



EXPLORE & DISCOVER

A CORPORATE NEWSLETTER

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Who is Big Rock Exploration?

Big Rock is an international technical consulting company based out of Minneapolis, Minnesota. We specialize in natural resources including metals, minerals and energy.



What does Big Rock do?

Big Rock is focused on identifying, exploring for, and evaluating minerals and other natural resources. Our vast network of geoscientists, project managers, GIS professionals and field technicians provides clients with reliable expertise for all kinds of natural resource projects.


We focus on tailored project solutions for our clients by offering diverse and professional technical services.


EXPLORE OUR SERVICES

Let's get in touch!

 www.bigrockexploration.com

 info@bigrockexploration.com

 612.236.4562

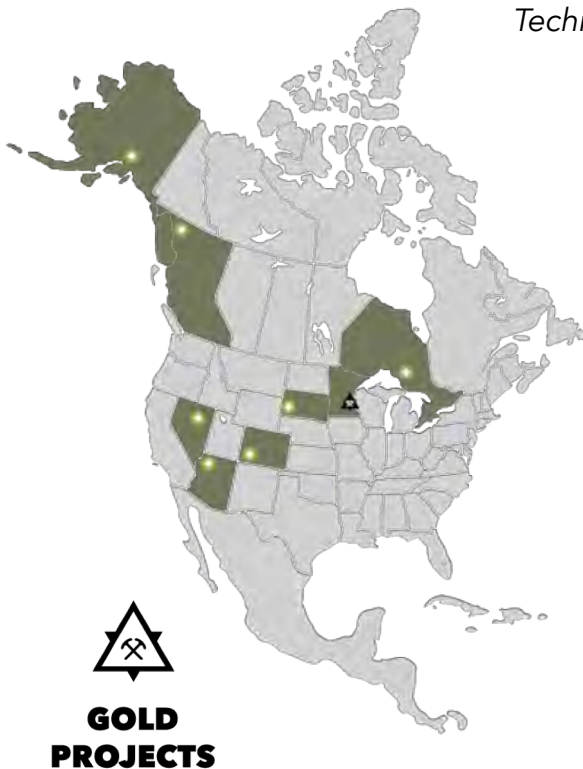
 1620 Central Ave NE #104
Minneapolis, MN 55413

Note From The Corner Office



Yesterday's decorative status symbol is tomorrow's most critical technology component

Gold is more than a status symbol. Gold is an important material that multiple industries rely on and it continues to be a critical mineral for technology and innovation. On top of its rarity, gold's unique physical properties enhance its material value and significance beyond that of a currency or investment-based asset. Gold is a key ingredient in satellite and telecommunication systems, space exploration, robotics, and nanotechnology.



Technological Innovation Is Key To Meeting Future Challenges

Gold is a key element, mineral, and commodity for the future! Big Rock is involved in a wide variety of gold projects, ranging from inception to production. As a key element in new age technology, gold presents a new type of value beyond standard currency backing and commodity hedging. While gold continues to be rare and beautiful, it is also a key ingredient of our future.

Also in this issue, we explore and discover:

- Gold as a strategic mineral
- Real-time geochemistry with pXRF
- Wind Energy: Big Rock's Role In This Growth Sector

We look forward to sharing our insights and working with you in the future!

Cheers,

Rob Bergmann
President
Big Rock Exploration, LLC



MINERALS ARE THE *FUTURE*

By Rob Bergmann, President, Big Rock Exploration

Gold has historically been desired throughout the world as a luxurious status symbol, but its status is now mission critical for tomorrow's technical innovations that will shape human life and modern society. Gold is also very rare, found at a relative abundance of only 0.004 parts per million in Earth's crust. With the combination of gold's rarity, a lack of recycling, and the amount of gold required for the critical components necessary for future technology and innovations, gold is becoming a key ingredient for the future of our society. While there are many examples, here is a high-level look at three sectors that critically rely on gold.

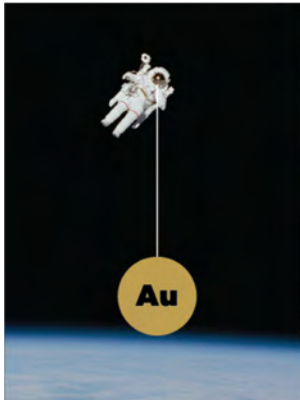


SATELLITE & TELECOMMUNICATIONS

GOLD STATUS: MISSION CRITICAL

Gold is an essential component of almost all modern electronics due to its efficiency as a conductor and resistance to corrosion and tarnishing.

As the interconnectivity and integration of our technological systems increases, so does the demand for reliable infrastructure and necessity for network integrity.

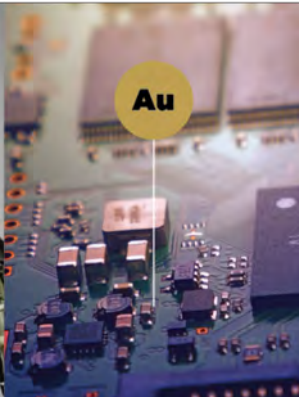
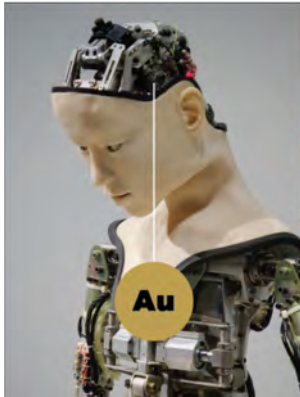


AEROSPACE & DEFENSE SYSTEMS

GOLD STATUS: MISSION CRITICAL

Gold is also used in ultra-thin covering applications because of its efficient infrared reflectivity.

Ultra-thin gold coatings have both aerospace and terrestrial uses due to gold's ability to reflect heat radiation and control temperature.



ROBOTICS & NANOTECHNOLOGY

GOLD STATUS: MISSION CRITICAL

Gold is also a critical component in emerging fields such as: air and water pollution filtration, lithium and air batteries, and photovoltaic cells.

Each of these technologies will play a role in addressing the environmental, social and economic challenges of the future, all of which will depend on the availability of gold.

BOTTOM LINE

As a key element in new age technology, gold presents a new type of value beyond standard currency backing and commodity hedging. While gold continues to be rare and beautiful, it is also a key ingredient of our future.

Sources: <https://www.visualcapitalist.com/>; <https://minerals.usgs.gov/minerals/pubs/commodity/gold/>

[READ MORE](#)

pXRF ANALYZER - REAL-TIME FIELD GEOCHEMISTRY

By Brian Lentz, Vice President, Big Rock Exploration



XRF Lab | The First Generation

While X-ray fluorescence (XRF) technology has had valuable application in geologic fields for quite some time, earlier generations of XRF analyzing tools faced significant limitations to their return on investment due to being large, immobile, and slow. However precise their data capabilities, it takes time before the results come in and the data can be utilized effectively. When geologists are in the field, time is money!

− SLOW − LARGE − IMMOBILE = COSTLY 😞



pXRF | The Next Generation

Over the past decade there has been significant development of portable XRF (pXRF) tools. These tools provide the opportunity to collect elemental data from rock and soil samples in the field within a matter of seconds. The pXRF can be used to “zap” each prepped sample, and within 10-30 seconds the pXRF will read and display data on up to 30 unique elements. While the data is only qualitative it has proven to be an effective tool to identify significant geochemical trends and anomalies.

+ FAST + SMALL + MOBILE = VALUE! 😊



DIG DEEPER:

“The use of property-scale portable X-ray fluorescence data in gold exploration: advantages and limitations.”

By Dennis C. Arne, Rob A. Mackie & Stacie A. Jones, Journal of Geochemical Exploration, 2011

[READ MORE](#)

BIG ROCK CASE STUDY | SYSTEMATIC GRID SOIL SAMPLING

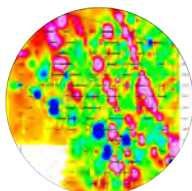


Systematic grid soil sampling is a common practice on projects that have soil cover concealing the rock beneath. Often, metals and other elements will leach out of the rock into the soils above, providing signatures for geologists to assess what lies beneath. Soil sampling is a proven method for establishing geochemical anomalies to identify targets for drilling.



CLIENT NEED | Rapid, accurate sample data to help identify drill targets

A large national mining company acquired a new land asset and needed to verify potential for drilling targets for further capital investment in the region. Due to time sensitivity, the property needed to be sampled and evaluated rapidly and at minimal cost. Data analysis from the project would be used to make material budget allocation for new drilling operations for where targets were generated.



BIG ROCK SOLUTION | pXRF field team, data management, & heat map analysis

We deployed a technical field team with pXRF capabilities to the project and began utilizing our systematic grid soil sampling techniques. With 15 days, all samples had been collected, prepped, and analyzed. On day 12, our team generated a heat map with distinct geochemical trends, which enabled the client to skip the long delay of a lab analysis and they were immediately able to follow-up on drilling targets. After the field work, 10% of the soil samples were sent to an XRF lab to validate and verify the pXRF data which proved to be accurate and reliable. This simple, methodical process combined with new pXRF technology has value for numerous applications and is a time-saving, cost saving, value-add for many of our clients' needs. After 2 weeks, the client had a significant and reliable geochemical soil heat map for helping to plan their drilling program.

WIND ENERGY OUTLOOK

By Brandon Isakson, Director of Operations, Big Rock Exploration

In recent years, Big Rock has observed a noticeable increase in the demand for geological engineering services related to wind farm construction. With our expertise in drill site management, geological and geotechnical logging, and health and safety, we are frequently contacted to assist in wind farm site characterization projects. The goal of such projects is to evaluate whether a site's ground conditions are suitable for the construction of wind turbines, transmission lines, substations, and related structures. This requires systematic drilling, sampling, and logging of each property's topsoil, till, and/or bedrock to evaluate lithology, rock competency, water table elevations, frost heave potential, and more.

KEY GEOLOGIC SERVICES NECESSARY FOR WIND ENERGY DEVELOPMENT:



DRILL SITE
MANAGEMENT



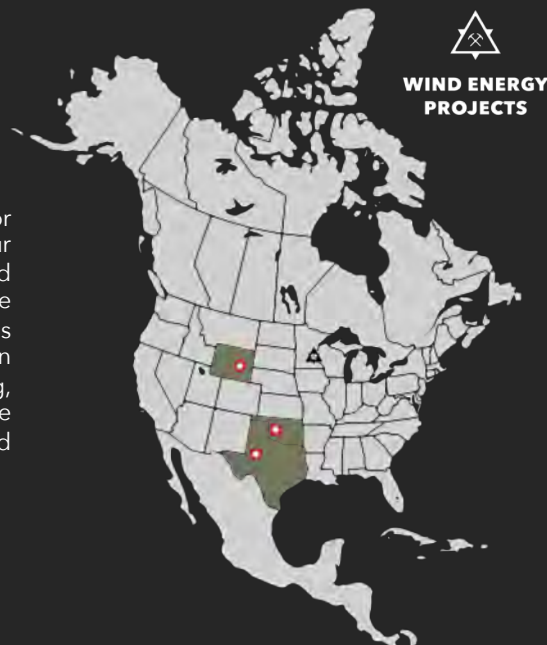
SITE SELECTION
& SURVEYING



GEOLOGICAL
LOGGING



GEOTECHNICAL
LOGGING



WIND ENERGY
PROJECTS

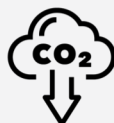
"Due to technological advancements, increasing cost-effectiveness, and tax credits for new producers, the wind energy industry has continued to expand its share of overall U.S. energy production."



WIND ENERGY
A MARKET SNAPSHOT

[READ THE REPORT](#)

A GROWING INDUSTRY BY THE NUMBERS



189M
METRIC TONS

Reduction in
CO2 emissions



7,017
MEGAWATTS

New wind capacity
added in 2017



105,500
JOBS SUPPORTED

Workers employed in
U.S. wind energy industry



UP TO 35%
MARKET SHARE

2050 estimate of
U.S. energy production

"Big Rock is excited to provide the critical geological services and consulting to help producers meet the growing demand for wind energy deployment across the U.S."

**LOOKING
AHEAD**



THE RENEWABLE ENERGY
SUPPLY CHAIN

Renewable energy technologies like solar and wind are experiencing unprecedented growth. *What does that mean for our domestic manufacturers and the industries that supply the required material resources?*

Tune in to our next **Explore & Discover** Issue No. 5 where we'll take a closer look at renewable energy supply chain considerations.

Sources: <https://www.energy.gov/eere/wind/downloads/2017-wind-technologies-market-report>

MEET THE FOUNDERS



Rob Bergmann
President



Rob Bergmann



Brian Lentz
Vice President



Brian Lentz

OUR STORY | TO BIG ROCK & BEYOND

Rob and Brian met in field mapping class at Winona State University where they completed their B.S. in Geology. After extensive independent work in the mineral exploration industry all across North America, they soon seized the chance to join forces and start the vision of what is now, Big Rock Exploration.

In addition to Big Rock, Brian and Rob have launched a portfolio of synergistic ventures in strategic real estate investment, gold exploration, and industrial metal recycling technology. Driven to innovate, these serial entrepreneurs are only getting started.

BIG ROCK MILESTONES | SINCE 2010

+65%

YEAR-OVER-YEAR
REVENUE GROWTH

30+

TECHNICAL
STAFF

9

INDUSTRIES
SERVICED

GLOBAL

PROJECT
FOOTPRINT

CORE VALUES

Family comes first

Zero harm

Friendship over business

Social & environmental stewards

Be the future

TESTIMONIAL | MAJOR MULTINATIONAL MINING CLIENT

"Rob and Brian are the new face of the mineral industry. Their young and talented group at Big Rock are paving the way for a new generation of exploring and developing natural resource projects. I am very impressed with their talent and leadership."



"We're big idea guys..."

...with strengths in strategic thinking, effective planning, and precise execution. We set ourselves apart by taking an idea, proving a concept through quality science, forming a startup company to create enduring value."

- Brian Lentz, VP, Big Rock Exploration

GEOLOGY MAKING HEADLINES

Electric Vehicle Revolution Goes Underground With Mine Truck

November 14, 2018, Niclas Rolander, Bloomberg

"Electric vehicles are reaching global markets far and wide -- and deep. Swedish mining equipment maker now aims to electrify all its underground machines within five years. The manufacturer on Wednesday launched a new range, including what it says is the largest battery-powered vehicle for mining below the Earth's surface: a 42 ton-capacity truck that can haul blasted rock through narrow tunnels. It's part of the company's latest series of mobile excavators, including drill rigs and loaders, designed to cut emissions and lower energy costs for miners."



Photo Credit: Epiroc AB

[READ FULL STORY](#)

Spain Wants To Phase Out Coal Plants Without Hurting Miners

October 26,, 2018, Eillie Anzilotti, Fast Company

"During the lead-up to the 2016 presidential election, Donald Trump won over voters in coal country by claiming he would keep mines open, and retain coal as a prominent energy source in the U.S. His argument was an economic one: He knew that miners were worried about their jobs, and that many did not see a path forward should the mines close."

But closing mines does not have to mean a loss of work. Done thoughtfully, it could present an opportunity for new economic growth, and environmental renewal. That's what Spain is looking to accomplish via its recent commitment to close nearly all of its coal mines by the end of this year."



Photo Credit: Dominik Vanyi, Unsplash

[READ FULL STORY](#)

PolyMet Copper Mine Clears Major Hurdle With State Permits

November 1, 2018, Jimmy Lovrien & Brooks Johnson, Duluth News Tribune

The Minnesota Department of Natural Resources issued permits for PolyMet's contentious copper-nickel mine in the Hoyt Lakes area, clearing a major hurdle for the decades-old mine proposal. The DNR granted the permit to mine and 10 other approvals on Thursday. The project still needs, at the very least, water and air quality permits from the Minnesota Pollution Control Agency and a wetlands permit from the Army Corps of Engineers before construction can begin.

"No project in the history of Minnesota has been more thoroughly evaluated," said DNR Commissioner Tom Landwehr in a statement. "This does not mean that the project will not have impacts, but it does mean that the project meets Minnesota's regulatory standards for these permits."



Photo credit: Jim Mone, Associated Press

[READ FULL STORY](#)

Bridging The Gap

EDUCATION AND OUTREACH

Big Rock Founders Speak To Geology Students, Aspiring Future Explorers

We believe a huge part of being an industry leader and innovator is helping support future generations of scientists.

Recently we had the pleasure of presenting to geology students about the importance of modern scientific exploration and career paths in the minerals industry.

Big Rock's 'Bridging The Gap' model is based on building partnerships at the community and institutional level that can help facilitate real-world learning opportunities by matching interested student candidates with Big Rock's available internships and project collaborations.



Brian and Rob present to student geologists at BHSU and SDSM&T this fall to share insights and discuss the importance of environmental geology.

[READ MORE ABOUT OUR MODEL](#)

LOOKING AHEAD

Connect With The Big Rock Team At Upcoming Industry Events

**AME
ROUNDUP.**

**Jan. 28-31, 2019
Vancouver, BC**

**SMART
MINING**
Resources for a Connected World

**Feb. 24-27, 2019
Denver, CO**

**PDAC
2019**

**Mar. 3-6, 2019
Toronto, ON**

**SME
MIN 2019**

**Apr. 15-17, 2019
Duluth, MN**



DIG DEEPER:

Big Rock co-founder and Vice President Brian Lentz breaks down his key insights on what trends and opportunities will define the geology industry in 2019 and beyond.

[GET OUR 2019 OUTLOOK](#)