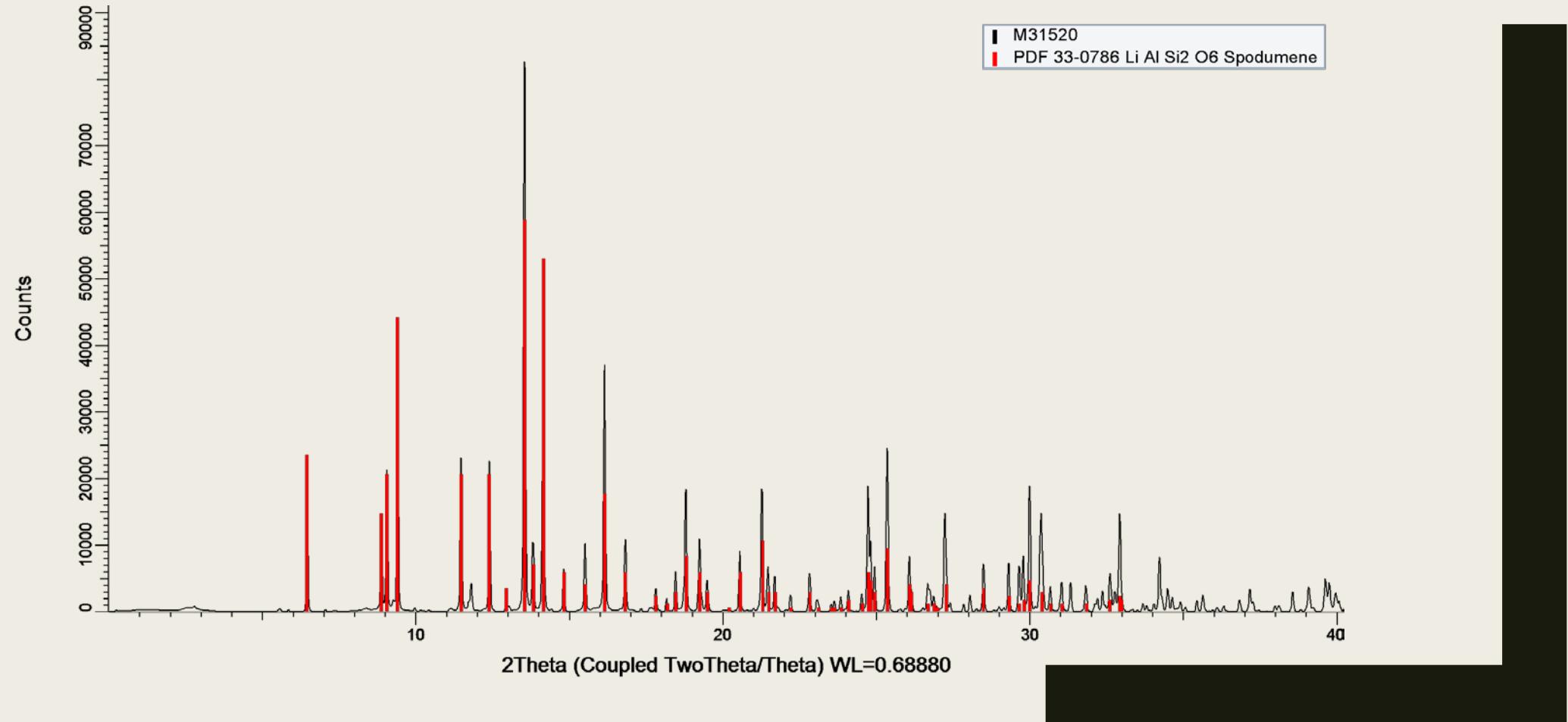


CoO with two energy peaks at 58.5 eV and 62 eV, indicating the presence of cobalt in the sample

XRF Analysis



XRD Analysis

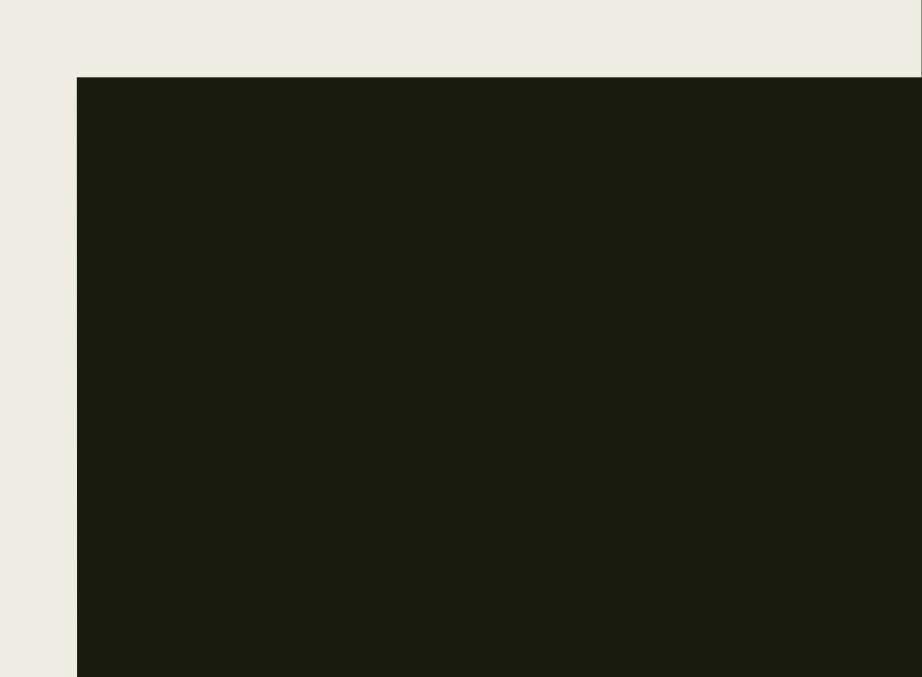


Summary of Skills Acquired

- Remote data collection using a synchrotron
- XANES, XRF, and XRD analysis
- Use of software for data analysis
- Project management
- Report writing
- Presentation skills
- Teamwork

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EXPANDING WORK INTEGRATED LEARNING AT WESTERN





Work-Integrated Learning Student Challenge

- Small, multidisciplinary student teams
- Create solutions to real-world mining problems
- Develop skills in:
 - Strategic thinking
 - Problem solving
 - Teamwork

