From the Rocks to the Stocks:
Library Research with a Geosciences Librarian and a Finance Librarian
January 14, 2021
Emily Wild and Bobbi Coffey, Princeton University Library

“If you can’t grow it, you mine it”  “Is it worth mining? What is my return on investment?”
Princeton University has a longstanding commitment to service, reflected in Princeton’s informal motto — Princeton in the nation’s service and the service of humanity — and exemplified by the extraordinary contributions that Princetonians make to society.”

https://www.princeton.edu/meet-princeton/service-humanity
Emily: “From the Rocks…

- Energy Resources: Oil, Gas, Coal, Gas Hydrates
- Mineral Resources & Commodity Information

https://cogccmap.state.co.us/cogcc_gis_online/

Emily C. Wild
Princeton University Library
ewild@princeton.edu

Schedule a Research Consultation:
Monday – Friday

Meet Our Specialists – Emily Wild

ORCID: https://orcid.org/0000-0001-6157-7629

Princeton University Library, 2018-Present
Chemistry, Geosciences and Environmental Studies Librarian
https://library.princeton.edu/staff/ewild

Department of Chemistry https://chemistry.princeton.edu/
Department of Geosciences https://geosciences.princeton.edu/
High Meadows Environmental Institute (HMEI) https://environment.princeton.edu/

- NH-VT & MA-RI: 1996-2008 Hydrologist

Water: https://www.usgs.gov/mission-areas/water-resources
Energy: https://www.usgs.gov/energy-and-minerals/energy-resources-program/
Minerals: https://www.usgs.gov/energy-and-minerals/mineral-resources-program

Environmental Health: https://www.usgs.gov/mission-areas/environmental-health
Hazards: https://www.usgs.gov/mission-areas/natural-hazards

Previously also worked in libraries at the reference desk:
Providence College, University of Rhode Island, Hartwick College
Energy & Minerals in Rocks - a geosciences librarian – who do I help?

At the U.S. Geological Survey, 2008-2018
- General Public
- Teachers, K-12
- College/University Professors
- City, County, State Natural Resource Managers
- Undergraduate & Graduate Students
- New Employees to Geosciences or Post-Docs
- Federal Science Agencies, Scientists & Attorneys
- Private Sector: Scientists & Attorneys
- International Governments & Institutions
- Experienced Library Users that need a refresher

Colorado and World Geology

At Princeton University, 2018-present
- Undergraduate & Graduate Students
- College/University Professors
- Librarians
- Post-Docs
- Federal Science Agencies, Scientists & Attorneys
- Private Sector: Scientists & Attorneys
- Finance Industry
- International Governments & Institutions
- City, County, State Natural Resource Managers
- Experienced Library Users that need a refresher

New York City Region & World Geology
What is geosciences?

From American Geosciences Institute (AGI) :
https://www.americangeosciences.org/critical-issues/faq/what-is-geoscience

Geoscience is the study of the Earth - its oceans, atmosphere, rivers and lakes, ice sheets and glaciers, soils, its complex surface, rocky interior, and metallic core. This includes many aspects of how living things, including humans, interact with the Earth. Geoscience has many tools and practices of its own but is intimately linked with the biological, chemical, and physical sciences.

Geoscience investigates the past, measures the present, and models the future behavior of our planet. But it also involves the study of other planets, asteroids, and solar systems, both to better understand the Earth and to expand our knowledge of the universe.
What is a geosciences librarian?

**Raw Data:** Real-Time, Continuous, Recent Partial Records, Historical

**Calculated Data:** Equations, Software Results, Lab Results, and Model Results

**Map Data:** Specific Location Information by Geosciences Topic

**Citation Data:** Bibliographic Information & Finding Publications

Many Free Geosciences Information Sources:
Geological Surveys & Geosciences Societies

Modified from:
Wild and Havener, 2001
“Online bibliographic sources in hydrology”
https://pubs.er.usgs.gov/pubs/collection/70023512

https://libguides.princeton.edu/geo/librarianwebinars
http://www.geoinfo.org/geoscience-librarianship-101/
USGS History: the Pre-USGS
Map Area the Four Surveys, 1867-1879

U.S. Geological and Geographical Survey of the Territories (Hayden)

U.S. Geological Exploration of the Fortieth Parallel (King)

U.S. Geographical and Geological Survey of the Rocky Mountain Region (Powell)

U.S. Geographical Surveys West of the One Hundredth Meridian (Wheeler)

Catalogue and index of the publications of the Hayden, King, Powell, and Wheeler surveys

The Four Great Surveys of the West

March 3, 1879: Legislation to rename the Coast and Geodetic Survey and transfer it to the Department of the Interior and to establish the U.S. Geological Survey for "classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain"
United States and Worldwide

- Earth processes that create oil, gas, coal, minerals, and uranium
- Location of natural resources

Geologic Time Scale – 2018
[Link to Geologic Time Scale]

Geologic Units - USGS Lexicon:
[Link to USGS Lexicon]

Geologic Units - Mexico Lexicon:
[Link to Mexico Lexicon]

Glossary of Geology
[Link to Princeton University's Glossary of Geology]

Example:
Glossary of Geology – Online at Princeton University
[Link to Princeton's Catalog]
USGS Estimates 214 trillion Cubic Feet of Natural Gas in Appalachian Basin Formations
Release Date: OCTOBER 3, 2019

Seismic Research Cruise Provides New Data on U.S. Atlantic Margin Gas Hydrates
Release Date: SEPTEMBER 20, 2018

Search = Arabian Shield Province: https://pubs.er.usgs.gov/search?q=Arabian+Shield+Province+
Search = Arabian Peninsula: https://pubs.er.usgs.gov/search?q=Arabian+Peninsula+
Search = Kingdom of Saudi Arabia: https://pubs.er.usgs.gov/search?q=Kingdom+of+Saudi+Arabia+
Search = Iraq: https://pubs.er.usgs.gov/search?q=Iraq

https://certmapper.cr.usgs.gov/data/apps/world-energy/?resource=conventional

https://pubs.usgs.gov/imap/0210a/plate-1.pdf

Summaries and Data Packages of Important Areas for Mineral Investment and Production Opportunities in Afghanistan

A User-Friendly, Keyword-Searchable Database of Geoscientific References Through 2007 for Afghanistan

The reference compilation is part of a larger joint study of Afghanistan’s energy, mineral, and water resources, and geologic hazards currently underway by the U.S. Geological Survey, the British Geological Survey, and the Afghanistan Geological Survey.
Mineral research materials

UW Researchers Turn Coal Powder into Graphite in Microwave Oven

2019 U.S. NET IMPORT RELIANCE

Substitutes: Synthetic graphite powders, scrap from discarded machined shapes, and calcined petroleum coke compete for use in iron and steel production. Synthetic graphite powder and secondary synthetic graphite from machining graphite shapes compete for use in battery applications. Finely ground coke with olivine is a potential competitor in foundry-facing applications. Molybdenum disulfide competes as a dry lubricant but is more sensitive to oxidizing conditions.

https://periodic.lanl.gov/index.shtml
Critical Minerals

Critical Mineral Commodities in Renewable Energy

Solar Panels

Several of the 35 mineral commodities listed as critical by the Department of the Interior play an important role in solar panels, where the Sun’s energy is transformed to electricity.

**PHOTOVOLTAIC CELL**

**ARSENIC**
High-purity arsenic is used to produce gallium-arsenide semiconductors for solar cells. In 2018, the United States was 100% reliant on foreign sources for arsenic.

**GALLIUM**
Used in gallium-arsenide and copper-indium-gallium-diselenide thin-film solar cells. In 2018, the United States was 100% reliant on foreign sources for gallium.

**GERMANIUM**
Germanium-based solar cells are commonly used in satellites. In 2018, the United States was more than 100% reliant on foreign sources for germanium.

**INDIUM**
Used in copper-indium-gallium-diselenide thin-film solar cells. In 2018, the United States was 100% reliant on foreign sources for indium.

**TELLURIUM**
Used in cadmium-tellurium thin-film solar cells. In 2018, the United States relied on foreign sources for more than 15% of its tellurium.

*Images Source: Photo Courtesy of the U.S. Department of the Interior.*
Critical Minerals

Critical Mineral Commodities in Renewable Energy

Wind Turbines
Wind turbines increasingly dot the American landscape, rising hundreds of feet in the air to capture electricity from the movement of the wind. Just like solar cells, wind turbines also rely on a few mineral commodities that have been designated as critical: aluminum and rare-earth elements.

**TYPICAL WIND TURBINE AND MAJOR COMPONENTS**

**ALUMINUM**
Aluminum plays a role in most parts of a wind turbine, particularly in the nacelle, where the transfer of wind power to electricity occurs. The United States was 50% reliant on foreign sources for aluminum in 2018.

**RARE-EARTH ELEMENTS**
Responsible for some of the most powerful and efficient magnets on the planet, rare-earth elements enable wind turbines to have smaller, lighter generators. Although the United States mined and exported rare-earth minerals in 2018, it relied on imports to meet its domestic demands for rare-earth compounds, metal, and manufactured products.

Batteries
Batteries play an important supporting role for renewable energy sources like wind and solar, allowing excess power to be stored for usage when direct solar or wind power is unavailable. Just like the energy sources they complement, modern batteries rely on critical mineral commodities, particularly cobalt, graphite, lithium, and manganese.

**COBALT**
On a global basis, the leading use of cobalt is in rechargeable battery electrodes. In 2016, the United States relied on foreign sources for 61% of the cobalt it consumed. Image Source: James St. Jam.

**GRAPHITE**
Graphite serves as an electrode in many lithium batteries. In 2016, the United States was 100% reliant on foreign sources for graphite.

**LITHIUM**
Lithium has a long history in batteries and now is a common material used in batteries today. In 2018, the United States was more than 50% reliant on foreign sources for lithium.

**MANGANESE**
Manganese serves as an electrode in many lithium batteries. The United States was 100% reliant on foreign sources for manganese in 2018.

The USGS delivers unbiased science and information to increase understanding of ore formation, undiscovered mineral resource potential, production, consumption, and how minerals interact with the environment. The USGS supports data collection and research on a wide variety of non-fuel mineral resources that are important to the Nation’s economic and national security. The agency’s mission is to provide reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life. For more information, please visit www.usgs.gov.
Rare Earth Processing Plant Opens in Colorado

USA Rare Earth's ambitious plans for domestic supply chain
Keeping up with the News

First Action Every Morning, During Lunchtime, and Last Action of Day

The New York Times

Saudi Arabia Will Cut Its Oil Production, Allowing Russia’s to Grow

Oil prices rose to levels not seen since February. The two major oil producers had been moving in lock step since an April agreement to cut output.


Example, Princeton University:
https://libguides.princeton.edu/WSJ

Energywire

ELECTRIC VEHICLE S
GM venture takes aim at EV frontier: Delivery vans

TOP STORIES
1. ELECTRICITY
2. ELECTRICITY
3. ENERGY POLICY
4. OIL AND GAS

Wednesday, January 13, 2021 — 7:16 AM

https://www.eenews.net/

The Wall Street Journal

Example, Princeton University:
https://libguides.princeton.edu/NYT

Geology Societies

Society for Mining, Metallurgy, and Exploration (SME)
https://www.smenet.org/

Publications:
Mining Engineering https://me.smenet.org/
Mining, Metallurgy & Exploration
https://www.smenet.org/Professional-Development/Publications/Mining-Metallurgy-Exploration

https://www.onemine.org/index.cfm

All About Mining:
https://allaboutmining.org/
Email me for past presentations (ewild@princeton.edu)

New York Section SME:
https://community.smenet.org/newyork/home

2020 events
Online presentations: Strengthening Critical Minerals Supply Chains in North America: The Key Role of Québec

SME’s 8th Current Trends in Mining Finance (CTMF) Conference
Managing Risk and Identifying Opportunities in a Disruptive World

https://www.smeannualconference.com/

Colorado Mining Association: https://www.coloradomining.org/
Denver Mint & Philadelphia Mint: Cent (Penny)

<table>
<thead>
<tr>
<th>Composition</th>
<th>Weight</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper Plated Zinc 2.5% Cu Balance Zn</td>
<td>2.500 g</td>
<td>0.750 in. 19.05 mm</td>
</tr>
</tbody>
</table>

https://www.usmint.gov/coins/coin-medal-programs/circulating-coins/penny

https://www.usmint.gov/learn/coin-and-medal-programs/circulating-coins
Manhattan Schist (Lower Cambrian)—Gray, medium- to coarse-grained, layered sillimanite-muscovite-biotite-kyanite schist and gneiss interlayered with layered tourmaline-garnet-plagioclase-biotite-quartz schist and gneiss with black amphibolite layers 3 ft or more thick. Weathers gray, tan, rusty, and maroon. Sillimanite occurs in lenses and nodules, commonly with kyanite, and also with magnetite or quartz; sillimanite nodules average 0.8 in. in length. Unit locally contains interlayered thin quartz-mica-plagioclase-garnet granofels. Sparse garnet and (or) plagioclase porphyroblasts are present; the granofels average 0.4 in. across. In places the foliation surfaces bear lustrous white mica having a gray metallic sheen. A major thrust fault, the Inwood Hill, separates the Manhattan Schist from the underlying Walloomsac Formation (see cross section A–A’).
“As of 2019, the vault housed approximately 497,000 gold bars, with a combined weight of about 6,190 tons. The vault is able to support this weight because it rests on the bedrock of Manhattan Island, 80 feet below street level and 50 feet below sea level.”

https://www.newyorkfed.org/aboutthefed/goldvault.html
Session Overview

- Natural resources based traded commodities:
  - Industrial metal (copper, aluminum...),
  - Precious metals (gold, silver..),
  - Forest (pulp, lumber..),
  - Energy (Brent, WTI...)
- Alternative energy / Renewable energy - Wind, Solar, Geothermal
- Rare Earths – not yet a traded commodity.
- Commodity investing: Commodity trading, ETF/ETNs, stock trading.
Bobbi: “…to the Stocks”

- Equity Research Analyst turned Finance Librarian
- 25+ years Wall Street analyst following technology
- Wrote extensively on changing industries and how industry evolution changed company valuation.
- Quoted as industry expert in New York Times and other print media and appeared on air for Bloomberg radio and TV as well as other venues.
Finance is defined as the management of money and includes activities such as investing, borrowing, lending, budgeting, saving, and forecasting. (From: Corporatefinanceinstitute.com)

The act of investing has the goal of generating income and /or increasing value over time. (from Investopedia)

Ways to invest - stocks of companies whose fortunes depend on the resource, ETF & ETN - Exchange traded funds and notes which are designed to mirror returns of the underlying asset and commodity future contracts. Varying level of leverage and costs.
As Princeton’s finance librarian, I help researchers find the resources they need for their independent research and related work. To help researchers, I curate pertinent resources in finance for Princeton University.

Accordingly, to know what the pertinent resources are I stay up to date on the trends in finance and in finance research.
At Princeton University, 2017-present

- Undergraduate & Graduate Students
- Alumni
- College/University Professors
- Librarians
- Post-Docs
- Finance Industry Professionals
- Experienced Library Users that need a refresher
New York Federal Reserve Bank

Over $260 billion in gold.

The vast majority of gold in the NY Fed is not domestic but owned by international entities.

https://www.newyorkfed.org/ - located in lower Manhattan and pre-COVID offered tours. The tours discussed the operations of the Federal Reserve Banks as well as visited the gold vaults in the basement.

There are 12 Federal Reserve Banks.
FRED - [https://fred.stlouisfed.org/](https://fred.stlouisfed.org/)  Crude oil prices / barrel
Finance research

FRED - https://fred.stlouisfed.org/  Gold price per Troy ounce

![Graph showing gold price per Troy ounce from 2016 to 2021. The graph illustrates the fluctuations in gold prices during this period, with notable increases and decreases. The most recent data point indicates a rising trend as of 2021. U.S. recessions are shaded on the graph, with the most recent end date being undecided. Source: ICE Benchmark Administration Limited (IBA).](image-url)
FRED - https://fred.stlouisfed.org/

For WTI

**Source:** U.S. Energy Information Administration

**Release:** Spot Prices

**Units:** Dollars per Barrel, Not Seasonally Adjusted

**Frequency:** Daily

**Definitions, Sources and Explanatory Notes**

**Suggested Citation:**

---

For Gold

**Source:** ICE Benchmark Administration Limited (IBA)

**Release:** LBMA Gold Price: Daily Prices

**Units:** U.S. Dollars per Troy Ounce, Not Seasonally Adjusted

**Frequency:** Daily

The London Bullion Market Association (LBMA) Gold Price was launched on the 20th March 2015 to replace the historic London Gold Fix. ICE Benchmark Administration (IBA) provides the auction platform, methodology as well as overall independent administration and governance for the LBMA Gold Price, with the LBMA holding the intellectual property rights. The price continues to be set twice daily (at 10:30 and 15:00 London GMT) in US dollars. Sterling and Euro prices are available but they are indicative prices for settlement only. For further information contact the LBMA at Au.Consult@lbma.org.uk or the IBA at iba@theice.com.

Copyright, 2016, ICE Benchmark Administration.

**Suggested Citation:**
EDGAR - https://www.sec.gov/edgar/search-and-access

EDGAR - Search engine for filing by publicly traded funds and companies
- Know what your are buying when you invest.
- Read the filings fund filings. Shareholder reports.
- Read the company filings. For companies:
  - 10-Ks are the annual filing and will show financial statements and have commentary on the state of the business, risks and notes on the financial statements
  - 10-Qs are the quarterly filings and will show the quarterly financial statements and will have notes on the financial statements.
  - 8-Ks are interim reports and often have significant events relevant to shareholders.
  - Proxy is reports that detail of the management compensation and materials for the annual meetings.
Resources - Government:
https://tools.finra.org/fund_analyzer/ - fund specific information from the Financial Industry Regulatory Authority (FINRA)
https://fred.stlouisfed.org/ - Current Economic Data from the St. Louis Federal Reserve Bank
https://fraser.stlouisfed.org/ - Historic Economic Data from the St. Louis Federal Reserve Bank
Resources – Commercial:

https://www.bloomberg.com/ - Bloomberg
https://www.ft.com/ - Financial Times
https://www.cnbc.com/ - CNBC
https://www.reuters.com/ - Reuters
https://www.economist.com/ - Economist
Thank you!
Questions?

Princeton University Library
https://library.princeton.edu/

Department of Chemistry
https://chemistry.princeton.edu/

Department of Geosciences
https://geosciences.princeton.edu/

High Meadows Environmental Institute (HMEI)
https://environment.princeton.edu/

Bendheim Center for Finance https://bcf.princeton.edu/