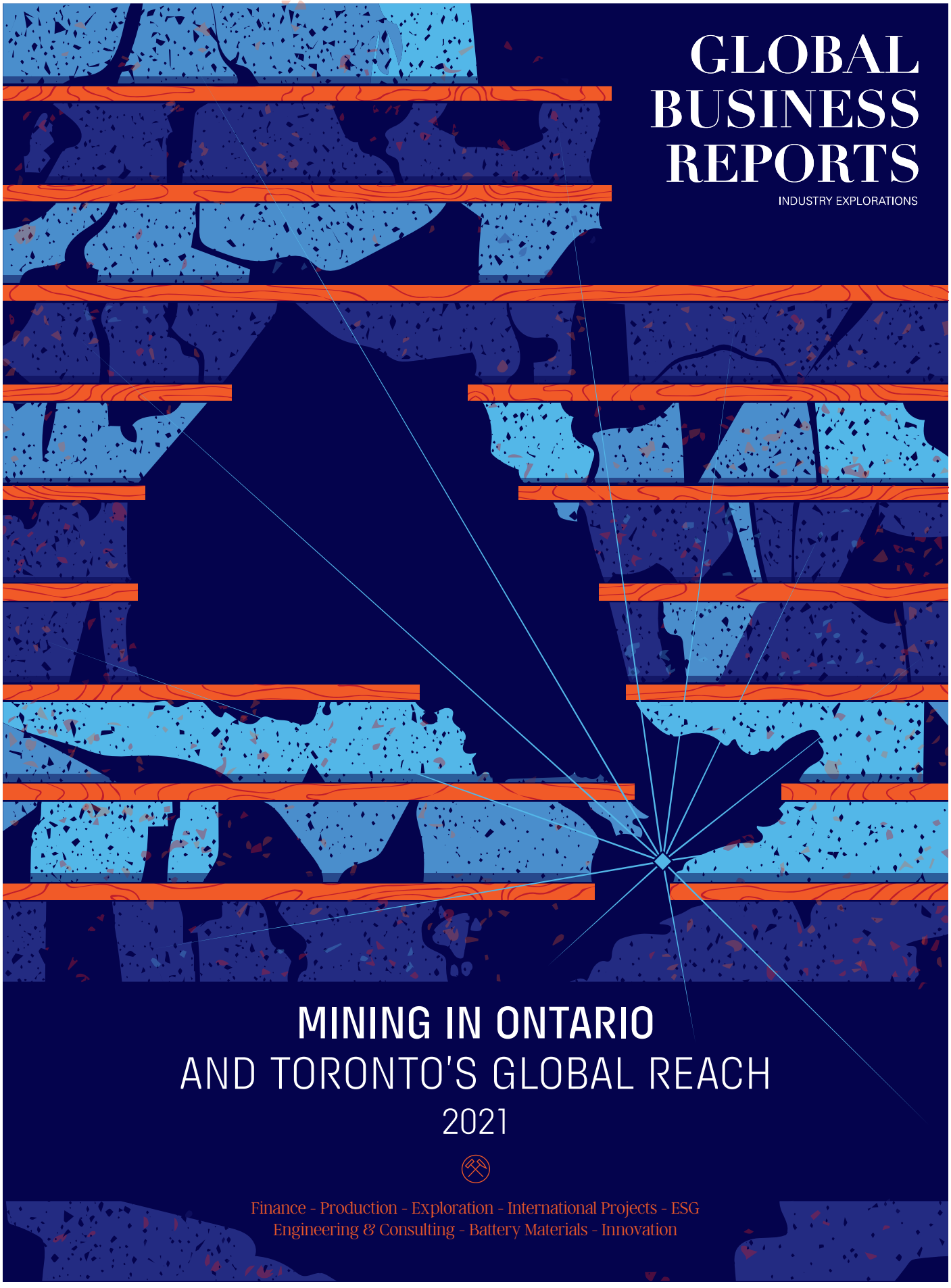

GLOBAL BUSINESS REPORTS

INDUSTRY EXPLORATIONS

MINING IN ONTARIO
AND TORONTO'S GLOBAL REACH
2021

Finance - Production - Exploration - International Projects - ESG
Engineering & Consulting - Battery Materials - Innovation

Dear Reader,

Global Business Reports (GBR) is delighted to present the 2021 edition of its annual guide to the mining landscape in Canada's largest mineral producing province. This edition of the report pays attention to Toronto's influence across the full value chain, from its financial institutions on Bay Street, mining producers and juniors headquartered in the city with operations across the globe, to its innovation-led service sector.

At PDAC 2020, when the previous edition of this report was launched, the mood was buoyant as rising precious metals prices had triggered a wave of M&A activity. However, the Covid-19 wrecking ball and ensuing lockdown sent the sector into disarray, as the unprecedented pandemic reduced operations to a bare minimum, taking months to return to full capacity.

Despite the unique challenges faced in 2020, the second half of the year breathed new life into the mining sector, spurred on by gold reaching an all-time-high of US$2,076 in August, followed by silver and base metals. The long-suffering junior exploration community rebounded with vigor, illustrated by new listings on the TSXV increasing by 71% in 2020, with the amount of capital raised increasing by 89%. While a correction in the PM market at the start of 2021 coincided with the rise of cryptocurrencies and the hysteria of the Robinhood generation of investors, macro conditions are aligned for mining to flourish in the years ahead.

The pandemic has also accelerated the adoption of new technology at mine sites, and Ontario's mature service sector is well placed to take advantage by offering solutions that create a safer, more sustainable mining environment. An emphasis on innovation is no longer an afterthought, as mining companies look to make up for time lost during lockdown. For a cyclical industry, the risk of standing still should not be an option.

The result of Global Business Reports' research is the production and distribution of *'Mining in Ontario and Toronto's Global Reach 2021'*. We would like to thank all our interviewees that have taken the time to provide their valuable insights. To all our readers, we encourage your feedback and welcome interest in being interviewed for future reports.

When it comes to mining, what happens in Ontario invariably does not stay in Ontario. In fact, it has a tendency to penetrate the global sector. The following pages are the culmination of over 70 interviews conducted with key decision makers to provide a holistic view of the companies and themes shaping the industry today.

Alfonso Tejerina
General Manager and Director
GBR

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MINING IN ONTARIO AND TORONTO'S GLOBAL REACH 2021
Industry Explorations
Global Business Reports

This research has been conducted by Ben Cherrington, Margarita Todorova and Jason Spizer
Edited by Mungo Smith
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INTRODUCTION TO ONTARIO

"The opening of new mines in Ontario is not a coincidence. We moved quickly as a government to signal to mining companies we would cut red tape, not just in a macro sense, but by sending swat teams into projects that are ready to move to a major milestone."

- Hon. Greg Rickford,
Minister of Energy, Mines,
Northern Development and Indigenous Affairs,
Government of Ontario

Photo by Laura de Moraes on Unsplash

From crisis to opportunity: The Covid-19 evolution

HIGH METALS PRICES AND INDUSTRY RESILIENCE HAVE HELPED MINERS WEATHER THE STORM

ONTARIO

Source: PDAC

more than

151,000 PEOPLE

employed in mineral exploration and mining

indigenous employment accounts for

11.2% **of mineral exploration and mining jobs in Ontario**

39 **mine sites operating in Ontario**

253,000

active mining claims

over 200

mineral exploration projects

At the PDAC convention in Toronto from March 1st to 4th, 2020, the mood was buoyant as the 23,000 attendees from across the mining world gathered to network and discuss the year ahead. The presence of hand sanitizer at exhibition booths and the occasional handshake replaced with a fist bump aside, this was a normal event in a pre-pandemic landscape. Less than two weeks later, the Canadian federal government would declare a state of emergency as Covid-19 began to rip through Europe and the Americas.

The speed of change took everyone by surprise, and initially devasted the mining industry, as the broad market sell-off in mid-March and ensuing lockdowns sent costs spiraling and caused operations to shut down save for essential care and maintenance, such as heap leaching and environmental management. "A number of mines in Ontario moved to a hot-idle status at the end of March, and the question was how long could we afford them to shut down for, particularly as the commodity markets went from zero to 60 quickly," said Greg Rickford, Minister of Energy, Mines, Northern Development and Indigenous Affairs, Government of Ontario.

Indeed, the sharp rebound in precious metals prices in April gave extra impetuous to restart operations ASAP, but many companies felt frustrated by the fact that they had access to significant supplies of PPE and rapid testing in other parts of the world in which they operated, but could not bring this to Ontario as it was not approved by the federal government. "This was an unfortunate lesson, as the PPE would have been a tremendous help to the indigenous communities in some of the far-reaching parts of Northern Ontario. We have consulted with Federal Minister of Natural Resources, Seamus O'Regan, to make sure that we will never be in this position again," revealed Rickford.

On a more positive note, as spring turned to summer, PPE and testing capacity were mobilized to safely reopen mines and northern communities. The reopening of mines came at an opportune time, as August saw the gold price reach an all-time high of US$2,076/oz, then silver reached its highest mark since 2013, before base metals such as copper and nickel took over the charge in Q4.

Ontario is the largest producer of gold, platinum-group metals and nickel in Canada, as well as the second-largest producer of copper, and the high metals prices leading into 2021 position the province's mining industry to fuel the economic rebound necessary in a post-Covid landscape. "Ontario's mining industry is an instrumental component of the economic strength of Canada and the pandemic has highlighted the essential nature of the industry," stated Samantha Espley, president of the Canadian Institute of Mining, Metallurgy & Petroleum (CIM).

Ontario's mining industry is an instrumental component of the economic strength of Canada and the pandemic has highlighted the essential nature of the industry and its role as a job-creation engine.

- Samantha Espley, President, Canadian Institute of Mining, Metallurgy & Petroleum (CIM)

Espley went on mention that the theme of CIM's virtual annual Convention in May 2021 is "Resilient and Thriving: Together in a Changing World," which, she says: "Speaks specifically to this ability of the mining industry to adapt and evolve, whether that is through the acceleration of automation and digitization or ensuring the health and wellbeing of our workforce during these challenging times."

The PDAC convention was held virtually in 2021, for the first time in its 80-year history, as social distancing restrictions remain in place before a widespread vaccination program is rolled out. Felix Lee, president of PDAC, acknowledged that the intent is to return to an in-person PDAC convention as soon as it is safe to do so, but from now on there will always be a virtual component to the event. "If there is a silver lining of Covid-19, it is that it has put us on the path of developing something we have always talked about internally," he said, suggesting that just as the evolution of the convention moved from the Royal York Hotel to the Metro Toronto Convention Centre, this new virtual component will allow for more widespread attendance for the event.

For PDAC to welcome physical guests in 2021, Canada will need to speed up its vaccine rollout. As of March 30th, 2021, less than 9% of its population had been vaccinated, compared to 30% in the US and 50% in the UK.

In July 2020, the International Council on Mining and Metals (ICMM) held a meeting with mining industry leaders titled 'Covid-19: Communication and collaboration to tackle a common enemy'. One of the key takeaways, according to ICMM CEO, Tom Butler, was that this was an opportunity to reframe the discussion around mining with local governments and host communities, as people start to appreciate the delivery capacity of mining companies in remote areas.

"If you shut an operation down there can be serious implications for host communities," observed Butler, illustrating the importance of the industry for more than just the metals and minerals that are mined.

As well as addressing its issues with local communities, the mining industry must also tackle its lack of diversity if it is to fulfil its potential and compete for talent with industries such as tech and healthcare. Heather Gamble took note of the lack of female representation within mining organizations, and subsequently founded Women on the Move (WOM) to connect female entrepreneurs with mining companies looking for supply chain procurement options from underrepresented groups. Less than 1% of large corporate supply chains procure with women owned businesses and WOM is working to change these dynamics in the mining industry.

Its Artemis project, designed to equip women entrepreneurs with senior-level sales training, coaching, sales business introductions and business connections, expanded from 20 to 60 members in 2020, and also obtained its first industry sponsors. "I believe there is still a massive opportunity to bring in and really drive, in a proactive fashion, a diverse talent pool. We seek to stimulate diversity within the supply chain, and the supply chain is four times as large an ecosystem as all the mining companies put together," Gamble highlighted. ■

Hon. Greg Rickford

Minister of Energy, Mines,
Northern Development and Indigenous Affairs
GOVERNMENT OF ONTARIO

How did the provincial government work with the mining industry during the initial Covid-19 outbreak?
A number of mines in Ontario moved to a hot-idle status at the end of March, and the question was how long could we afford them to shut down for, particularly as the commodity markets recovered quickly. Our mining advisory council was in contact with each of the mines to see how operations could ramp up safely. Many of the mining companies were frustrated by the fact that they had access to significant supplies of PPE and rapid testing because they operated in other parts of the world, but could not bring this into Ontario as it was not approved by the federal government.
This was an unfortunate lesson, as the PPE would have been a tremendous help to the indigenous communities in some of the far-reaching parts of Northern Ontario. We have consulted with Federal Minister of Natural Resources, Seamus O'Regan, to make sure that we will never be in this position again. The good news is, as the summer progressed, we worked closely with companies and federal government to mobilize PPE and stabilize testing capacity to safely reopen mines and northern communities.

Which measures have been taken to alleviate increased energy costs brought on by the pandemic?
Financial relief had created a marked increase in energy costs, due to the low demand of electricity across the province caused by the pandemic. This was particularly to the detriment of electricity-intensive mining operations such as Newmont's Borden project. In response, we implemented a global adjustment smoothing policy to support medium to large electricity consumers through the deferral of a portion of the global adjustment over three months, starting in April 2020. We are now looking to address this through our annual budget so it does not arise again.
Another area we addressed was the industrial conservation initiative peak hiatus – a highly problematic phenomenon in the province of Ontario which occurred as a consequence of the disastrous energy policy of the previous government. Some businesses ended up shutting down for days when the demand for energy reached a point where the price was out of control. To help large industrial companies return to full operation, we eliminated the requirement to limit electricity during those peak hours.

To what do you attribute the new wave of mine development in Ontario?
The opening of new mines in Ontario is not a coincidence. We moved quickly as a government to signal to mining companies we would cut red tape, not just in a macro sense, but by sending swat teams into projects that are ready to move to a major milestone. Our mandate of being open for business can be validated with the mining companies, and has been exemplified through projects such as the Sugar Zone and Borden moving into production, and more recently Côté Gold. Our swat teams were proactive in disentangling certain red tape, and then moving the red tape out to legislative bundles so it never has to happen again.

Can you tell us about the development of small modular reactors (SMRs) in Ontario, and when we could expect to see them implemented at mine sites?
Recently, Ontario Power Generation (OPG) announced that three companies (GE, Terrestrial and X-energy) have qualified to develop SMRs on a brownfield site in Ontario. These companies will make submissions to OPG on their ability to build size and scale SMRs in a competitive timeline, which could lead to SMR technologies at mine sites as early as 2025.

How have events in 2020 highlighted the importance of creating a critical mineral supply chain in North America?
There has been an enhanced recognition that we need to urgently ensure our supply chain of critical minerals and metals. Talks have mobilized quickly between federal governments and provinces, including the US undersecretary of commerce, to look at how we can protect ourselves from supply chain disruption – an issue that was highlighted by the pandemic with China shutting down. Canada, and in particular Ontario, has some of the largest and most exquisite reserves of these critical minerals, and we need to enter into discussions and agreements for their supply to the North American market. ■

Samantha Espley

President
CANADIAN INSTITUTE OF MINING, METALLURGY & PETROLEUM (CIM)

What were some of the highlights for CIM in 2020?
CIM continues to encourage relevant dialogue across mining's wide ecosystem – not only in Canada but globally. CIM undertakes its outreach and shares industry best practices and technical knowledge through its award-winning magazine, as well as a quarterly peer-reviewed international CIM Journal. However, the pandemic has accelerated our programming pivot toward digital. Webinars, virtual conferences and podcasts are now a critical part of our strategy.
For instance, our Virtual Capital Projects Symposium, the first of its kind in 2020, was very successful. The biggest challenge for the organization is adapting trade shows to a virtual format successfully. Engagement with members is critical and we are always brainstorming new solutions to extend our reach.
Finally, some of the biggest accomplishments are the publication of three best-practices guidelines focused on mineral reserve and mineral resource reporting; exploration and property valuation; the creation of a new Health & Safety Society within CIM; and the launch of CIM Academy, which hosts recordings of hundreds of technical presentations.

Can you speak to the resilience of the mining sector and its importance to the economies of Ontario and more broadly Canada?
Ontario is the largest producer of gold, platinum-group metals and nickel in Canada, as well as the second-largest producer of copper. Ontario's mining industry is an instrumental component of the economic strength of Canada and the pandemic has highlighted the essential nature of the industry and its role as a job-creation engine. Mining employs over 500,000 workers nationally and many more indirectly in adjacent industries such as manufacturing and construction. Also, the mining sector is the largest private sector employer of indigenous peoples.
In Canada overall, the sector contributes C$100 billion, or 5% of total annual GDP. The industry's annual exports make up 20% of the country's total exports.

What role is technology playing in making Canadian mining more sustainable and competitive?
Technology clusters and supply service clusters, such as MineConnect™ based out of Sudbury, contribute to wealth and job creation. They also represent interesting synergies for the mineral sector. Enabling technologies such as underground communication, cloud computing, and software systems make mining safer and more efficient. Mining is an industry that benefits greatly from the utilization of technology and machinery solutions.
Technology also helps secure mining's license to operate by ensuring the integrity and stability of infrastructure systems such as tailings dams. The social side of the mining equation, working closely with communities, is facilitated by technology as well. Tools such as augmented and virtual reality, for example, can allow engagements and interactions with communities to better familiarize them with project details and the mining process. And, from a different angle, the transition to technologies such as battery electric vehicles and energy storage to reduce carbon emissions will require the raw materials such as cobalt and nickel that Ontario has a long history of producing.

What are some of the biggest knowledge gaps CIM wants to address?
CIM's role is to engage society to help them become more informed about the minerals industry and to highlight the importance of minerals across sectors and activities. CIM currently has a project in the proposal stage with Science North, a science center in Sudbury, to leverage gamification to share a better appreciation of the science present in the exploration, extraction and processing of mineral resources. Another aspect of mineral literacy is supporting the training of our next generation of industry professionals through measures such as mentoring programs and scholarships. We work with institutions to address the decline in demand for geology and engineering higher education programs, which are crucial for establishing the future success of the industry. Broadly speaking, the three knowledge gaps that CIM is focused on addressing are: health and safety, sustainability, and diversity. We created our H&S society to address mental health and safety, an Environmental and Social Responsibility Society to address the environmental and social impacts of mining and a Diversity committee to foster inclusion. ■

Simon Irish

CEO
TERRESTRIAL ENERGY

What inspired the founding of Terrestrial Energy?
Looking at the big problem the world faces, we are seeking to decarbonize by removing fossil fuels from the global energy basket, which at the moment contributes 84% of supply. What struck me very clearly is that nuclear energy is capable of out scaling fossil fuels. We have vast quantities of fissionable material in Canada and if you include foreign sources, there is millennia worth of efficient fuel.
Technologies to realize the nuclear energy future must solve an economic problem and they must be competitive. With conventional nuclear its problem is cost related. New plants are unaffordable to construct, even by sovereigns. Plus, the power that it generates is uncompetitive against many alternatives, particularly natural gas. I was looking at these technologies and the molten salt reactor (MSR), which is part of a class of a group of next generation nuclear technologies called Generation IV, stood out very clearly.

How might Terrestrial's IMSR technology be a useful solution for miners looking to decarbonize?
As global demand for metals increases, the mining business is increasingly looking to develop mega projects. If a mega project holds US$50 billion of in situ metal value over a 50-75-year period, it would likely be economically productive for generations. The mine has to be cost competitive in order to secure financing and too often with mining projects the pivot point is cost of energy at minehead. If you can bring vast amounts of industrial energy to minehead through a 1,000 km extension from an existing, big electric grid, the moment you do that, you turn that US$50 billion of in situ industrial metals from an economic curiosity into something that is very real. This is where SMR's (small modular reactors) come in. Our SMR is very capable of being situated close to one of these deposits, increasing reliable, cost competitive power. ■

Felix Lee

President
PROSPECTORS & DEVELOPERS ASSOCIATION OF CANADA (PDAC)

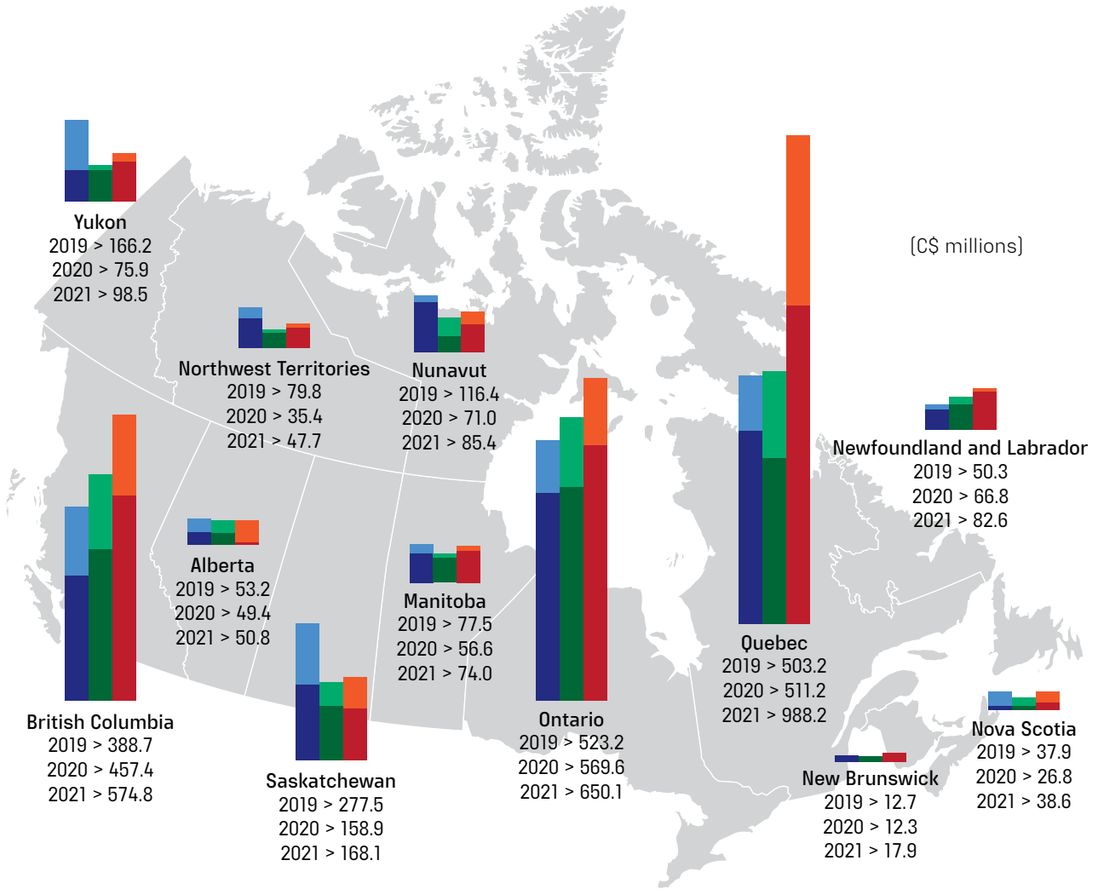
Can you comment on PDAC's role as an advocate for the Canadian mining industry?
For the 361 days of the year that the convention is not happening, PDAC works as an advocacy body on behalf of the mineral exploration sector. Our work covers a broad spectrum of issues that are important to our sector and our members, such as: sustainability, indigenous relations, health and safety, access to land, and capital markets. We are constantly working with the Canadian Federal Government and regional associations to assist them on matters related to mineral exploration and development industry. We have made really good progress in the last few years and that has been reflected in the convention itself. The Prime Minister of Canada attended the conventions in 2019 and 2020, and in 2020 we also had three of his cabinet ministers attend and stay for the full three days, which is very telling of the relationship that PDAC has with government.
Our work is focused in two main branches. In the short term working collaboratively to find how our sector can set the economy back on the path of recovery, by increasing exploration and discoveries that can generate jobs. The second, working to set Canada on the path towards a low carbon economy. We have been working closely to identify the minerals and metals that our industry can help provide which are critical to making that transition.

Do you expect future PDAC events to return to the in-person format, or could a hybrid model be introduced?
The intent is to return to an in-person PDAC convention as soon as it is safe to do so, but from now on there will always be a virtual component to the event, so we may see a hybrid model in 2022. If there is a silver lining of Covid-19 is that it has put us on the path of developing something we have always talked about internally. Industry veterans will remember the evolution of the convention from the Royal York Hotel to the Metro Toronto Convention Centre, and what we are seeing now is the next step, the virtual component. ■

MINERAL EXPLORATION BY PROVINCE AND TERRITORY

Source: Natural Resources Canada's Survey of Mineral Exploration, Deposit Appraisal, and Mine Complex Development Expenditures, l'Institut de la statistique du Québec, S&P Global Market Intelligence, Corporate Exploration Strategies, Bank of Canada

In 2020, Ontario was the leading jurisdiction in spending followed by Quebec, then British Columbia. These three provinces accounted for almost 3/4 of total expenditures. Quebec is anticipated to become the leading jurisdiction in 2021 on higher spending for precious metals (mostly gold).



(C$ millions)

2019 Canada total C$2.3 B
- Exploration **C$1.6 B**
- Deposit appraisal **C$0.7 B**

2020(p) Canada total C$2.1 B
- Exploration **C$1.5 B**
- Deposit appraisal **C$0.6 B**

2021(si) Canada total C$2.9 B
- Exploration **C$2.1 B**
- Deposit appraisal **C$0.8 B**

Development Spotlight

A NEW WAVE OF GOLD PRODUCTION IN ONTARIO

Image courtesy of Wesdome Gold Mines

Since Doug Ford's Progressive Conservative government was elected in June 2018, Ontario has seen a new wave of gold production come online, starting with Harte Gold's Sugar Zone in October 2018, Newmont's Borden mine in October 2019, and most recently, Pure Gold Mining's Red Lake operation (the former Madsen mine), which poured its first gold on December 29, 2020. "The opening of new mines in Ontario is not a coincidence," stated Greg Rickford, Ontario's Minister of Energy, Mines, Northern Development and Indigenous Affairs. "We moved quickly as a government to signal to mining companies we would cut red tape, not just in a macro sense, but by sending swat teams into projects that are ready to move to a major milestone," he continued.

This trend is set to continue in the coming years, with a number of projects given the green light to start construction in 2020, and others progressing through development on the path to near-term production.

The most significant project in Ontario's development pipeline is IAMGOLD's (TSX: IMG) Côté Gold project located between Sudbury and Timmins, which received approval in July 2020 to commence construction in Q4, with production expected to start in the second half of 2023, according to president and CEO, Gordon Stothart.

Côte will produce nearly 500,000 oz/y for the first five or six years, at an AISC of US$600/oz, with the average production guideline across the full 18-year LOM closer to 300,000 oz/year. "The resource measures about 10.2 million oz (Moz), of which 4 Moz are inferred resource defined at much lower gold prices than what we are currently witnessing," detailed Stothart, who went on to reveal plans to announce resources at two adjacent targets, Gosselin at 1.5 km east of the main property, and Young-Shannon, in 2021. "Our target is for another 3 to 4 million oz, to take the existing 18 LOM to 25 years. We contemplated a future expansion plan that could see us adding 20% to the current plant, which has a total capacity of 36,000 tons per day without any major modifications."

Another gold producer to receive the green light in 2020 is Argonaut Gold (TSX: AR), which received approval from its board of directors in October for the construction of the Magino mine in Ontario. Magino is a past producer of 100,000 oz as an underground operation, and sits next door to Alamos Gold's (TSX: AGI) Island Gold mine, one of Ontario's standout performers in recent years. "Magino will be an open-pit milling operation with about 20% to 40% of the gold coming through gravity, requiring low cyanide consumption as the ore body is clean," explained Peter Dougherty, Argonaut's president and CEO, noting that the feasibility study (FS) done at the end of 2017 showed that during the first five years of the project around 150,000 oz/y can be produced at an AISC of US$711. "Back then, in a US$1,250 gold environment, this would have equated to a pay back of around three to four years. In today's market, the pay back drops to under two years, and the previous NPV with a 5% discount of US$290 million rises to almost US$900 million," he revealed.

Dougherty went on to describe Magino, which has a financing package in place and should move into production in Q1 2023, as the cornerstone asset in the company's portfolio. He concluded: "We are at a turning point, moving from relatively high-cost and short mine life operations into a company with foundational assets that can produce over the long-term."

Before Côté and Magino, the next gold mine in Ontario's development pipeline is the Bateman project in Red Lake. On March 14th, 2021, Evolution Mining announced they would acquire Battle North Gold Corporation's (TSX: BNAU), owners of the Bateman project, for total consideration for approximately C$343 million. Before the transaction had been announced, Battle North's president and CEO, George Ogilvie, revealed that Bateman could have ore at the mill by November 2021.

Ogilvie joined the company in December 2016, picking up the pieces of Rubicon Minerals' failed Phoenix Gold mine, which had been fast-tracked into production in 2015 by the previous management team to disastrous effect. As former president and CEO of Kirkland Lake Gold, Ogilvie has been credited with improving operations at the Macassa mine, and believes he is on the verge of another transformation, this time in the Red Lake district.

When questioned about why Battle North waited until 2020 to rebrand, Ogilvie explained: "Because there had been a lot of reputational damage done at that point in time, we felt that if we rebranded, people might perceive that we were trying to put lipstick on a pig. Instead, we decided the focus should be on technically de-risking the project and working towards the feasibility study."

The FS used a base case gold price of US$1,525, resulting in an after-tax IRR of over 50%, an after-tax NPV close to C$310 million using a 5% discount factor, and approximately C$420 million free cash flow (FCF) after tax, for an average of 80,000 oz/y over 8 years with an AISC of US$875. Ogilvie went on to describe the project at US$1,900/oz gold, which would result in an after-tax IRR of around 83%, an NPV in excess of C$500 million, and close to C$700 million FCF. ■

> *Côté Gold is an exceptional project that meets Tier-1 criteria, located between two communities with a long history in mining: Timmins and Sudbury. It will be producing nearly 500,000 oz yearly for the first five or six years, at an AISC of US$600/oz.*
>
> **- Gordon Stothart, President & CEO, IAMGOLD**

Gordon Stothart

President & CEO
IAMGOLD (TSX: IMG)

How has IAMGOLD Corporation evolved over the years, and what are its main focuses today?
We have three operating mines: the Essakane gold mine in Burkina Faso, producing since 2010, and with a life span to 2030. Second, the Rosebel mine in Suriname also has a LOM going into the 2030s and we foresee potential expansions as we acquired a satellite deposit at Saramacca back in 2016. Although we are yet to define the reserves there, in Q1 2020 we completed the connecting road between Rosebel and Saramacca. Our third mine is the Westwood underground project in Québec. Additionally, IAMGOLD has different growth opportunities together with several pipeline projects, our exploration footprint being, in fact, larger than our production footprint. Our key development projects are the Côté Gold project in northern Ontario and the Boto project in southeast Senegal.

IAMGOLD received approval to start construction at its Côté Gold project in northern Ontario. Could you walk us through the upcoming milestones for this project?
In July 2020, we announced that we will proceed with the construction of the Côte project, which we expect to begin in Q4 of 2020, to bring the asset into production by the second half of 2023. IAMGOLD owns 70% of the project, having sold the remaining 30% to Japanese Sumitomo Metal Mining in 2017, who has proven a great partner.
This is an exceptional project that meets Tier-1 criteria, located between two communities with a long history in mining: Timmins and Sudbury. Côte will be producing nearly 500,000 oz yearly for the first five or six years, at an AISC of US$600/oz. Across the full LOM of 18 years, the average production guideline is closer to 300,000 oz/year. The resource measures about 10.2 million oz, of which 4 million oz are inferred resource defined at much lower gold prices than what we are currently witnessing. The design for our reserves was at a gold price of US$1,200, and for our resources at US$1,500.
Besides, we defined two adjacent targets, Gosselin at 1.5 km east of the main property, and Young-Shannon in between. We planned to announce resources at these targets in 2020, but the exploration program was slowed by Covid-19 and we could not complete all the planned drilling. However, we think we can define a resource next year, and our target is for another 3 to 4 million oz, to take the existing 18 LOM to 25 years. We contemplated a future expansion plan that could see us adding 20% to the current plant-which has a total capacity of 36,000 tons per day-without any major modifications.
The next milestones would be to announce a major earthmoving contract, which will see many people mobilizing on-site to begin the earthworks in Q1 or Q2 of next year. This summer, we have worked on establishing camps, clearing camping areas, and developing protocols. We are also looking at signing equipment purchases, and we already pre-negotiated many of the contracts at around 55% of the total spend estimate through bids that helped us de-risk the project. ■

George Ogilvie

President & CEO
BATTLE NORTH GOLD CORPORATION (TSX: BNAU)

What were the main highlights from the feasibility study for the Bateman Gold project?
We decided to use a base case gold price of US$1,525, and a 0.7 CAD/USD exchange rate. This resulted in an after-tax IRR of over 50%, an after-tax NPV close to C$310 million using a 5% discount factor, and approximately C$420 million free cash flow (FCF) after tax. That was generated by producing almost 80,000 oz of payable gold on an annual basis over 8.2 years.
If you run this project at US1,900/oz gold, the after-tax IRR is around 83%, the NPV is well in excess of C$500 million, and there is close to C$700 million FCF.

Can you explain the importance of fast-tracking capital development at Bateman?
The secret to mining these deposits is to have your capital development far in advance, and by the time we declare commercial production we will have between 40 to 50 stopes available, which gives us optionality to alter the mine plan to deliver consistent feed into the mill. ■

Peter C. Dougherty

President & CEO
ARGONAUT GOLD (TSX: AR)

> When the feasibility study was done in 2017, at a US$1,250 gold environment, this would have equated to a payback of around three to four years. In today's market, the payback drops to under two years.

Can you introduce Argonaut Gold (TSX: AR) and provide an overview of the company's portfolio of North American assets?
Argonaut Gold is junior gold producer currently running four operations: three in Mexico, and one in Nevada. We have just launched a development campaign to start our next mine build – the Magino mine in Ontario – which we believe will become the cornerstone asset in our portfolio. Today (October 2020), we sit in a unique position, with assets providing substantial cash flow, generating approximately US$25 million per quarter free cash flow (FCF) going on to the balance sheet. This fuels Argonaut's organic growth pipeline.

In October 2020, Argonaut's board of directors approved construction of the Magino mine in Ontario. What attracted you to the asset, and what type of mine will you build?
We searched for three years to find this project, looking for an asset that had the requisite size and mineralization, and importantly for Canada – infrastructure. Magino is a past producer of 100,000 oz as an underground operation, which sits right next door to Alamos Gold's Island Gold mine. There is already power, water and road access, and the site sits 6 km from rail and 15 km from the town of Dubreuilville. The ore body comes to the surface and is very easy to mine, with the deepest spot of overburden to remove being 3 m. Magino will be an open-pit milling operation with about 20 to 40% of the gold coming through gravity, requiring low cyanide consumption as the ore body is clean.
A feasibility study (FS) was done at the end of 2017, which showed that during the first five years we could produce around 150,000 oz/y at an AISC of US$711. Back then, at a US$1,250 gold environment, this would have equated to a pay back of around three to four years. In today's market, the pay back drops to under two years, and the previous NPV with a 5% discount of US$290 million rises to almost US$900 million. We will start this project at 10,000 tons per day (t/d), and, while we sit with an already-defined endowment of over four million oz in the M&I category and nearly another million oz in the Inferred category, we are also drilling at depth. We see a tremendous opportunity that five years down the road we could be looking at a 20,000 mt/d operation, of which 1,000 mt/d would come from underground, for a LOM of 20 years. Beneath the pit, drilling has showed a 5 to 6-meter wide zone running from 250 m to 900 m down, with an average grade of 6 to 8 g/mt Au.

How are you financing the build, and what is the timeline for development?
The green light has already been given to the financing package for Magino. This will come through Argonaut's current cash balance that sits at US$180 million, and financing of up to US$175 million by way of a US$50 million bought deal and a revolving credit facility of US$125 million. The FS showed a capex range of between US$360 million and US$380 million, which we have adequately protected.
We have partnered with Ausenco Engineering Canada Inc. to build the Magino processing plant on a fixed-bid price. The mine will take two years to construct, during which we will do a study to show how we intend to go from 10,000 mt/d to 20,000 mt/d, and will put out a maiden underground mineralized inventory.

In addition to bringing Magino online, what is the company's growth strategy for the next two years?
We are currently drilling Florida Canyon. We completed 10,000 feet of drilling in 2020 and are expecting to drill at least 50,000 feet in 2021. 2 million oz have already been found, and we see potential to expand this significantly. In January 2021, we will start drilling at the past-producing Standard Mine next to Florida Canyon, which could lead to our second mine in Nevada.
Argonaut also has the Cerro Del Gallo development project in Mexico, which we hope to have permitted in the first half of 2021, and we would like to move the construction team that built our San Agustin to Cerro del Gallo. ■

MINING PRODUCTION

"We are also seeing a lot of opportunities for M&A at the mid-size level. We expect that these mid-sized companies of similar size will be looking at combining, or might be acquired by the majors."

- Keith Spence,
President & CEO,
Global Mining Capital Corp.

Image courtesy of Wesdome Gold Mines

Precious Metals

GOLD PRODUCERS AWASH WITH FREE CASH FLOW, BUT PRECIOUS METALS HAVE LAGGED IN 2021

"Embedded in every crisis is a fantastic opportunity," stated Barrick chief Mark Bristow, quoting Winston Churchill, a sentiment surely shared by Ontario's mining producers in 2020. The year of Covid saw spectacular results for precious metals producers, with many companies recording record free cash flow (FCF), led by Newmont and Barrick, which both produced US$1.3 billion FCF in Q3 alone.

Gold was already burning brightly before the pandemic, surpassing US$1,650/oz in February 2020, but the unpresented printing of fiat currencies in the wake of the Covid-19 crisis fuelled gold's fire and sent it to an all-time high of US$2,076/oz in August. The correction that followed has taken the wind out of gold's sails to some extent, but even at US$1,700, any producer worth their salts should be making money hand over fist.

Although results have been eye-catching, there has been no shortage of challenges. In the case of Barrick (TSX: ABX), Covid was not the only hurdle to overcome, as Bristow referenced the Pascua-Lama process in Chile, the coup in Mali, integrating Nevada Gold Mines with Newmont, and the Porgera situation in Papua New Guinea among the list of challenges to overcome. He also mentioned the case of Barrick's Hemlo mine in Ontario, which was under debate after the Randgold merger and decision to focus on tier-one assets.

"Three years ago while looking for growth opportunities, we identified Canada as a region that was complementary to Australia in terms of its mining tradition, legal framework and prospective geology."

- Jake Klein, Executive Chairman, Evolution Mining

"Hemlo is a world-class asset that has been mined for a long time and has produced an enormous amount of gold, where people made money almost in spite of what they did. Then came the end of the easy living and people gave up," said Bristow.

However, realizing that Barrick is underinvested in Canada, as well as having an accumulated loss and corporate expenses in the country, the decision was made to reinvest and modernize Hemlo. Barrick went back underground and consolidated the east and western extensions of Hemlo on the greenstone belt, as well as bringing in Australian mine contractor Barminco to help transform the way the underground mining operation is run. Bristow added that Barrick's operational and corporate changes and geocentric approach have given Hemlo a 10 year horizon to add between 220,000 to 250,000 oz/y, profitable at US$1,200 gold.

For Kirkland Lake Gold (KL) (TSX:KL), 2020 was a transformational year, growing its profile into a junior/senior company with the acquisition of Detour Gold in January. KL achieved record production of 1.37 million oz in 2020, a 41% increase year-over-year from 2019, through its portfolio of three cornerstone mines with Macassa and Detour Lake in northeastern Ontario, and Fosterville in Australia.

Since coming under KL control, Detour Lake has had an immediate impact on KL's bottom line, contributing 516,757 oz of production in its first 11 months. "We feel that this was the right deal at the right time for Kirkland Lake," president and CEO Tony Makuch expressed. KL's long-term vision for Detour is far more ambitious, and the Makuch contends that Detour is poised to post stronger results in 2021, with production targeted to reach between 680,000 to 720,000 oz/y. The company sees many parallels to its Fosterville asset, and is aiming to emulate that success by following a similar model of aggressive exploration. "Detour Lake has the potential to be one of the largest gold mines in the world, and potentially one of the world's most profitable as well," asserted Makuch.

Another of Ontario mining's success stories in recent years is Wesdome Gold Mines (TSX: WDO), which joined KL on the TSX30 list for the second year running in 2020. Wesdome met the low-end of its 2020 guidance with 90,278 oz mined at its Eagle River mine at a head grade of 14.2 grams per tonne, despite dealing with Covid challenges. Duncan Middlemiss, Wesdome's president and CEO, related that drilling at both Eagle River and Kiena had been particularly impacted by the pandemic, but the company had big plans for both properties in this regard in 2021.

Speaking of the potential he sees at Kiena, Wesdome's Québec asset which could be up and running by the end of 2021, Middlemiss stated: "Kiena has a great land position of 70 km2 with a lot of potential evident through historical results from past mining operations, many of which closed when gold was at US$35/oz. Furthermore, some of these operations were constrained by land, but Kiena is an amalgamation of 12 to 15 previous properties, so now we can explore the full potential."

With the company in a position to organically fund the modest startup at Kiena to the tune of C$40 million (according to the PEA), a tangible path to become a 200,000+ oz/y producer and double production in the near-term is within reach. Middlemiss concluded: "If gold remains at these levels, Wesdome is going to be a cash-flowing cow, and there will also be possibilities to inorganically create value. This is what it is about: we are not just chasing ounces, but focusing on high-grade gold in the Abitibi region."

Multi-asset mid-tiers

Alamos Gold (TSX: AGI) has experienced considerable growth in recent years, transitioning from a single-asset producer with its Mulatos mine in Mexico, to a multi-asset mid-tier with three producing mines, two of which are in Ontario: Young-Davidson and Island Gold. John McCluskey, AGI's president and CEO, discussed the build out and commissioning of the deep levels of Young-Davidson which has taken the mine from 6,000 tonnes per day (mt/d) throughput capacity, to 8,000 mt/d.

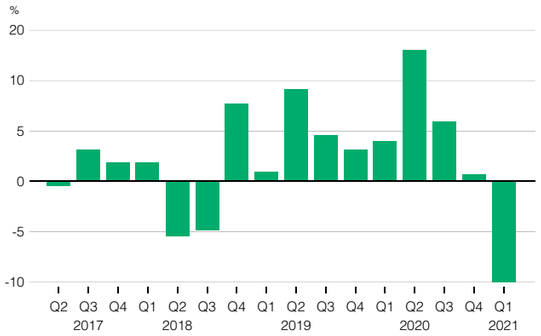
"Once all that infrastructure is in place, it takes some time to ramp up because of the necessary stope sequencing: you need enough stope faces open to supply the ore," explained McCluskey, and the inventory of broken ore stockpiled during the Covid-19 lockdown that lasted until July allowed AGI to test this capacity once the shaft had been commissioned, pushing material through at 8,000 mt/d for six weeks straight. "By Q3 2021, we will be able to put 8,000 mt/d through the mill consistently, which will continue for 13+ years. Costs at the mine have come down as we now benefit from economies of scale and a more automated system that requires minimal handling," he elaborated.

GOLD PRICE EVOLUTION

Source: Gold Stats

SPOT GOLD QUARTERLY PERCENTAGE CHANGE

Source: Bloomberg



AGI's Island Gold mine has also contributed to their success, on the back of exploration that has seen the mineral endowment grow from 1.8 million oz to 3.7 million oz, and seen the grade increase significantly at death. McCluskey detailed: "At the 1,100 m level we are now looking at 19 g/mt average Inferred resource grades below the Eastern extension, up from the 10.5 g/mt average grade from 650 m depth, and 4.5 g/mt at 400 m.

Australian mid-tier, Evolution Mining (ASX: EVN), is leading the redemption of Ontario's famous Red Lake district since its acquisition of Newmont's Red Lake gold mine for a total consideration of US$375 million in April 2020. In the 2000s, Red Lake transformed Goldcorp into the most valuable gold company in the world after it consolidated the Dickenson, Campbell and Cochenour mines and discovered the famous 7 million oz high-grade zone. However, the operation never really adapted to its future where it would need to mine lower grade ounces because the high-grade zone had been depleted and the operation had a high cost-structure. "In order to build a sustainable, profitable future, the mine needed to recapitalize, recalibrate and invest in the necessary exploration and development," asserted Jake Klein, EVN's executive chairman, who added that Newmont recognized and understood this, but had other priorities that required their focus and therefore decided to sell it.

"Red Lake has got all the hardware – it's the culture and software that we believe needs to change," stated Klein.

These changes include decommissioning hardware and two of the five shafts, automating two shafts, shutting the Red Lake mill to fill the Campbell mill, and reducing the leadership team and workforce to streamline the operation. Exploration has also been a focus, with a new reserve statement due to be released by June 2021. "We expect the resource to grow significantly and the results of the study will indicate how best to mine it, including what is the best milling strategy, whether that be building a new mill or cooperating with other mills in the area."

M&A in Q1 2021: a sign of things to come?

2020 was a more sedate year for precious metals M&A compared to 2019, which saw the Barrick Randgold merger finalized and the Kirkland Lake Detour deal announced. One of the more interesting M&A stories of 2020 was the TMAC Resources saga, as the Canadian government denied the sale of the company and its Hope Bay gold mine to Chinese state-owned company Shandong Gold Mining for C$230 million. Less than a month later, on January 5th, 2021, it was announced that Agnico Eagle would acquire TMAC for a transaction with a total equity value of C$286.6 million, a 26% premium to the C$1.75 per share Shandong was due to pay.

Is this an early sign that producers will start paying over the odds for assets, or will we look back at this deal as good value if Agnico manages to turn TMAC's underperforming assets around? The market did not take kindly to KL's Detour acquisition, but with gold US$400/oz higher than when the deal was announced in January 2019, and with drilling supporting the potential transition to a "super pit" concept that could substantially increase production, perhaps other cash-rich producers would be wise to act before gold reaches new highs.

Another deal that caught the eyes in December 2020 was Equinox Gold Corp's (TSX: EQX) announcement it would acquire Premier Gold Mines Limited (TSX: PG) in an all-stock deal valued at C$611.7 million. EQX chairman Ross Beaty, who fully underwrote a C$75 million equity financing to help fund the deal, said on a call that it fits Equinox's strategy "to grow as big as we can as quickly as we can." Part of the deal includes the acquisition of a 50% interest in the permitted, development-ready, Hardrock project should now move quickly through development with the deep-pocketed EQX as operators of the mine.

M&A activity in Ontario gathered pace towards the end of Q1, as Evolution Mining strengthened its position in the famous Red Lake region, acquiring Battle North Gold Corp for C$343m on March 15th, 2021. "The additional processing capacity from the new Bateman mill will also accelerate our ability to achieve our objective of producing in excess of 300 000 oz/y of gold from Red Lake," said Evolution's Jake Klein. ■

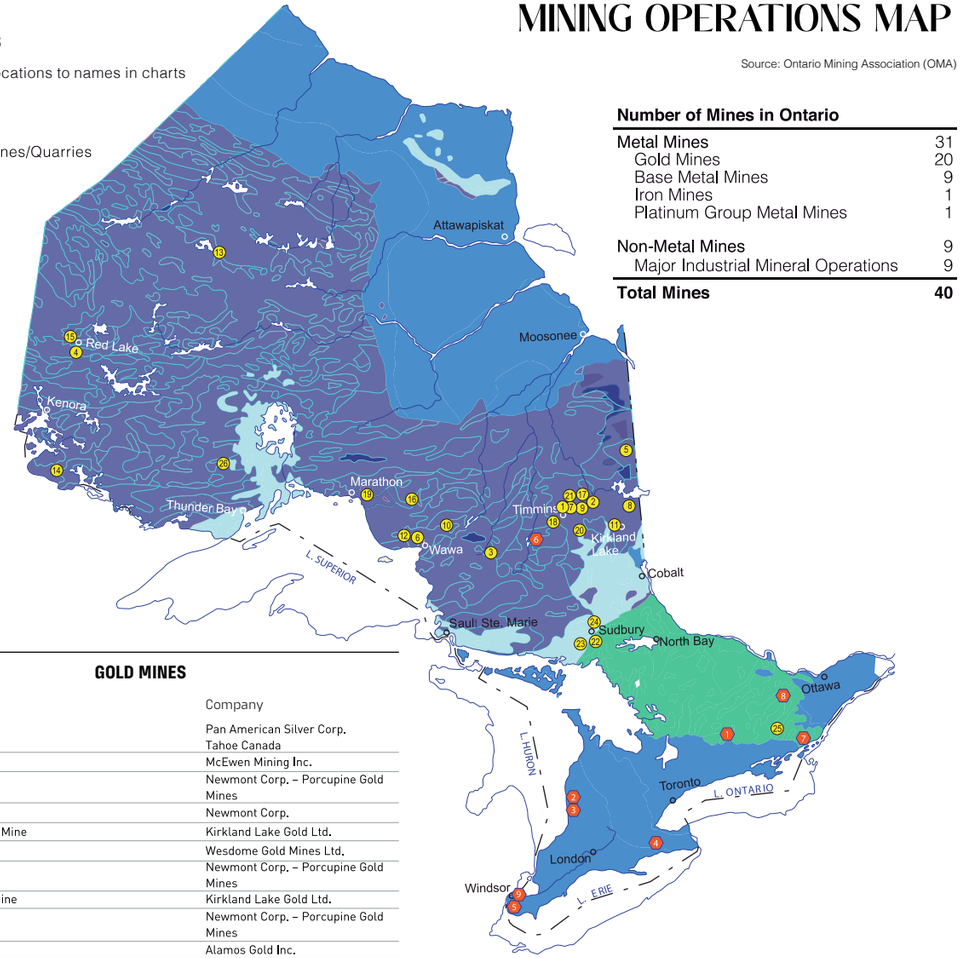
MINING OPERATIONS MAP

Source: Ontario Mining Association (OMA)

MINE LOCATIONS

Numbers relate locations to names in charts

- Metal Mines
- Industrial Mines/Quarries



Number of Mines in Ontario	
Metal Mines	31
Gold Mines	20
Base Metal Mines	9
Iron Mines	1
Platinum Group Metal Mines	1
Non-Metal Mines	9
Major Industrial Mineral Operations	9
Total Mines	**40**

GOLD MINES

	Name	Company
1	Bell Creek Mine	Pan American Silver Corp. Tahoe Canada
2	Black Fox Mine	McEwen Mining Inc.
3	Borden Mine	Newmont Corp. – Porcupine Gold Mines
4	Cochenour Mine	Newmont Corp.
5	Detour Lake Gold Mine	Kirkland Lake Gold Ltd.
6	Eagle River Mine	Wesdome Gold Mines Ltd.
7	Hollinger Mine	Newmont Corp. – Porcupine Gold Mines
8	Holloway – Holt Mine	Kirkland Lake Gold Ltd.
9	Hoyle Pond Mine	Newmont Corp. – Porcupine Gold Mines
10	Island Gold Mine	Alamos Gold Inc.
11	Macassa Mine	Kirkland Lake Gold Ltd.
12	Mishi Gold Mine	Wesdome Gold Mines Ltd.
13	Musselwhite Mine	Newmont Corp.
14	Rainy River Mine	New Gold Inc.
15	Red Lake Gold Mines	Newmont Corp.
16	Sugar Zone Mine	Harte Gold Corp.
17	Taylor Mine	Kirkland Lake Gold Ltd.
18	Timmins West Mine	Pan American Silver Corp. – Tahoe Canada
19	Williams Mine	Barrick Gold Corp.
20	Young – Davidson Mine	Alamos Gold Inc.

BASE METAL MINES

	Name	Company
21	Kidd Creek Mine	Glencore PLC
22	Sudbury Operations: McCreedy West Mine	KGHM International Ltd.
23	Sudbury Operations: Coleman Mine, Copper Cliff North Mine, Creighton Mine, Garson Mine, Totten Mine	Vale S.A.
24	Sudbury Operations: Fraser Mine, Nickel Rim South Mine	Glencore PLC

IRON MINES

	Name	Company
25	Tomclid Iron Mine	Ferromin Inc.

PLATINUM GROUP METAL MINES

	Name	Company
26	Lac des Iles Mine	Impala Platinum Holdings Ltd. – Impala Canada Ltd

MAJOR INDUSTRIAL MINERAL OPERATIONS

	Name	Company
1	Blue Mountain Operations (nepheline syenite)	Covia Canada Ltd.
2	Goderich Brine Field (salt)	Compass Minerals Canada Corp.
3	Goderich Mine (salt)	Compass Minerals Canada Corp.
4	Hagersville Mine (gypsum)	Gebr. Knauf KG
5	Ojibway Mine (salt)	K+S Windsor Salt Ltd.
6	Penhorwood Mine (talc)	Imerys Talc
7	St. Lawrence Mine (wollastonite)	Canadian Wollastonite
8	Tatlock Quarry (calcium carbonate)	OMYA Canada Inc.
9	Windsor Brine Field (salt)	K+S Windsor Salt Ltd.

Mark Bristow

President & CEO
BARRICK GOLD (TSX: ABX)

What did the challenges Barrick faced in 2020 teach you about your business?
Embedded in every crisis is a fantastic opportunity. While the gold price accelerated our business strategy, Covid tensioned up our team, and we were able to prove that this model worked. Five quarters of practice at holding operations accountable for their business had prepared us to rely on our local teams, and there was no shortage of challenges. In Chile we had to deal with geopolitical issues and the Pascua-Lama process; in Argentina we had to manage the legacy issues at Veladero and the currency crisis; in Peru we put Lagunas Norte on care and maintenance; there was a coup in Mali; a democratic transition in DRC; the Porgera challenge in Papua New Guinea; modernizing Hemlo; and unwrapping Nevada Gold Mines. Q3 was the culmination of a global business working towards being world class in every aspect that had been built over 18 months through multi-faceted challenges.

What are your views on the best way to sustainably build a license to operate?
Mining touches every facet of life, so you are bound to run into challenges. It is the way you manage these challenges that is important. You cannot manage everything remotely: you have to embed a culture in your organization and people have to live sustainability. The social side of ESG – poverty – is often neglected. The World Health Organization (WHO) is forecasting that 100 million people will move below the breadline (US$1.90 per day) because of Covid. We have just been through a series of governance meetings with institutional fund managers, independent directors, sustainability executives and HR managers, and there is a realization within these ESG groups of the importance of reality rather than compliance. For too long the industry has been more hung up with compliance than actual behavior. Companies that think simply ticking boxes is enough to raise money are in for a rude awakening, as the pandemic has highlighted that the world is not a platform for exploitation.

> You need an R&D arm in any business, and in mining the foundation of new business starts with exploration. It is the engine that drives our M&A strategy.

Can you tell us the company's plans for the Hemlo gold mine in Ontario?
When we did the due diligence with Barrick there was a big debate about Hemlo, but we realized that the company is underinvested in Canada. Hemlo is a world-class asset that has been mined for a long time and has produced an enormous amount of gold, where people made money almost in spite of what they did. Then came the end of the easy living and people gave up. Putting geologists back in there, we now have a 10-year horizon to add between 220,000 to 250,000 oz/y, which is profitable at US$1,200 gold. We aspire to build Hemlo into a tier two asset – something that has 3 million oz of reserves and can produce in the region of 250,000 oz/y for more than 10 years.

In 2020, Barrick appointed two new exploration VPs. What is their mandate?
You need an R&D arm in any business, and in mining the foundation of new business starts with exploration. It is the engine that drives our M&A strategy. We brought Aofie McGrath into Africa where we already have a very strong geology drive and exploration teams. To reestablish Barrick in Latin America, we brought in Leandro Sastre, who was a very smart mineral resource manager at Veladero with a lot of experience.

From an M&A perspective, what type of assets would you be interested in to increase Barrick's portfolio in Canada?
We are actively looking for ways to increase Barrick's portfolio in Canada, as it is a very solid destination to invest your money, is mining-friendly, and we have tax benefits here. We have looked at the new emerging geology of British Columbia and the big greenstone belts of Canada, in particular the Archean greenstones of Ontario and Québec. We are agnostic on whether it's M&A, greenfield, a single or a multi-asset company. What is important is the quality. We are looking at one early-stage opportunity to consolidate a reasonable footprint, and Barrick has a team dedicated to explore such opportunities. ■

Tony Makuch

President & CEO
KIRKLAND LAKE GOLD (TSX:KL)

How would you assess Kirkland Lake Gold's performance in 2020, and what accomplishments have you achieved across the portfolio?
2020 was a record year for Kirkland Lake Gold (KL). We produced 1,369,652 oz of gold, a 41% increase from 2019, and more than we had ever produced. Very importantly, we joined the ranks of senior gold producers with the acquisition of Detour Lake in January. This acquisition was the right deal at the right time for KL. Detour Lake is a tremendous asset with substantial upside that is already making an important contribution to our operating and financial results. We are already achieving very encouraging exploration success at Detour Lake, which supports our view that we can significantly grow reserves, increase production and improve unit costs. Looking at our other cornerstone assets, Fosterville achieved record results in 2020, producing over 640,000 oz. At Macassa, this operation was impacted the most by COVID-19 as well as other factors, but we bounced back later in the year with a strong Q4. Very importantly, the mine made excellent progress with the #4 Shaft project, which ended the year on track for completion by late 2022, with target production growth to 400,000 – 425,000 ounces in 2023.

Kirkland Lake was again present near the top of the TSX30 list in 2020. What have been the keys to delivering sustained value over time?
The TSX30 is based on three-year return and, over that time, our strong performance has been driven by the success we achieved at Fosterville. Fosterville was a 150,000 oz/y producer when we acquired it in 2016. For the last two years, the mine has produced well over 600,000 oz/y at extremely high grades and low unit costs. We were able to transform Fosterville through success with the drill bit. What is very exciting for KL now is that we see similar transformational potential at all three of our current cornerstone assets. At Fosterville we are optimistic that we can identify additional high-grade zones and are investing over US$85 million this year on exploration. Like Fosterville, we acquired Detour Lake a year ago because we saw an opportunity to transform the mine through effective exploration. Our drilling to date has been very successful and provides increasing evidence that a much larger, more continuous and higher-grade deposit exists at Detour Lake than is currently included in the Mineral Reserves. Finally, at Macassa mine, our foundation asset, we are sinking a new shaft that will dramatically improve the operation, including significantly growing production, lowering costs and improving working conditions. The shaft will effectively launch a new chapter for exploration in Kirkland Lake, where recent drilling has clearly shown that there remains a lot more gold to be found in this historic mining camp.

> Our drilling to date provides increasing evidence that a much larger, more continuous and higher-grade deposit exists at Detour Lake than is currently included in the Mineral Reserves.

How does Kirkland Lake weigh organic reserve growth versus M&A?
KL is a company built out of M&A. Through three transactions we took four junior producers, KL, St Andrew Goldfields, Newmarket Gold (Fosterville) and Detour Gold (Detour Lake), and created one, stronger, more valuable company. Through these deals, we generated significant value by combining assets with considerable exploration upside and then investing aggressively in the drill bit to prove up their potential. We did it at Fosterville, with the mine quadrupling production from 2016 to 2019, we are in the process of doing it at Detour Lake, and we are investing significant capital at Macassa to effectively create a new, modern mine. Given the value created from our previous deals, we will never completely turn our back on M&A. Having said that, with the upside we currently see at our three cornerstone assets, we are not focused on doing any additional acquisitions at this point in time. This is particularly the case given the impact the current high gold price environment on valuations. As always, we will continue to look at opportunities and if we find something that we believe has transformational value creation potential, we may very well act on it. ■

Duncan Middlemiss

President & CEO
WESDOME GOLD MINES (TSX: WDO)

Wesdome was ranked 7th on the TSX30 list in 2020 (up from 19th in 2019). What do think contributed to this?
It is a 1A/1B situation. I think it all started with operational improvements at the Eagle River complex, which would be 1A, but exploration at Eagle has also been transformative, so that would be 1B. Eagle had been underexplored and underinvested when I got involved, but we have managed to transform the asset from a 50,000 oz/y operation to 90,000+ oz/y, which we continue to incrementally grow.
I think the investing public saw a company that operates a mine in a great jurisdiction (Ontario), visibility to opening a mine in another great jurisdiction (Québec), and a tangible path to become a 200,000+ oz/y producer in the near-term. We are not just chasing ounces, but focusing on high-grade gold in the Abitibi region.

Which investments have been made to upgrade operations at Eagle River in the last 12 months?
We are augmenting the ventilation system by adding a second fan on surface, and doing underground development as Eagle River evolves and gets deeper. These are steeply dipping ore shoots that are very Abitibi-typical. We have also modernized our hoists.

To what extent has drilling been constrained in 2020, and do you plan to add rigs in 2021?
Drilling has been challenged at both operations in 2020. At Eagle, because it is a camp job, we ceased all diamond drilling in late March. Pre-pandemic we had five drills underground and two on surface, and we have been able to get back to three drills underground and one on surface by November. To get back to pre-pandemic levels, we are improving the infrastructure at the camp and have redesigned the kitchen to allow for social distancing. At Kiena, drilling was shut down for 8 weeks in the spring, but we have been fortunate to be able to ramp up and now have seven drills operating underground. We have big plans to drill in 2021, but this will be partly dependent on what happens with the pandemic.

Will the cash flow accumulation in 2020 be enough to organically fund the restart at Kiena?
The Kiena start-up will be between C$35 to C$40 million according to the PEA, and we are in the process of doing the PFS which will further define costs. Wesdome is able to organically fund the restart. We have a pristine balance sheet with no debt and a C$45 million line of credit, so total liquidity is C$115 million. If things go to plan we will be able to get Kiena up and running by the end of 2021, providing value to shareholders without having to go back to the market.

What potential do you see to expand the resource at Kiena through exploration?
The mill at Kiena is a 2,000 mt/d entity and what we have is a very high-grade, smaller volume deposit at the A Zone, which should produce between 750 to 1,000 mt/d. Kiena has a great land position of 70 km2 with a lot of potential evident through historical results from past mining operations, many of which closed when gold was at US$35/oz. Furthermore, some of these operations were constrained by land, but Kiena is an amalgamation of 12 to 15 previous properties, so now we can explore the full potential.

Would you also consider M&A activity to grow Wesdome's production profile?
We think we can get Eagle to between 100,000 oz/y and 125,000 oz/y in the next couple of years, and the same at Kiena. The question is what is next? Filling the mill at Val d'Or and a mill expansion at Wawa would be the priority. We want to do this in a three to five year timeline, so if the right M&A opportunity came along it is something we would consider, but organic growth is the current focus. There is a need for size to gain relevance, and US$5 billion market cap companies seem to be more investible for funds, which provides for better liquidity. ■

> We think we can get Eagle to between 100,000 oz/y and 125,000 oz/y in the next couple of years, and the same at Kiena.

John McCluskey

President & CEO
ALAMOS GOLD (TSX: AGI)

How has the underground mine development at Young-Davidson impacted production levels?
We had been working for a number of years on the build out and commissioning of the deep levels of the Young-Davidson mine. This included taking the shaft from 750 meters (m) down to 1,500 m, and building new infrastructure at depth to be able to take the mine from 6,000 tonnes per day (mt/d) throughput capacity, to 8,000 mt/d. Once the infrastructure is in place, it takes some time to ramp up because of the necessary stope sequencing: you need enough stope faces open to supply the ore.
To complete the lower mine expansion, we had planned temporary downtime of our main production shaft starting in late February 2020. Due to COVID-19, this shutdown extended slightly longer than planned into July. During the downtime, we were trucking some ore up the ramp from the upper levels to feed approximately 3,000 mt/d to the mill, and continued to mine ore in the lower levels, but stored it underground. This created an inventory of broken ore, therefore we had a lot of material ready to go once the shaft had been commissioned, and were able to push it through at 8,000 t/d for six weeks straight.
By Q3 2021, we will be able to put 8,000 mt/d through the mill consistently, which will continue for 13+ years. Costs at the mine have come down as we now benefit from economies of scale and a more automated system, which requires minimal handling.

> Our engineers believe reserves and resources could potentially grow to upwards of 5 million oz in the coming years.

Can you explain how the Island Gold mine has evolved through exploration?
Richmont Mines had already made the discovery at Island Gold, mining a deposit that went back more than a decade, but had not performed impressively, with shallow reserves and mediocre grades. Before we acquired the mine, Richmont had made a series of improvements, including testing at depth to look for higher-grade gold and increased production through the mill from 500 mt/d to 900 mt/d, increased the grade from 4.5 g/mt to 9 g/mt, and raised annual production from 40,000 oz/y to 90,000 oz/y. This was achieved through mining to a depth of 650 m, which is still very low for the Canadian Shield, and this triggered our interest.
Generally, when reserve estimates are modeled by a company the size of Richmont, they take an optimistic view. However, when we looked at Richmont's model, they were taking a conservative view. Island Gold is now one of Canada's highest-grade, lowest-cost mines. At the 1,100 m level we are now looking at 19 g/mt average Inferred resource grades below the Eastern extension, up from the 10.5 g/mt average grade from 650 m depth, and 4.5 g/mt at 400 m. The mineral endowment has gone from 1.8 million ounces to 3.7 million oz, as of December 2019. We have not been drilling at the same rate in 2020 because of COVID, but the work that we are doing clearly indicates that the ore body will continue to grow. Our engineers believe reserves and resources could potentially grow to upwards of 5 million oz in the coming years.

What are the latest developments from AGI's Mexican assets, including the Mulatos mine and the La Yaqui Grande development project?
The Cerro Pelon satellite deposit at Mulatos was brought into production in 2019 and has been performing well with grades consistently higher than what was modeled, which helped contribute to free cash flow (FCF) of US$31 million in Q3. Cerro Pelon also represents the first real greenfield opportunity we have had near Mulatos, as previous owners Placer Dome had not drilled it. Areas like El Carricito and El Halcon hold enormous potential in terms of geologically similar high sulfidation gold deposits.
La Yaqui Grande will be a huge step forward for Mulatos, with 123,000 oz/y average production over five years and an AISC of US$578/oz with initial production expected in Q3 2022. This will keep Mulatos going for another seven years. For context, when we started Mulatos in 2005 it had a six year mine life, so we should have run out of ore by 2011. Here we are in 2020, still mining at 150,000 oz/y run rate, with at least seven years left to run and the possibility to extend through exploration – replicating the success we have had with El Victor, San Carlos and Cerro Pelon. ■

Jake Klein

Executive Chairman
EVOLUTION MINING (ASX: EVN)

What led to the acquisition of the Red Lake mine from Newmont Goldcorp in November 2019?
Three years ago while looking for growth opportunities, we identified Canada as a region that was complementary to Australia in terms of its mining tradition, legal framework and prospective geology. The opportunity arose to acquire the Red Lake asset as Newmont had just completed the Goldcorp deal. In the 2000s, Red Lake really transformed Goldcorp into the most valuable gold company in the world after it consolidated the Dickenson, Campbell and Cochenour mines and discovered the famous 7 million ounce high-grade zone. However, the operation never really adapted to its future where it would need to mine lower grade ounces because the high-grade zone had been depleted and the operation had a high cost-structure. In order to build a sustainable, profitable future, the mine needed to recapitalize, recalibrate, and invest in the necessary exploration and development. Newmont recognized and understood this but had other larger priorities that required their focus and therefore decided to sell it.

> In order to build a sustainable, profitable future, the mine needed to recapitalize, recalibrate, and invest in the necessary exploration and development.

How is your approach to mining Red Lake different to previous operators?
The previous mine engineers never thought that anything less than 15 grams per tonne (g/mt) would make it into the mine plan, and anything that was drilled at less than 3-4 g/mt was not even assayed. 7 or 8 g/mt is very high grade from an Australian mining perspective, and we see outstanding opportunity for the future of the mine.
The base case when we acquired the mine was to transform the asset to a producer of more than 200,000 oz/y Au at an AISC of less than US$1,000/oz. We have now recalibrated our expectations to say that we will be able to produce between 300,000 oz/y and 500,000 oz/y in the longer term. The first step was to take a database of 6 million assays and 142 geological block models, and consolidate that down to 19 larger block models, giving us a JORC-compliant resource base of 11 million ounces.

What operational changes have been made to restructure and modernize the mine?
Red Lake has got all the hardware – it's the culture and software that we believe needs to change. We made a number of changes on the hardware front, decommissioning 56 of the 140 pieces of equipment that were underground; decommissioning two of the five shafts that were operating, and automating two shafts. Neither of the two mills were operating at full capacity, so we shut the Red Lake mill down until we can fill up the Campbell mill. Furthermore, we are spending a lot of money on exploration, with six diamond drill rigs operating underground to infill the resources to convert to reserves, and to discover more ounces.
On the culture side, we reduced the leadership team from 13 to seven and reduced the workforce from 1,150 to 700 people. We are keen to introduce an approach where people are incentivized for performance rather than just working for fixed pay. We have found that sharing the benefits of success has worked well at Evolution's Australian operations, which ultimately produces more gold, more efficiently and safely.

Do the mills have the capacity to process the planned increase in production?
At the moment the operation is mine-constrained as we are not yet hoisting enough material to the surface, but the longer term plan is to make it mill-constrained. The sequencing we are looking at begins with the Upper Campbell area, which has 4.3 million oz near-surface at 10.5 g/mt. A decline development has already been permitted, and we should commit to this in the next six months. We are also working on a new reserve statement that will be informed by the 11 million oz of resources we have already released. We expect the resource to grow significantly and the results of the study (which should be out by June 2021) will indicate how best to mine it, including what is the best milling strategy, whether that be building a new mill or cooperating with other mills in the area. ■
(interview conducted in October 2020)

TORONTO'S FINANCIAL DISTRICT

"From 2013 until mid-way through 2020 it was really the well-polished mining investor with the stomach for the ups and the downs who funded projects. Now we have the new wave of investors, which is a great thing for the market, but does raise the level of urgency to get drill results."

- Michael F. White,
President & CEO,
IBK Capital Corp.

Photo by Yeshi Kangrang on Unsplash

Mining Finance in Toronto

THE MINING SECTOR'S FINANCIAL CORNERSTONE

Toronto has long been the home of mining finance, anchored by investment banks, mining brokerages and the Toronto Stock Exchanges (TSX and TSXV). However, the days of raising finance in an afternoon on Bay Street alone are a thing of the past, even considering current robust metals prices. Financial road shows and virtual conferences across North America, Europe and Asia, newsletters, analyst coverage, social media influencers and royalty and streaming companies, mean companies have to cast their nets wide to attract project finance, as a reduction in brokerage activity combined with new-age competition from the likes of crypto and cannabis has made raising capital a multi-layered task.

That being said, Canada's biggest city, and in particular its capital markets, remain the industry's cornerstone. Dean McPherson, head of business development for global mining at the TMX Group, gave the example of Newcrest Mining (TSX: NCM), Australia's largest gold producer, listing on the TSX in October 2020 to "gain global exposure" (according to its CEO, Sandeep Biswas), as an illustration of the global appeal of Toronto's stock exchanges, which represent double the amount of listed mining companies than its nearest competitor, the ASX.

2020 was an atypical year for mining finance, as the global meltdown in March in response to the Covid-19 pandemic sweeping through Europe and the Americas caused valuations to plummet. The mass sell-off during the liquidity crunch in mid-March appeared catastrophic, but the market rebounded swiftly, led by precious metals in the summer, before base metals surged through Q4 and into 2021. "The wave of money flooded all stages and sizes of companies in the precious metals sector, from grassroots to the producers. It was wonderful to see, and allowed those with different risk profiles to participate where they felt comfortable from a risk/reward standpoint," observed Michael White, president and CEO of IBK Capital.

However, since the heady days of August, there has been a lull in the precious metals sector. While prices remain robust, time will tell whether the current six-month correction is the start of a decline or a platform for new highs.

Can precious metals reclaim new highs?

On January 6th, 2021, Democratic candidates Jon Ossoff and Raphael Warnock won the Georgia senate runoff to trigger the 'blue wave', giving the Biden administration control of the Presidency, Congress and Senate. At the same time, Covid-19 was ravaging the Northern hemisphere, with record mortality rates across North America and Europe. Such a context, with the unprecedented fiscal stimulus seen in 2020 expected to increase in 2021, would surely be perfect for gold? In the following two days, gold would drop over US$100 from US$1,960/oz to under US$1,850/oz.

Why did this happen? A move upwards in real rates, probably the most important driver for gold, is one factor. However, another hedge against fiat currency – crypto – has boomed during the same period. Bitcoin's dramatic ascent from US$10,000 in September 2020 to over US$50,000 in April 2021 can be seen in sharp contrast to gold's performance in a similar timeframe, correcting from its US$2,076/oz all-time high in August 2020 and treading water in the US$1,700 range since.

A more sinister factor has also contributed to gold's failure to ignite. In September 2020, JP Morgan agreed to pay more than US$920 million to resolve US authorities' claims of market manipulation, the largest sanction ever tied to the illegal practice known as spoofing. Over eight years, 15 traders at the biggest US bank caused losses of more than US$300 million to other participants in precious metals and Treasury markets. In January 2021, Deutsche Bank agreed to pay more than US$130 million to resolve a government investigation into violations of the Foreign Corrupt Practices Act (FCPA) and a separate investigation is ongoing into a commodities fraud scheme. The charges include manipulative commodities trading practices involving publicly-traded precious metals futures contracts.

For retail investors in particular, such manipulation can be dispiriting. You study market fundamentals, research companies, projects and management teams, only to be repeatedly knocked back even when macro conditions seem extremely favorable. All this while the Robinhood generation of investors blindly plough their stimulus checks into Tesla stock heading to the moon, despite a 1,500 to 1 price-to-earnings (PE) ratio.

NEW MINING LISTINGS TSXV

2019	2020
28	48 ↑

NUMBER OF MINING FINANCINGS TSXV

2019	2020
1081	1467 ↑

CAPITAL RAISED TSXV (C$ BILLION)

2019	2020
2.16	4.10 ↑

Source: TMX Group

While the current precious metals correction may have lasted longer than expected, PM bulls still have good reason to remain optimistic. Andrew Kaip, managing director of equity research at Red Cloud Securities and former senior gold analyst at BMO, described the post-August consolidation as healthy. "The amount of government debt is such that it will take years to switch away from low and negative real treasury bond yields: the most significant driver for the price of gold," said Kaip, suggesting we are heading towards stagflation. "Governments will rise the monetary base to cover their obligations and this will bring inflation coupled with non-existent growth."

Michael White, president and CEO at IBK Capital, believes we are still in the early stages of the bull market. "We will look back at current gold prices as the building of a base before moving higher, rather than a peak," he stated, pointing to the run up in gold at the start of the previous cycle in 2000, where gold broke out from US$250/oz to peak at over US$1,900 in 2011.

If the current cycle, which started at US$1,200/oz in 2018, sees a similar run up, perhaps forecasts of the likes of Pierre Lassonde (US$20,000/oz) and Nick Barisheff (US$10,000/oz) will not seem so far-fetched. Even Bitcoin bull, Max Keiser, predicted that gold will move to US$3,000/oz and silver to US$100/oz by the end of 2021 in a January interview with Daniela Cambone of Stansberry Research.

Macro conditions seem ideal for a secular bull run, but in a market increasingly built on sentiment rather than value, catalysts such as the successful roll-out of Covid vaccinations and economies reopening in the summer could take the wind out of gold's sails. For mining investors, focusing on companies with growth profiles that can create value regardless of PM prices remains the most prudent strategy.

What investors want, and what to avoid

As money flows into the exploration segment, there are a myriad of red flags investors must be cognizant of, as lifestyle companies pop up and previously dormant juniors reappear with rehashed stories about projects that often continue to be flawed. Red Cloud's Andrew Kaip suggested that the most fundamental red flag for mining investors is the construct of management: "There has to be confidence in the team's capability to achieve their objective. Management teams that do not have the in house expertise and rely solely on external sources to deliver project advancement increases risk for the investor."

Furthermore, Kaip listed overly-optimistic assumptions on delivery of key milestones in development and exploration as a risk factor, as well as the geological risk carried by exploration stage companies, especially for pre-resource stories.

Michael White of IBK Capital echoed the sentiment that it is important for management to manage expectations and provide clear communication, as no company is immune to shareholders with short patience. "Drilling just for the sake of drilling is never a good idea and will ultimately waste the money of those who invested," he said, adding that the best projects will attract money and have success, even if it takes a little longer than some people expect.

High precious metals prices also spurn new public listings, as privately run juniors look to ride the wave and take advantage of financing opportunities. "Across our markets compared to last year, the number of financings and new mining listings are up 33% and 59%, respectively, while the amount of capital raised is up 39%," revealed Den McPherson of the TSX, quoting figures until August 2020.

Keith Spence, president and CEO of Global Mining Capital Corp., took note of the bullish sentiment around miners with projects in Canada. He explained that prior to the current bull market, financiers would focus on projects with a large resource, good reserves and good grades, while dispelling political risk. "That kind of thinking, whereby companies are taking extra country risk in return for a super deposit, is not as evident as it was years ago. People would rather have a more modest project with lower risk," Spence said.

During the process of listing publicly, companies must be cognizant that raising the cash is not the only factor to consider. "One of the key mistakes management teams make involves the capital structure of companies when they plan to go public," explained Denis Frawley, partner at Toronto-based law firm Ormston List Frawley LLP, noting that proponents can be rushed by favorable market conditions and neglect aspects such as the share structure and meeting market requirements in order to classify for listing. "It is also very important for management to work closely with their audit partners to plan and manage expectations well, and to clearly present the company's financial structure to shareholders early."

For the bull market to really take off and reach new heights, generalist investors must return. For this to happen, the industry's reputation for wasting capital must also improve. Fortunately, 2020 was a banner year for FCF producing miners, and even at US$1,700/oz gold this should continue. As rebuilding confidence with investors takes time, miners must stick to capital allocation programs predicated on US$1,200 gold prices, suggested Kaip. "In 2021, it will become more acceptable for reserve prices to move higher, but operators need preserve a respectable margin for investors," he reflected, stating that the priority should be to maintain EBITDA margins that insure there is sufficient FCF generated above project capital to allow for growing dividends. ■

Today, ESG comes up in nearly every interaction with investors. It used to be a buzzword, then it became a checklist, and now it has become a real thematic in underwriting.

- Michael W. Scherb, Founder & CEO, Appian Capital Advisory LLP

Mining Returns to Center Stage

Expert Opinion Article by
DEAN MCPHERSON,
HEAD OF GLOBAL MINING,
TORONTO STOCK EXCHANGE & TSX VENTURE EXCHANGE

Last year we launched the TSX30 program in an effort to shine a light on some of the companies on Toronto Stock Exchange by recognizing the top 30 performers over a 3-year period across all sectors. By raising the profile of our top performers, we are offering investors another window into important market trends and offering opportunities for portfolio diversification through companies that may be missed by the indices or ETFs for various reasons. Last year, eight mining companies made the list.

In 2020, the mining sector dominated the TSX30, increasing to 14 companies. Representing an average 3-year return of 223% for the sector. You can purview the full list here: www.tsx.com/tsx30. This is pretty impressive by any measure, especially considering the volatility associated with the sector recovery that we first observed started just over three years ago.

Past performance does not guarantee the future, however, and there are some important observations here that may be helpful as we anxiously look to the start of a new year and navigate out of this Covid-19 pandemic.

While precious metal (particularly gold) prices have been on a steady climb, equities are finally joining the trend. Expectations are that the trend is likely to continue with growth across the number of financings, amount of capital raised, as well as the number of new listings. It is encouraging that this interest and corresponding heightened activity in our market goes beyond the Toronto Stock Exchange and extends into the TSX Venture, dominated by exploration and development mining companies.

Investors have clearly returned their interest to the mining sector; not just specialist investors, long waving the flag for hidden value with the sector, but the generalist investors who are searching for growth and value investment opportunities. This spring, sector headlines focused on the world's most famous value investor (Berkshire Hathaway) making an historic first investment in one of our gold mining issuers (Barrick, TSX: ABX).

We posit this is no coincidence. Over the past four years, the mining sector has been going through a process of transformation (Mining 2.0), as companies corrected missteps of the past, improved balance sheets, better communicated and embraced corporate social responsibility initiatives (such as ESG) as key business success factors. We believe investors are now recognizing and evaluating mining companies not only based on commodity exposures but as well-managed investment opportunities with tremendous value and growth opportunities.

As this Mining 2.0 transformation spreads and extends further into the early exploration stage companies, investment opportunities in mining (for even the generalist investors) may now only be scratching the surface.

Half of the 14 mining companies recognized on the TSX30 program this year started out on our TSX Venture Exchange, where they developed and eventually graduated to the Toronto Stock Exchange. This only highlights the value within our world leading two-tiered equity markets. We continue to empower our issuers so they can exceed investors'/stakeholders' expectations through relentless innovation. This year we launched an ESG 101 site focusing on resources and information for our issuers.

As we celebrate 2020TSX30, follow these trends as we look to 2021 when we hope to recover from this pandemic. Significant future investment opportunities to meet your portfolio diversification needs may already be here - on the globe's leading mining equity markets and ecosystem. ■

www.tsx.com/mining

TSX 30 2020

TMX THE FUTURE IS YOURS TO SEE.®

RANKING	COMPANY NAME	TICKER	HQ LOCATION	SECTOR	3-YEAR PERFORMANCE (%)
4	Kirkland Lake Gold Ltd.	KL	ON	Mining	363%
5	Alacer Gold Corp.	ASR	CO	Mining	349%
6	International Tower Hill Mines Ltd.	ITH	CO	Mining	292%
7	Wesdome Gold Mines Ltd.	WDO	ON	Mining	285%
8	Dundee Precious Metals Inc.	DPM	ON	Mining	273%
9	Teranga Gold Corporation	TGZ	ON	Mining	250%
12	Trilogy Metals Inc.	TMQ	BC	Mining	238%
14	Orla Mining Ltd.	OLA	BC	Mining	192%
19	Champion Iron Limited	CIA	Australia	Mining	169%
21	Sandstorm Gold Ltd.	SSL	BC	Mining	160%
23	Wheaton Precious Metals Corp.	WPM	BC	Mining	144%
24	Sprott Inc.	SII	ON	Financial Services	143%
25	Yamana Gold Inc.	YRI	ON	Mining	142%
28	Lundin Gold Inc.	LUG	BC	Mining	132%
29	SSR Mining Inc.	SSRM	BC	Mining	130%

Andrew Kaip

Managing Director – Equity Research
RED CLOUD SECURITIES

There has been a lull in the precious metals markets since August with stable prices and low trading volumes. Do you think this is a consolidation period before a move higher?
We are seeing a natural consolidation within the precious metal market given the significant run up after the onset of the pandemic in March, and this is healthy. Additionally, historical analysis clearly indicates that during election years there is downward pressure on the precious metal market, as investors wait for the election result to react. We saw that in 2016, when prices were suppressed and roared back into a rebound after the election. While Covid vaccines may cause short-term blips, in the long-run it will not impact prices because the amount of government debt is such that it will take years to switch away from low and negative real treasury bond yields: the most significant driver for the price of gold. We are heading towards stagflation. Governments will rise the monetary base to cover their obligations and this will bring inflation coupled with non-existent growth.

How would you compare the current situation for mining companies compared to the previous bull market?
We are not even close to a junior valuations boom, and mining stocks are nowhere near the level they should be given the quantitative easing that is taking place. It is interesting to compare the response to precious metals on the back of the global financial crisis. Governments have injected three times the amount of money during the pandemic than they did during the global financial crisis. Furthermore, the overall precious metals sector is incredibly healthy after years of restructuring compared to where it was in 2008. For the first time ever, precious metal miners are real businesses generating returns on capital investment and returns on equity that are comparable to the broader S&P 500. In fact, given the struggles faced by many subsectors in the index, miners should outperform mainstream equity markets.

What advice would you give to mining companies looking to attract generalist investors?
The mining industry's reputation is still an issue for investors, as well as the perception that precious metals prices have peaked. It will take a while to rebuild confidence with generalist investors. In order to deal with the reputational challenge, miners must stick to capital allocation programs predicated on US$1,200 dollars gold prices. In 2021, it will become more acceptable for reserve prices to move higher, but operators need preserve a respectable margin for investors. It must be a priority to maintain EBITDA margins that insure there is sufficient free cash flow generated above project capital to allow for growing dividends.

> We are not even close to a junior valuations boom, and mining stocks are nowhere near the level they should be given the quantitative easing that is taking place.

What are some of the frequent mistakes you see management teams make that raise red flags?
There are a myriad of red flags investors must be cognizant of. The most fundamental one is the construct of management. There has to be confidence in the team's capability to achieve their objective: management teams that do not have the in house expertise and rely on external sources to deliver project advancement increases risk for the investor. Overly-optimistic assumptions on delivery of key milestones in development and exploration are also a risk factor. Finally, investors have to remember that exploration stage companies carry geological risk, especially for pre-resource stories.

What do you think the mining landscape will look like by the end of 2021?
There is a very constructive outlook for mining. From a base metals perspective, it will be a discussion of whether 18 months from now the pandemic will be behind us and there will be rebounding growth in Western and developing economies. If the current prices are from re-stocking in China, there is a question of whether or not we can expect price drops in 2021. The Chinese are very quiet about their restocking patterns and Western investors are often caught off-guard.
The electric vehicles' story line will also be interesting because it is metal intensive. The fact of the matter is that hard assets will continue to be continuously desirous within the current context, which favors businesses of resource exploitation. ■

Michael F. White

President & CEO
IBK CAPITAL CORP.

How have investors who insist on boots on the ground due diligence navigated the travel restrictions enforced by the pandemic?
It comes down to trust, and mining is a small industry. You can get very good comfort about the potential of a project from individuals who have already visited projects and did their due diligence (DD) pre-pandemic. For projects closer to home (Canada, the U.S. and Mexico) it is easier to make a visit, or find trusted individuals to make a visit for you. This is where the importance of your network comes into play, and where a company's management team is invaluable – mining has always been a business which depends on talented, trustworthy people. Our network of 32 years, some good desktop DD and Zoom calls have become commonplace in aiding our efforts this year.

How do you suggest exploration companies balance the demands of shareholders to produce results in a hot market with the need to plan thoroughly?
From 2013 until mid-way through 2020 it was really the well-polished mining investor with the stomach for the ups and the downs who funded projects. The Osisko group is an example of one of these investors. This type of investor knows when to give a junior time to do sufficient preparation and work before spending money on the next phase. Now we have the new wave of investors, which is a great thing for the market, but does raise the level of urgency to get drill results. You saw this in 2020. Companies that were drill-ready generally performed better in Q2 and Q3. While no company is immune to shareholders with short patience, it is important for management to manage expectations and provide clear communication. Drilling just for the sake of drilling is never a good idea and will ultimately waste the money of those who invested. ■

Keith Spence

President & CEO
GLOBAL MINING CAPITAL CORP. (GMC)

Has the volatile macro environment created opportunities for Global Mining Capital Corp?
Global Mining Capital (GMC) had an arbitrage opportunity when a potential Chinese acquisition of a Canadian company was not approved on national security grounds. Because there was a probability that the company would not be acquired there was a significant correction in the acquisition price. The market was telegraphing that it did not think the deal would happen. We felt that the value of the company was significantly above the price that was offered, and our thinking was that it would at least get back to the proposed acquisition price and likely exceed it if the acquisition did not occur. In this scenario, if the target company did not get the approval for the acquisition, we would still make money. And if they did, we made some money as well.

Are you finding that projects in stable jurisdictions are receiving a valuation premium in the current market?
What has happened recently, is that the investors are not taking a lot of country risk. This is unique in the mining space. It has completely changed, and all the serious institutional money prefers North America and Australia. You also have selective geographies, where country risk is tolerable and deals are happening. For example, in West Africa, people are comfortable with Ghana versus some of the other jurisdictions. I cannot remember a time in my career, where projects in Ontario, and others close to home in British Columbia and Quebec, were in such high demand, and so easy to finance. Even in the last mining boom in the 2000s, the demand for North American projects, and the ability to finance them was not as high as it is now. The kind of thinking whereby companies are taking extra country risk for that super deposit is not as evident as it was years ago. People would rather have a more modest project with lower risk. ■

Denis S. Frawley

Partner
ORMSTON LIST FRAWLEY LLP

To what extent do you think the mining sector has been affected by the pandemic?
In general, the inflow of capital to the mining sector has been reduced due to the pandemic. Unless there is a particular aspect that distinguishes a company and aligns it with an emerging need, it has been difficult for companies to raise funds. Although the sector has faced challenges in 2020, it has not been decimated either; gold and metals for clean technology continue to attract investment. The mining clients we work with that are doing better tend to have a variety of liquidity sources with which to weather the storm.
More recently, the second wave of infections has brought back uncertainty; however, it is not comparable to the shock felt during Q2. I believe the sector will look to 2021 with a sense of tempered optimism because the long-term and macro fundamentals look favorable, especially for precious metals. For base metals, the fundamentals are contingent on whether the lifestyle changes brought on by the pandemic such as remote working become permanent.

What are some of the key considerations for private junior companies looking to list publicly?
One of the key mistakes management teams make involves the capital structure of companies when they plan to go public. Proponents can be rushed by favorable market conditions and neglect aspects such as the share structure and meeting market requirements in order to classify for listing. The regulators can provide very constructive feedback, and following this feedback closely will ensure the requirements for a company to go public are met. It is also very important for management to work closely with their audit partners to plan and manage expectations well, and to clearly present the company's financial structure to shareholders early.

> **Mining has become very adaptable in that companies are able to advance projects in tight financial circumstances – the industry has improved from a capital allocation standpoint. I think this puts the sector in a good position for the years ahead.**

Given the potential of the mining sector to help grow the economy in a post-Covid landscape, do you think regulations could be modified to fast-track project development?
Expediting the development process has always been a mandate for government and it is difficult to argue how the current situation makes that any different. Over the past decades, the number of stakeholders that have an input in moving a project forward has increased and that makes execution more difficult – governments cannot ignore those stakeholders. Accompanying the multiple parties involved through the regulatory process and being mindful of all the stakeholders should be a priority. Specifically, government should lead those discussions and help identify potentially contentious points in order to prevent them from festering into lingering problems. If a company is mindful of all stakeholders and plans accordingly to ensure agreement, the route to execution is made smoother.

In comparison to previous bull markets, where in the cycle would you say we are now?
The market has not reached 2011 levels where it started boiling over. Since the end of the super cycle, there has not been a sustained boom and the exuberance of gold has not spread to other areas. Managers and geologists have been very careful with their budgets, and this has helped the industry through the pandemic. Mining has become very adaptable in that companies are able to advance projects in tight financial circumstances – the industry has improved from a capital allocation standpoint. I think this puts the sector in a good position for the years ahead.

How would you summarize OLF's expertise and its focus moving forward?
OLF continues to work primarily with junior exploration companies and offers not only legal advisory, but practical advice around deal execution. We help companies avoid common pitfalls that can lead to undue complications and expose transactions to risk. The last 12 months have taught clients that moving quickly is of the utmost importance, and the uncertainty of the current economic panorama has highlighted that juniors need to take advantage of windows of opportunity.
Moving forward, we are very interested in market consolidation when well-funded companies acquire projects from smaller companies that have promising assets, but are doing less well. There are opportunities for bigger juniors or producers to cherry-pick interesting projects and do out-right acquisitions. Our experience makes OLF well-suited to contribute within this ecosystem. ■

CANADIAN EXPLORATION

"We are actively looking for ways to increase Barrick's portfolio in Canada, as it is a very solid destination to invest your money, is mining-friendly, and we have tax benefits here."

- Mark Bristow,
President & CEO,
Barrick Gold

Image courtesy of Talisker Resources

Ontario-based juniors exploring across Canada

In the same way that many of Toronto's best mining companies operate outside of Canada, many of the best Toronto-based juniors operate outside of Ontario. In this article we feature three standout projects in Canada's east, west, and central provinces: Québec, British Columbia and Manitoba.

QUÉBEC – O3 MINING TRANSITIONS FROM EXPLORER TO DEVELOPER

O3 Mining (TSXV: OIII) reached a number of milestones in 2020, including the PEA for its Marban project in Val-d'Or, Québec, released in September. The study, led by Ausenco, used a US$1,450/oz gold price, producing a net present value (NPV) of C$423 million and an internal rate of return (IRR) of 25.2%, with an AISC of US$822 and an affordable CAPEX of C$256 million.

"The NPV of the conservative scenario of US$1,450/oz equates to twice our market cap. Out of the 3.9 million ounces that O3 Mining has already defined, less than half equates to a potential market cap two to four times our current size," said O3 president and CEO, Jose Vizquerra, who added that there is the opportunity to extend the mineralization outside of the PEA pit and expand this resource at Marban.

This opportunity will be explored thoroughly in 2021, as on January 6th, O3 announced it had mobilized 12 drill rigs in Val-d'Or. The 12 rigs will be operating an aggressive 250,000 metre drilling campaign, which will highlight the potential at O3's other properties, including Alpha, also in Val-d'Or, Quebec.

For its 2021 exploration campaign, O3 has partnered with Mira Geoscience to define targets using artificial intelligence (AI). Vizquerra elaborated: "We are the first group in Val-d'Or to use AI by putting together historical data to create blocks of geological information, including the location of the faults, sonic alteration, and areas with the most gold and concentration of shear zones."

Considering O3's properties sit only 8 km from Wesdome's Kiena mine, and 12km from the Canadian Malartic mine, which is due to run out of ore by 2027, Val-d'Or will be a hotspot of exploration, development, production, and maybe even M&A in the years to come.

BRITISH COLUMBIA

When BC Premier John Horgan declared that the province had its highest investment in mineral exploration since 2012 this past year, it was welcome news for Talisker Resources (TSX: TSK), who has made sizeable bets on the prospectivity of the region. The Toronto-based explorer purchased 100% of the Bralorne gold project, which lies 248 km northeast of Vancouver, from Avino Silver & Gold Mines in a multimillion-dollar cash and stock deal in December of 2019. It has since undertaken aggressive exploration resulting in an expanded drill program. As of the end of 2020, TSK has completed 21,547.95 m of drilling at Bralorne, and results continue to verify and prioritize the interpreted expansion and continuity of targeted vein corridors. According to the company's president & CEO, Terry Harbort: "The confirmation of close to surface bulk-tonnage mineralisation at the Charlotte Zone has been a real game changer for us. Our initial exploration strategy was based on confirming well-constrained high-grade potential at depth, defined by historic drift assays and level plans. Now with the discovery and drill confirmation of broad areas of mineralisation surrounding the high-grade veins we have to essential "re-imagine" Bralorne's potential as we work to define large areas of bulk tonnage mineralisation and build these to resource, all in addition to the high-grade veins at depth."

MANITOBA

Perhaps one of the most influential pieces of commodity research in 2020 came from a September report by Bernstein Research titled 'King Copper once and future'. The thesis they outlined was that all the elements of a good commodity stew are present and will likely to remain present long term. These ingredients include—a dollop of demand strength, a sprinkle of supply concerns, a rising cost curve and minimal threats from alternatives.

In fact, the fundamentals of copper are so strong, that it encouraged industry veteran Alistair Ross to come out of retirement to look for ways to mine copper that was previously considered uneconomic. Bullish fundamentals were only half the story for Ross. The other key motivation was the opportunity to think creatively and resourcefully about new ways of planning a mine. "When I joined Rockcliff Metals (CSE:RCLF), the deposits on their books suggested there was no known way to mine them profitably. I wanted to take on the challenge of creating a mining method that would have the economic capacity to turn pretty rock into a valuable asset," Ross declared.

This journey led the company to the Flin Flon-Snow Lake area of central Manitoba, where RCLF has its 100%-owned Tower and Rail project. The secret to driving more positive economics lied in questioning old industry dogma and implementing technology in a clever way. The most common law Rockcliff tried to break away from is Taylor's Law, which provides a guideline of how many tons per day (mt/d) a miner should be able to take out of a deposit. At Rockcliff, according to Taylor's law, the deposit suggests production of 800 mt/d, peaking at around 1,000 mt/d. The company engineered a design in its PEA that demonstrated the potential to mine 3,000 mt/d by utilizing technology not in use when Taylor's Law was developed. Using the base case assumptions, the PEA also indicates that the project has technical and financial merit with an after tax NPV of US$71 million and an IRR of 30% assuming a US$3.15/lb copper price. ■

The Red Lake region heats up

Historically, the Red Lake mining district in Northwestern Ontario is best known for its high-grade gold deposits, with overall production exceeding 30 million oz of gold, mostly driven by the iconic Campbell and Red Lake gold mines. Today, a host of factors such as declining gold reserves, global economic instability, and a rise in the price of gold have led to a resurgence in gold exploration in the region.

One of the key successes stories driving the Red Lake rebound has been the exciting high-grade gold discovery made by Great Bear Resources (TSX:GBR) in 2017. Their flagship 100%-owned Dixie project covers an area of 300 km2 and is situated 25 km southeast of the town of Red Lake. The property contains four separate projects and the success of GBR's Dixie project has attracted a number of other junior explorers to stake claims and acquire properties in close proximity to the property.

GBR has the largest exploration program in the district and, from a physical footprint, it is the largest gold system that has been discovered in decades in the area. At the LP fault discovery, the company has drilled gold in it along 11 km of strike length, and according to Great Bear president & CEO, Chris Taylor: "There is no one else in the district that has anything like that. What we are looking at is one of the largest exploration programs and the highest success rate on drill holes. All of the drill holes that we have put in targeting our zones have hit gold mineralization, which cannot be said about any other project."

GBR's success certainly makes it a compelling target for M&A, and the company recently brought on Michael Kenyon as a director, who has been involved in several large mining project builds and eventual sales. Although his addition could be perceived as foreshadowing a future sale, Taylor pointed out that effectively, whether you want to build and operate a large mining project or sell it, you have to do the same things. "That means developing the project, de-risking the asset and making it appealing to yourself as a potential operator, or to whichever other potential operator might come in and buy it. We intend to transform GBR from a leading exploration company to a leading development company," he stated.

Another Red Lake-focused junior based outside of Ontario is Vancouver-headquartered BTU Metals (TSXV: BTU), which joined GBR on the TSX Venture 50 list in 2020 thanks to a share price appreciation of 191%. BTU's Dixie Halo project, a 200 km2 property that surrounds GBR's Dixie project, was acquired after completing six separate land transactions, according to CEO, Paul Wood. "This area of the Red Lake camp is dramatically underexplored – only twenty holes had been drilled on our entire property by the time we acquired it," said Wood, adding: "BTU is really the first group to seriously explore this land package, which is an incredible opportunity in such a marquis mining camp."

On the topic of potential M&A in the Red Lake district, John Kontak, president of West Red Lake Gold Mines (CSE: RLG), commented: "There is certainly interest from people with the financial capacity to create consolidation and any transactions made in the near-term will be considered to have taken place early in the cycle."

RLG holds joint venture claims at the Rowan mine property with Evolution Mining, a 1.1 million oz resource with an inferred grade of 7.57 g/mt, within 500 meters from surface.

Red Lake sits in the Uchi geological sub-province in northwestern Ontario, an area that is also home to a hive of junior activity outside of the famous Red Lake camp. One of the new players in the region is Auteco Minerals (ASX: AUT), led by the team that had huge success with Bellevue Gold, the Australian junior that reached A$1 billion market cap in 2020. Ray Shorrocks, Auteco's executive chairman, explained what attracted him to the Pickle Crow project in Ontario: "It reminded me of an early-stage Bellevue: an unloved, disused mine, in a tier one jurisdiction, that had been discarded but had great potential."

Between 1935 and 1966, Pickle Crow had been one of the most prolific gold mines in Canada, but stopped because gold had fallen to US$35/oz. Now, the Auteco team is looking to build on Pickle Crow's inferred resource of 1 million oz at 11.3 g/mt gold, with a resource upgrade targeting 1.5 million oz set to be released in 2021, before drilling out the regional areas to move towards 2 million oz. "Importantly, we want to sustain the grade around 10 g/mt," added Shorrocks.

Auteco Minerals acquired the Pickle Crow project from First Mining Gold Corp (TSX: FF), which decided to focus on its flagship Springpole gold project. Since bringing on Dan Wilton as CEO in 2019, Springpole, which is one of the largest undeveloped gold projects in Ontario, has made great strides. In 2020 alone, FF raised more than C$60 million to advance the asset through the environmental assessment process through to the point where they can negotiate and ultimately conclude agreements with their indigenous communities. The company also completed its Pre-Feasibility Study.

"Declaring reserves on this project for the first time truly was a milestone for us," said Wilton, reflecting on the culmination of a year of detailed data collection, trade-off studies, and engineering and technical de-risking work done by the FF team and its partners. "The results of the study confirm that Springpole has the potential to become a strategically significant, highly profitable gold mine in one of the most attractive mining jurisdictions in North America. I think anyone who looks at our track record over the last 12 months can really understand that we have fundamentally improved the risk-reward profile of this business."

TIMMINS

During the past 100 years, the Timmins area has produced over 70 million oz of gold, making it one of the richest gold camps in Canada. The Porcupine Destor Fault Zone and its surrounding areas influence the location of many of the major gold deposits in the Timmins camp and the Abitibi Greenstone Belt. Timmins is also home to Kidd Creek, one of the largest VMS ore deposits in the world.

If the best place to explore for a new mine is near an existing mine, then Noble Mineral Exploration (TSXV:NOB) has chosen well with its Project 81. It is a contiguous parcel of land covering parts of 14 townships adjacent to Kidd Creek mine, and it is common that mega VMS deposits are associated with other satellite deposits. Despite NOB recently completing a drill program with a partner on the Dargavel Gold Trend and the historical success of surrounding areas, Noble president and CEO Vance White believes that Project 81 is in an area that has been underexplored. White explained: "It is covered by overburden and consequently there is no outcropping on it. As a result, the only way that you are going to be able to determine whether there is a successful deposit is by going out and drilling."

Noble has taken out much of the early risk by carrying out up-to-date airborne EM/Mag surveys. Given the significant infrastructure in the area, the potential for the asset is very high.

Also near the Kidd Creek Complex is Canada Nickel's (CNC) large Crawford resource. Noble announced a project property transfer to CNC in December 2019, and the Noble-CNC spin-out deal gave Noble shareholders a direct benefit through exposure to CNC's Crawford resource. As a result, Noble owns approximately 2.1 million shares in CNC and already distributed 10 million to its shareholders. If CNC wishes to pick up the second option, Noble can take back additional shares, depending on the number of options that they pick up, or take cash back. In White's view: "We felt that there was an opportunity there that could encourage Glencore's participation. That is going to be a call that CNC's team will be making down the road. The prefeasibility study will be available in early 2021 and that should give us a good handle on the kind of numbers we are looking at, but we know it is a very large deposit."

25 km south-west of Timmins and accessible by road all year-round is Melkior Resources (TSXV:MKR) flagship Carscallen project. Success on the project brought forward a partnership that was announced at the end of September 2020 with Kirkland Lake Gold. The details of this deal include a C$110 million option to earn-in and joint venture, which allows KL to earn 50% of the project in return for spending C$10 million on exploration. Upon earning the 50% the deal converts to joint venture, which allows KL the ability to earn another 25% for C$100 million. In addition to Carscallen, MKR established a partnership with Barrick on its White Lake gold project, which

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José Vizquerra

President & CEO
O3 MINING (TSXV: OIII)

What were the highlights from the PEA for the Marban project announced in September 2020?
Our PEA included several highlights. Firstly, the all-in sustaining cost was US$822/oz Au produced resulting in a margin of about US$1,000/oz at current gold prices. Secondly, Marban's CAPEX is relatively low and affordable at C$256 million. Lastly, with production averaging 115,000 oz per year, the project's leverage provides to the investment. Every C$1 million invested in CAPEX will generate C$1.7 million in free cash flow. Ausenco led the PEA using a US$1,450/oz gold price, producing a net present value (NPV) of C$423 million and an internal rate of return (IRR) of 25.2%. If we use US$1,900/oz gold, the NPV rises to C$846 million with a 45% IRR. In context of O3 Mining's (TSXV: OIII) (OTCQX: OIIIF) market cap today, the NPV of the conservative scenario of US$1,450/oz equates to twice our market cap. Out of the 3.9 million ounces O3 Mining has already defined, less than half equates to a potential market cap two to four times our current size.

How have you managed to maintain a low capex for the project, and what potential do you see to expand the resource?
Being situated in Val- d'Or provides us with access to roads, railroads, highways, hydropower and experienced technical skilled labor; all significant costs to put a project into place. Additionally, energy alternatives like hydropower highlight the investment opportunity in Quebec using its environmentally innovative approach to attract investors.
There is the opportunity to extend the mineralization outside of the PEA pit and expand this resource at Marban. This could add ounces and potentially increase the overall production and mine life. In 2021, we will be drilling to find more high-grade gold to improve the economic metrics of the project.

> We are becoming an increasingly interesting piece on the chessboard that is Val-d'Or. We are only 8 km from Wesdome's Kiena property and 12 km from the Canadian Malartic mine, which is due to run out of ore by 2027.

Can you tell us about O3 Mining's exploration campaign for 2021 and use of AI to define targets?
O3 Mining increased to twelve rigs from January 2021 as part of our aggressive 250,000 metre drilling campaign. Drilling will also highlight the potential at O3's other properties, including Alpha also in Val-d'Or, Quebec.
In partnership with Mira Geoscience, we have identified targets using artificial intelligence (AI) and machine learning for exploration. We are the first group in Val-d'Or to use AI by putting together historical data to create blocks of geological information, including the location of the faults, sonic alteration, and areas with the most gold and concentration of shear zones.
Recent results, including 10.4 g/mt Au Over 3 metres at the Simkar zone on the Alpha property in December 2020, confirmed the value and utility of AI targeting. With the Alpha property extending over 20 km east west and having many discrete gold deposits, it is possible that potential open pits could be combined into a larger pit.

Considering the appetite for M&A in a gold bull market, how will you balance developing the company sustainably with the potential of being bought out?
We are becoming an increasingly interesting piece on the chessboard that is Val-d'Or. We are only 8 km from Wesdome's Kiena property and 12 km from the Canadian Malartic mine, which is due to run out of ore by 2027. Malartic has a mill with the capacity to process 55,000 mt/d, and in the best-case scenario, as it transitions to an underground mine, it will be able to extract a maximum of 25,000 mt/d. This excess capacity could be used to toll mill ore from Marban, cutting its C$256 million capex in half. For an asset with 2.5 million oz, a toll mill scenario probably makes more sense than a competitor acquiring O3 Mining. However, if we can increase the project's reserves to 5 million oz it could elicit interest from other parties. It is important that we remain self-sufficient.
To move through development, first we complete a baseline environmental study and then an environmental impact assessment. Next, we must apply for and obtain production permits before starting construction and entering production. These steps will de-risk the project and make it more valuable, which will happen in parallel with the continuing growth in resources through exploration. ■

Chris Taylor

President & CEO
GREAT BEAR RESOURCES (TSXV: GBR)

How has Great Bear Resources (GBR) progressed toward showing continuity and grade over distance?
Most of our work has been focused on the LP fault zone discovery. That is a multi-kilometer long continuous gold zone that we found in 2019, and have drilled around 100 holes since June of 2020. As we continue to drill the LP fault, we continue to see the gold mineralization and continuity. We are now showing why the high-grade gold is where it is and there is a large-scale footprint right up to surface that the zone is demonstrating. We are demonstrating that there is a high grade, to surface gold system of significant size.

GBR is becoming an attractive acquisition target. Is this something the company is actively considering?
We recently brought on Michael Kenyon as a director, who has been involved in several large mining project builds and eventual sales. Effectively, whether you want to build and operate a large mining project or sell it, you have to do the same things. That means developing the project, de-risking the asset and making it appealing to yourself as a potential operator, or to whichever other potential operator might come in and buy it. We intend to transform GBR from a leading exploration company to a leading development company. ■

Dan Wilton

CEO
FIRST MINING GOLD CORP. (TSX: FF)

What are the most attractive characteristics of First Mining's Springpole project?
There are very few 5 million-ounce equivalent projects that are on a development path and in a permitting process. The ore body is a continuously mineralized, reasonably homogenous, intrusive ore body. That means it is 150 to 350 m wide, 1 km long and 400 m deep. It is a disseminated and continuous ore body, which translates into it being mineable in an efficient and low-cost manner.
Also, Ontario is a tier-one jurisdiction. It outperforms when it comes to permitting projects in Canada. The infrastructure in the area around us is excellent. Springpole is 100 km from Red Lake. We have provincial forestry logging road networks that are pushing up towards the mine and we are 40 km from a power line. Having all of this infrastructure in place for a project of this size is remarkable.

How has First Mining Gold evolved in recent years?
Since our current management team took over two years ago, we have transformed First Mining. In 2020 alone we raised more than C$60 million to advance Springpole through the environmental assessment process through to the point where we can negotiate and ultimately conclude agreements with our indigenous communities. Additionally, we recently completed our Pre-Feasibility Study. ■

Terry Harbort

President & CEO
TALISKER RESOURCES (TSX: TSK)

Talisker Resources (TSX:TSK, OTCQX: TSKFF) recently received a 14.9% strategic investment from New Gold. What does this partnership mean for your company?
In a single word: Validation. New Gold's CEO Renaud is an experienced narrow vein miner and their international technical team is very strong. As one of Canada's top gold producers they are the largest regional player in south-central British Columbia, so Talisker forms a logical partner in their growth strategy. As all of our projects including Bralorne have excellent road access we provide numerous potential project synergies for New Gold going forward.

Talisker acquired its flagship Bralorne project in December, 2019. What makes this project even more attractive today than it was one year ago?
The confirmation of close to surface bulk-tonnage mineralisation at the Charlotte Zone has been a real game changer for us. Our initial exploration strategy was based on confirming well-constrained high-grade potential at depth, defined by historic drift assays and level plans. Now with the discovery and drill confirmation of broad areas of mineralisation surrounding the high-grade veins we have to essential "re-imagine" Bralorne's potential as we work to define large areas of bulk tonnage mineralisation and build these to resource, all in addition to the high-grade veins at depth. ■

Darwin Green

President & CEO
HIGHGOLD MINING (TSXV: HIGH)

What is the genesis of HighGold (TSXV:HIGH) and what was the opportunity HighGold identified when it acquired its assets?
HighGold was formed in 2019 by way of a spinout from a precursor company called Constantine Metal Resources. Acquisition by Constantine of the Johnson Tract project in Alaska provided the impetus for the spinout of all the company's gold exploration assets and the creation of HighGold. This allowed the shareholders to realize the value of Johnson Tract and the Timmins gold assets and became the opportunity to raise funds and hire dedicated technical teams to explore and advance each of them. Johnson Tract is a unique project, as it is on ground owned by the Alaskan Native Corporation, Cook Inlet Region, known by 'CIRI'. In the 70s, Alaska settled their native land claims by creating corporate entities, in which the shareholders were indigenous peoples in the surrounding region, and each corporation was able to select lands for the purpose of generating revenue. CIRI approached our management team to advance this project, which had been explored in the 80s and 90s by senior producers. The project was not viable given the price of gold and the economic environment of the day and sat idle, until CIRI approached us and we jumped at the opportunity to advance this project. What makes Johnson Tract special is that it has the unique combination of very high-grade mineralization – both gold and base metals – over very wide widths.

Can you provide an overview of the other assets in HighGold's portfolio?
HighGold has three properties in the Timmins area, which constitutes a very large land position that is well over 200 sq km – one of the largest land positions held by a junior miner in the Timmins gold camp. Much of this land was acquired over 10 years in an entirely different and less robust gold market than we currently are experiencing. It would be very difficult to acquire the land that we have in today's hot gold market.
The crown jewel of our land package is Munro-Croesus, a former producing mine in the early 1900s which had relatively small total production. However, what they did produce was fantastically high grade. Gold samples from this mine had mineralization of more than 10,000 ounces per ton. Munro-Croesus was the nucleus of our property position. We spent the better part of 2020 and early 2021 consolidating the land around Munro-Croesus – much of which is patented and has been in private hands for several generations. Now it is gaining prominence within HighGold as a second pillar for us in terms of creating shareholder value through exploration.

> **The threshold for a deposit to go the distance is lower in an established mining camp like Timmins than it is in Alaska. However, Alaska is elephant country.**

What are the benefits and challenges of operating in Alaska and how does it compare with Ontario?
There is less infrastructure in Alaska, which leads to higher costs. That said, as far as Alaska goes, HighGold is in a very good position in that we are very near tidewater within 10 km of the coast and are also relatively close to population centers that help support the project. Johnson Tract is a project that will produce concentrates and proximity to deep tidewater is important for shipping to overseas markets. We use helicopters for our exploration program in Alaska, so that doubles the cost of drilling compared to a place like Timmins where your drillers go back to their own homes at the end of their shift. Certainly, the threshold for a deposit to go the distance is lower in an established mining camp like Timmins than it is in Alaska. However, Alaska is elephant country. There are some monster deposits there and it has got tremendous potential. In Timmins, the lower hurdle point for success is offset by the fact the ground has been more picked. That said, our claims in Timmins are surprisingly underexplored for such a mature and prolific gold producing district and that is the opportunity we have. Alaska is a great place to make brand new discoveries and big ones. ■

Vance White

President & CEO
NOBLE MINERAL EXPLORATION (TSXV: NOB)

Can you explain Noble's current interest in Canada Nickel's Crawford project and the options that were acquired in the ensuing months?
When Noble spun out the Canada Nickel (CNC) deal, we gave our shareholders a direct benefit through exposure to CNC's large Crawford resource. It is headed up by notable geologists with deep expertise in the field of nickel and as a result, Noble's shareholders can now benefit directly from a project with enormous potential. Furthermore, with Crawford sitting a few kilometers north of the Kidd Creek Complex, we felt that there was an opportunity there that could encourage Glencore's participation. That is going to be a call that CNC's team will be making down the road. The prefeasibility study will be available in early 2021 and that should give us a good handle on the kind of numbers we are looking at, but we know it is a very large deposit.
The other properties that were optioned out to CNC are potential low-grade, nickel, PGM, cobalt deposits that we know from our experience drilling them contain between 0.25 to 0.27% nickel. Recently, CNC completed an airborne mag and gravity survey over the option properties, and they are getting ready for a drill program that could start around January 2021. Right now, Noble owns approximately 2.1 million shares and we distributed 10 million to our shareholders. If CNC wishes to pick up the second option, Noble can take back additional shares, depending on the number of options that they pick up, or take cash back.

Can you provide an update on Project 81, including mobilization of the diamond drill at the Dargavel Gold Trend project?
We recently completed a drill program with a partner on the Dargavel Gold Trend and we are currently waiting on results to come in from the assay office. With respect to other opportunities at Project 81, we are entertaining option and Joint Venture Partners coming in on certain areas of those projects. Additionally, the group that came into the Carnegie Township option are planning an active program over the course of the next few months.

What did the exploration update from the Holdsworth Oxide Sand Project Preliminary Metallurgical Results show?
Noble engaged Dundee Sustainable Technologies to determine whether a gold concentrate could be generated from the oxides, and utilizing their system, we were able to generate over 90% concentrate. The next step is to determine what kind of resource we have and what kind of economics will be associated with the asset. It is early stage, but we have hope that it is something that may be able to generate some fairly near-term cash flow in the next 12 to 18 months.

What role do you think the project generator model can play during a bull market?
At Noble, our job is take out the early risk on a project by completing all of the airborne surveys and compiling historic and current data. We do this to the point where the next round of de-risking the project is at the drill phase. From there, we have another partner come in and carry that out either in association with Noble or on their own whereby we can then take a position down the road. Normally, if it is another junior or mid-tier company, we will take an equity position in them and take a ride on their paper. Then, in the final analysis, we can take a direct interest should they prove something up. It is about laying off the next round of risk to the partner coming in.

Do you have a final message for potential partners about Project 81?
Project 81 is in an area that has been totally underexplored. It is covered by overburden and consequently there is no outcropping on it. As a result, the only way that you are going to be able to determine whether there is a successful deposit is by going out and drilling. Noble has taken out the early risk by carrying out up-to-date airborne EM/Mag surveys, and we are considering doing a gravity survey over the entire project area. The potential on an asset in an underexplored area, with significant infrastructure, is very high, and Noble's success with the CNC deal has validated our land package. ■

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is 20 km east of Barrick's Hemlo mine. This is another option and JV deal that gives Barrick the option to earn 75% of the project.

MKR CEO Jon Deluce highlighted that in Melkior's case, having partners such as Kirkland Lake and Barrick allows them to progress projects with the assistance of world-class outside capital and know-how. It also allows the company to now focus efforts on its Québec assets. "This leads to considerable de-risking as there is obviously a level of credibility that comes to a company when you partner with major mining companies. They have recognized our exploration success and they have the money, expertise and infrastructure that allows them to move the asset forward to potential production much faster than we are able to," said Deluce.

HighGold Mining (TSXV:HIGH) is another company that has bet on the Timmins area and currently has three properties in the region, which constitutes a large land position that is well over 200 km2. The company, which is also present in Alaska, acquired its Timmins land package over 10 years and consequently has had a nice tailwind given the runup in gold prices. Darwin Green, president and CEO of HighGold Mining, remarked: "It would be very difficult to acquire the land that we have in today's hot gold market."

The crown jewel of HighGold's land package is called Munro-Croesus, a former mine in the early 1900s which had relatively small total production. However, what they did produce was fantastically high grade. Gold samples from this mine had mineralization of more than 10,000 ounces per ton, making it the "nucleus" of their property position. The area is increasing in prominence within HighGold and now stands as a second pillar in the company's effort to create shareholder value through exploration. "In Timmins, the lower hurdle point for success is offset by the fact that the ground has been picked over a lot more. That said, our claims in Timmins are surprisingly underexplored for such a mature and prolific gold producing district," Green said.

HEMLO AND THUNDER BAY

Barrick's Hemlo mine has produced more than 21 million ounces of gold, and has been operating continuously for more than 30 years. Located 350 km east of Thunder Bay, it has been one of the mainstays of Ontario's gold industry. After the Barrick Randgold merger, there were rumors it may have been sold, but reinvestment by Barrick has given the mine a 10-year horizon to produce between 220,000 to 250,000 oz/y, according to Barrick chief, Mark Bristow.

The junior market in the region has also revitalized and will see a new publicly listed junior in 2021, Trojan Gold Inc. (TGI). Between 2014 and 2015, Charles Elbourne's private company, Tashota Resources (TRI), acquired over 18,000 acres (100% optioned) of prospective claims in the Hemlo gold camp, known as Hemlo South, Hemlo West, Hemlo North and Black River. "At the time, everyone thought I was nuts because Barrick was rumored to be closing down its Hemlo mine in 2018. Having spoken in depth with Rudy Wahl, the geologist that ran the underground operations at Barrick's Williams mine for 18 years, I disagreed that Hemlo would soon close, or that the area had been mined out," explained Elbourne, whose conviction has been vindicated with the investments made into Hemlo in 2020.

Elbourne plans to take Trojan Gold public in 2021 to primarily focus on the Hemlo property, and can count on the experience and expertise of TRI board members Rudy Wahl, Russell Kwiatkowski, who discovered the LaRose property in Thunder Bay, and Rodney Barber, former chief geologist at Hemlo.

Slightly closer to Thunder Bay lies LAURION Mineral Exploration's (TSXV:LME) flagship Ishkoday project, which is a gold and polymetallic mineralized project that straddles highway 807, 10 km north off highway 11. The property sits on 47 km² of highly prospective land and the company has spent over C$13 million to date, much of which has been devoted to drilling. In 2020, the company drilled a total of 7,667 m in 31 diamond drill holes. Cynthia Le Sueur-Aquin, president and CEO of LAURION, contends: "One of the key strengths of this asset is its demonstrated mineralized exposure to the surface. LME have a substantial 2D and 3D database, which we are very proud of."

Looking to build on their potential at Ishkoday, in December 2019, LAURION acquired the neighboring Brenbar property, which is about 275 hectares and is contiguous and to the west of Ishkoday. LME completed a significant amount of mapping and channel sampling on Brenbar in 2020 and plans on completing a further significant program of over 10,000 m of drilling in 2021. In describing the company's unique approach to funding through substantial insider ownership and access to high net worth investors and family offices, Le Sueur-Aquin indicated: "We are able to protect our company form potential predatorial behavior and it permits LAURION to move forward in a safe and transparent environment and achieve our objectives."

KIRKLAND LAKE

Home to the most successful gold producer of the past five years, Kirkland Lake has a host of juniors looking to replicate the exploration success that has transformed KL's Macassa mine. Someone who knows about finding mega deposits is Danièle Spethmann, who worked on early exploration teams that led to the discoveries of Fruta Del Norte in Ecuador and the Choco 10 Carolina Zone in Venezuela.

Now back in Ontario as the president and CEO of Warrior Gold (TSXV: WAR), Spethmann described the company's Goodfish-Kirana property, which sits on 4,100 hectares 5 km outside of the town of Kirkland Lake: "It has over 22 high-grade gold showings and three major mineralized structures… The property lies six kilometers north of the Cadillac Larder Lake Deformation Zone (CLLDZ) and just north of a series of structures that have produced over 25 Moz of gold over the last 100 years."

Another junior active in the Kirkland Lake region is Northstar Gold Corp. (CSE: NSG), which had operated privately for 11 years before its IPO in December 2019. The company has four 100% owned properties in a 2,300-hectare land package, including its flagship Miller Gold property, situated 14 km southwest of Kirkland Lake. ■

Palladium powers on

From 2018 to 2020, no other metal matched palladium's dramatic ascent, moving from US$966/oz in February 2018 to US$2,800/oz in February 2020. Indeed, the C$1 billion Impala Platinum announced it would pay for North American Palladium's Lac des Iles mine, near Thunder Bay, Ontario, seemed like a steal in hindsight.

Since the market crash in mid-March 2020, palladium's price action has been steady, trading in the US$2,300/oz to US$2,650 range from July 2020 until April 2021; a superb margin for producers, many of which produce palladium as a by-product. With the automobile industry expected to rebound in 2021 as economies open up in a post-Covid landscape, and a nine-year production deficit still very much an issue, palladium demand should remain robust for the foreseeable future.

Since acquiring the Marathon palladium property in Ontario from Sibanye Stillwater in 2019, Generation Mining (TSX: GENM) published a feasibility study for the project in March 2021. The study was conducted at US$1,725/oz palladium, far below today's prices, but still resulted in an IRR of 30% and an NPV of C$1,007 million. Executive chairman, Kerry Knoll, described the PEA as a "game-changing document" for the company, adding: "At today's price (US$2,600/oz), the NPV would more than double."

Before a construction decision can be made, the permitting process, which was started by the previous operator, should be complete in early 2022, according to Knoll, who noted that during this time, GENM will focus on financing, exploration, and detailed engineering.

Knoll also spoke of the investment opportunities available for investors in palladium in a far less crowded (but also less covered) space than precious metals: "If you want to invest in a palladium producer, you do not have many choices, and none in North America. There are only a handful of development companies and we are only one of two junior companies with a feasibility study at the moment."

The other option for investors is betting on the jockey in an early-stage play, and Clean Air Metals (TSXV: AIR) has a management team of some repute, including executive chairman Jim Gallagher, former CEO of North American Palladium (NAP) before its sale to Impala, and CEO Abraham Drost, former CEO of Carlisle Goldfields before its sale to Alamos Gold in 2016. "Upon examination of the project, I was astounded at the historic high-grade drill intercepts and agreed to join," revealed Drost, speaking of AIR's Escape Lake project just north of Thunder Bay.

Drost elaborated on AIR's Thunder Bay North project, a high-grade, multi-ounce platinum and palladium magma conduit system consisting of two sub-horizontal conduits, one of which is the Current Lake deposit, with a 9.8 million tonne historic estimate, with the the Escape Lake deposit 3 km to the west. "We have recognized that this system has a lot of similarities structurally and stratigraphically to the Norilsk mining district in Russia and similar exploration techniques," he said, commenting that the C$85 million already spent on the project by previous owners Rio Tinto and Panoramic also attracted the AIR team.

For the Current Lake deposit, Nordmin Engineering is due to deliver an initial resource validation under NI 43-101 in Q1 2021, with a PEA or scoping study expected in Q2. "We can credibly say that not only are we going to explore and delineate the project, we have the experience and track record to build it," concluded Drost.

According to a palladium forecast by Metals Focus, the palladium price will hit a new all-time high in 2021 on the back of growing car sales in China, tighter emissions rules favoring hybrid vehicles, continuing shortages, and a weaker US dollar. With this in mind, the outlook remains favorable for palladium-focused juniors in tier-one jurisdictions such as Ontario. ■

Kerry Knoll

Executive Chairman
GENERATION MINING (TSX: GENM)

What were the main highlights from the Feasibility Study published for the Marathon palladium project?
We published a Feasibility Study on our Marathon palladium project in March, 2021, which was a game-changing document for Generation Mining. The study was done at US$1,725/oz palladium, while the current price (March, 2021) is over US$2,600/oz. Despite using a conservative price point, Marathon still had an IRR of 30% and an after tax NPV of C$1,007 million. At today's price, the NPV would more than double.

Can you tell us more about the feasibility study and recently announced metallurgical improvements?
Last March, Generation Mining hired a new COO, Drew Anwyll, who was one of the key players at Detour Gold, helping grow that company for eight years as general manager of the mine and VP operations. We brought Drew in to oversee the feasibility study this year, which started in the spring. Fortunately, most of the field work had been completed before Covid struck, and we delivered the study in the first quarter of this year as promised.
G-Mining Services, Knight Piesold and Ausenco are doing the study for us, and we also brought in outside consultants such as Steve Haggarty, a metallurgist who was VP Operational Support at Barrick. Steve has redone our flowsheet and metallurgy, improving the recovery rate of PGM and copper at a lower cost than the figures presented in the PEA. The new study, released in August 2020, showed a 4% increase in palladium recovery, 10% increase in platinum, and 3% increase in copper. All of this extra metal comes with cost savings on capex and opex, and adds as much as an extra C$25 million per year during the LOM.

In February 2021, Generation Mining began another exploration drill program along western margin of Marathon Deposit. What is the main area of interest you are targeting?
The main area where we are doing the feasibility study is made up of two zones. One is the main Marathon deposit, which contains about 7 million ounces of relatively lower grade (but very profitable) ore. The other zone is the W-Horizon, which is smaller, narrower and richer than the main zone. We are drilling down-dip from that deposit, looking for higher-grade mineralization that would lend itself to an underground operation. We are also following up some excellent results below the main zone that were returned last fall, and a couple of electromagnetic anomalies that we also found last year.
These deposits were formed by a volcanic eruption by magma coming up through a conduit. We are looking down the conduit for spots where the minerals got concentrated to potentially form massive sulphide deposits (VMS), and this is the other target of our current campaign.

Considering the lack of palladium producers based in North America, would you say Generation Mining is more likely to move into production than become a near-term M&A target?
I have started six companies in my career, and four of them moved into production before they were taken over. The other two were taken at the PEA and feasibility stages, respectively. We are 100% intending to build the mine. This does not mean we will not get taken out along the way, but we are not marketing the company to do so. If M&A were to happen, the three big South African companies – Anglo, Impala and Sibanye (our partner) – would be potential buyers, as some companies are looking to diversify outside of South Africa.

What are the next steps that need to be completed before a construction decision can be taken?
The first step was to finish the feasibility study, which was done on time. The permitting was started by the previous operator, and we have continued this by changing some of the design criteria. Our timeline to complete permitting is early 2022. During this time, we will be focused on financing, exploration, and detailed engineering. For the financing, we have a number of options, including bringing in a partner. Sibanye could exercise its back-in option, which means that they would have to put up two thirds of the money to build the mine. The main deposit does not have any royalties on it, so we are talking with various streaming companies about the possibility of selling a royalty or a stream that could be on the gold, or the platinum, for example. At US$$2400 palladium, the capex pay-back period would only be 18 months, which is very attractive to banks. ■

> At US$2,400 palladium, the capex payback period would only be 18 months, which is very attractive to banks.

Abraham Drost

CEO & Director
CLEAN AIR METALS (TSXV: AIR)

What potential do you see at the Thunder Bay North project?
Thunder Bay North is multi-ounce platinum and palladium magma conduit system, with high grade characteristics. We have recognized that this system has a lot of similarities structurally and stratigraphically to the Norilsk mining district in Russia and similar exploration techniques can be applied. It consists of two sub-horizontal conduits, one of which is the Current Lake deposit, with a 9.8 million tonne historic estimate that is currently being evaluated by Nordmin Engineering. 3 km west of this, we have been drilling off the Escape Lake deposit, a Rio discovery that is showing every bit of the potential and scale of the Current Lake deposit. The historic level of expenditure also attracted Jim and I to the Thunder Bay North Project, as Rio Tinto and Panoramic had collectively spent C$85 million on the project. Clean Air Metals has a strong operating platform as a result. We are not your average startup.

How was the financing of the deal to acquire the property structured?
Benton made a C$3 million (50%) down payment to Rio Tinto in October, 2019, to secure the deal in return for shares of Clean Air Metal and is a 17% shareholder of the company. In October 2020, Clean Air Metals made a C$1 million payment to Rio Tinto to maintain the Escape Lake option, and there are C$2 million in payments to Rio remaining over the next two years (October 2021 and 2022). Panoramic have transferred 100% ownership of Panoramic PGM's (Canada) Ltd., now a wholly owned subsidiary and 100% owner of the Current Lake deposit to Clean Air Metals, subject to security on the remaining payments of C$1.5 million per year over the next three years going forward. Clean Air Metals has paid C$8.5 million of a C$15 million purchase price so far and we are funded to make the balance of those payments today. However, for the time being we are content to go with the instalment plan and put our money in the ground to expand the resource. As we come to a definitive feasibility study on the Current Lake deposit, we may elect to exercise the option with Benton Resources early by paying everyone out.

Where are you targeting exploration efforts for the rest 2020 and early 2021?
The mandate to Nordmin Engineering was to deliver an initial resource validation under NI 43-101, which we expect by Q1 2021 and a Preliminary Economic Assessment or scoping study in Q2/21. In addition, we have the Escape Lake deposit that is currently being delineated.
We believe that the 30,000-hectare Thunder Bay North project land package holds significant greenfield potential as well. Drawing upon techniques used in the Norilsk mineral massive sulphide deposit model, we applied audio-magnetotellurics (a low frequency resistivity system) to the feeder zone areas of the Current Lake and Escape Lake intrusions, where they are underlain by the Escape Lake fault. As a result, we have discovered heretofore unknown low-resistivity, high-conductivity anomalies, which we will be drill testing.

Is the medium to long term plan for the project to engage in M&A or actually build the mine?
We can credibly say that not only are we going to explore and delineate the project, we have the experience and track record to build it. Presently our base case is a high-grade, underground, ramp-access mining operation at the Current Lake deposit and that is the mandate for Nordmin Engineering's design team.
There is competitive tension in the region. Impala Canada's Lac Des Iles mine is located 60 km up the road, and Lundin Mining's Eagle deposit is on the south side of the Lake Superior basin. We will see how M&A in the region plays out, but importantly Clean Air Metals has the flexibility and experience to develop the Thunder Bay North project itself should this be justified according to optimized engineering solutions. ■

> Rio Tinto and Panoramic had collectively spent C$85 million on the Thunder Bay North project. Clean Air Metals has a strong operating platform as a result. We are not your average startup.

GLOBAL REACH

"Some people have wondered if a higher gold price has meant more competition for assets. I think it is fair to say that asset prices are increasing, but for the right assets – those which really need an operating team to build – we have not suddenly seen a lot of teams spring up overnight that want to build gold mines as a result of higher gold prices."

- Doug Ramshaw,
President,
Minera Alamos

Image courtesy of HighGold Mining

Toronto's Global Reach

ORCHESTRATING THE WORLD'S MINING INDUSTRY

"If you want to be world class in the mining industry you have to be global," affirmed Mark Bristow, a statement which rings true when examining many of Canada's most successful mining companies. Five of the 13 Canada-based mining companies to make the 2020 TSX30 operate 100% of their mines abroad: Dundee Precious Metals (Serbia, Bulgaria, Namibia), Teranga Gold (Senegal, Burkina Faso), Trilogy Metals (Alaska), Orla Mining (Mexico), and Lundin Gold (Ecuador). Additionally, six of the remaining eight earn a large percentage of their revenue from foreign operations: Kirkland Lake Gold, Sandstorm Gold Royalties, Wheaton Precious Metals, Sprott, Yamana Gold, and SSR Mining.

Proximity to Toronto's financial ecosystem, short flights to New York and London, a favorable time zone to conduct business throughout the Americas, Europe and Africa, a long-standing mining tradition, and the presence of engineering houses, consultancies and technology companies, make Toronto a natural hub for the decision makers who orchestrate global mining.

In this article we will focus on Toronto-based companies operating in four regions – Mexico, Africa, the US and Mongolia. From early-stage exploration through to production, from precious metals to base metals, lithium and uranium, the companies featured vary in profile, but all have one thing in common: the ability to mine deposits abroad, while mining the markets in Toronto.

Mexican precious metals

Mexico has been rocked by Covid-19; the country has the third highest body count and its GDP dropped by 8.5% in 2020, its biggest economic contraction since the Great Depression in 1932. In parallel to this, president Lopez Obrador (otherwise known as AMLO) has alienated a number of foreign investors with his populist policies and state-heavy approach. The AMLO administration also ruffled the feathers of Mexico's mining sector with the removal of the mining sub-secretary post in 2020, and government initiatives to combat organized crime have left power vacuums in the cartel structure, causing violence to rise in certain regions of the country. The launch of a new police force to protect mining operations in high-risk areas is a welcome development, but its necessity is indicative of a reality that investors should be aware of.

Despite the challenging macro environment, Mexico's mining industry has remained robust, as the world's largest silver producer and 9th largest gold producer benefits from rich geology, a skilled workforce, and a clear one-year permitting process that allows projects to be moved into production quickly and at low capex.

Indeed, the ability to act rapidly helped Canadian mining companies operating in Mexico respond to the pandemic in a more timely manner than in their home 'tier one' jurisdiction. "At our Mexican operations we were testing quickly as far back as May, but in Canada, even though the testing equipment is developed here, the Canadian healthcare system (Health Canada) was not allowing companies to use the equipment until July 1st," observed John McCluskey, president and CEO of Alamos Gold (TSX: AGI), which operates the 150,000 oz/y Mulatos mine in Sonora, Mexico.

Toronto-based Torex Gold (TSX: TXG) was recognized by the National Mexican Institute of Social Security for its safety standards and leadership on the development of Covid-19 precautionary measures, one of a number of milestones achieved by the company as it celebrated its 10th anniversary in 2020. On the corporate side, Jody Kuzenko transitioned from COO to president and CEO in June 2020, as Fred Stanford moved to the role of executive chair. Additionally, Rick Howes, Robin Bienenstock and Roy Slack were brought on to the TXG board as new directors.

On the operational front, TXG's El Limón Guajes (ELG) mining complex delivered a marquee Q3, with the company's best financial quarter to date, generating US$124 million in free cash flow (FCF), as well as all-time highs for gold sales, realized margin, EBITDA and operating cash flow. "For the first time since commercial production, we achieved a net cash position hitting US$77 million," said Kuzenko, before highlighting that the company's proudest record is in safety, as ELG crossed the threshold of 10 million hours worked without lost time injury in November 2020.

A feasibility study for TXG's Media Luna project is scheduled to be concluded in mid-2021, and a plan for the commercialization of its Muckahi ore transportation technology has given the company an organic and varied growth pipeline. Kuzenko also hinted at potential M&A on the horizon: "We are actively seeking growth opportunities that enable value accretive geographic diversification. TXG's goal is to become a 1 million oz to 1.5 million oz producer."

She also affirmed that the company's primary focus is to deliver reliable and consistent cash flow from ELG, pay down debt and internally fund and bring Media Luna into production by early 2024.

Soon to be Mexico's newest gold producer, Minera Alamos (TSXV: MAI), enjoyed a stellar 2020, with its share price appreciating 143% from January 1st to December 31st on the back of the successful development of its first mine, Santana, and the August acquisition of its third project, Cerro de Oro. Santana represents the fourth mine in 15 years the MAI management team has built in Mexico, and delivering within its pre-Covid guidance is a particularly impressive feat considering construction was only able to commence in July 2020.

For MAI shareholders, a number of upcoming catalysts point to continued success in 2021, starting with the expected re-rate as the company transitions from developer to producer, with first gold from Santana expected in Q2 and FCF by the end of 2021.

remodeled PEA as the company looks to increase the resource and the corresponding production profile of the project. Furthermore, growth through the drillbit offers upside as MAI moves from final pit-optimization to test the other pipes at Santana. "The success of this drilling will dictate whether Santana is a nice 45-50,000 oz/y operation, or what we believe the project can grow to – a 100,000 oz/y operation from a series of discrete pits to a central pad," explained president Doug Ramshaw.

The second project in the company's pipeline, Cerro de Oro (CDO), was acquired in August for a series of modest cash payments and MAI shares that equated to less than 1% dilution. Ramshaw compared CDO to the El Castillo mine built under the Castle Gold banner (before being acquired by Argonaut Gold): both gold discoveries from the early 90s with a 600,000+ oz starter resource to build a low capex, open-pit, heap leach operation on. Elaborating on whether a higher gold price has meant more competition for assets, Ramshaw reflected: "I think it is fair to say that asset prices are increasing, but for the right assets – those which really need an operating team to build. We have not suddenly seen a lot of teams spring up overnight that want to build gold mines as a result of higher gold prices."

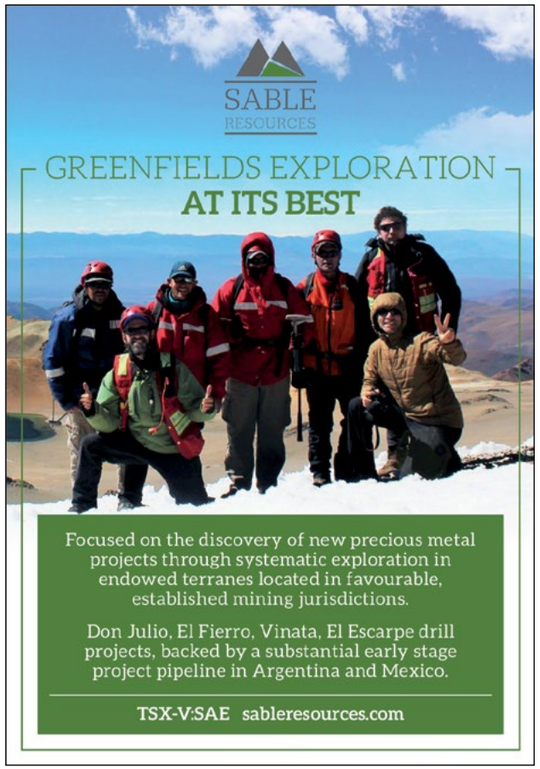
With Santana up and running and construction at CDO a possibility by the

end of 2021, MAI's third and arguably most exciting project, La Fortuna, could potentially be built without taking on debt, according to Ramshaw. La Fortuna's 2018 PEA showed a sub-US$500 AISC, and US$27 million capex for a 50,000 oz/y operation, and drilling at the asset in 2021 will go towards a remodeled PEA as the company looks to achieve a 7-year LOM – the minimum starter point for its projects.

Silver outperformed gold in 2020, appreciating 47.61% compared to gold's 24.88%, and Mexico, as its biggest producer, could be in for a spectacular year if the bull market continues. For those looking for a greenfield play with multi-bagger potential, Sable Resources (TSXV: SAE) has the team, asset, and importantly the timing, to deliver significant shareholder returns in the coming years.

SAE has taken a patient and methodical approach in searching for properties in Mexico, and over time, the company has acquired over 1.1 million hectares in mineral applications and 40,000 hectares in mineral titles. According to president and CEO Ruben Padilla: "Sable is now one of the largest landholders in the silver mineral belt region of Mexico. We have done a lot of work on our properties, and we have identified 140 anomalies or targets to be evaluated."

Three of these projects (Vinata North, Vinata South and El Escarpe) currently stand ready for drilling, and are located in the same region where SAE discovered the Margarita Silver deposit, which was recently sold for C$7.5 million after an initial investment of only C$1.5 million – a clear example of Sable's capacity to generate value through mineral discovery.



Having scalability as well as size distinguishes DSV in the silver space, where nine of the top ten primary silver mines are underground operations, which tend to be more difficult to scale up.

- Taj Singh, President & CEO, Discovery Metals (TSXV: DSV)

In describing the prospective territory in which Sable's assets are located, Padilla asserts: "The Central Mexico Silver Mineral Belt is the richest silver mineral belt in the world, the permitting process is very straightforward, the infrastructure is great, and there are no problems with local communities."

He also noted: "The exploration and drilling costs are very competitive with the leading jurisdictions in the world, so Sable is confident in the value that these properties will generate."

Another of the silver-focused juniors active in Mexico is Discovery Metals (TSXV: DSV), which made the 2020 TSX Venture 50 list with a share price appreciation of 247% on the back of over 100 holes drilled at its Cordero asset in Chihuahua, the fourth largest undeveloped silver resource in the world. Eric Sprott has increased his stake in DSV to 27%, as the Toronto-based junior has become one of the go-to names in the nascent silver bull run.

"It is an asset that offers the scarce combination of margin, size and scalability," stated Taj Singh, DSV's president and CEO, remarking that Cordero's deposit geometry makes it amenable to a staged capex approach. This scalability distinguishes DSV in the silver space, where nine of the top ten primary silver mines are underground operations, which tend to be more difficult to scale up. "Cordero has a higher-grade core surrounded by medium to lower-grade mineralization which means the deposit can be mined strategically and in a staged fashion to take advantage of the grade distribution of the deposit," he explained.

Singh described the DSV story as a relatively simple one: "A world class silver asset that will continue to get better as we de-risk and optimize it," noting upcoming catalysts that include a resource update and PEA in H2 2021, and ongoing drill results on both brownfield targets as well as DSV's first ever drill testing of greenfield targets elsewhere on its land package. "We have a cash balance of over C$80 million and no debt, so we have significant firepower to continue to aggressively advance the project and drive value through the exploration and development." ■

Jody Kuzenko

President & CEO
TOREX GOLD RESOURCES (TSX: TXG)

How have the corporate changes at Torex Gold positioned the company for future growth?

2020 has been a significant year for Torex Gold (TXG), which is fitting given it marks just over a decade since the asset was purchased and the company began. In terms of management, as part of our management succession plan, I transitioned from the COO to President and CEO in June 2020, as Fred Stanford transitioned to the role of Executive Chair. We have also welcomed three new directors to the board: Rick Howes, Robin Bienenstock and Roy Slack, all of whom bring tremendous experience and diverse knowledge to Torex.

On the topic of diversity, I would like to highlight that Torex now has 30% female representation on its board and 40% on its executive team. This was achieved solely through merit and without quotas. Our commitment to diversity extends to cultural diversity and a testament to that is the recent appointment of Faysal Rodriguez to the role of VP for Mexico.

What were the operational highlights from the El Limón Guajes (ELG) mining complex in 2020?

2020 was an exceptional year at ELG, and Q3 results can only be described as extraordinary. It was a record-breaking period across many facets of the business. In addition to having TXG's second highest quarter of production ever, producing over 130,000 oz Au, we had our best financial quarter to date, generating US$124 million in free cash flow (FCF). The records achieved in Q3 include all-time highs for gold sales, realized margin, EBITDA, operating cash flow and – importantly in today's market environment – record FCF. Finally, for the first time since commercial production, we achieved a net cash position, hitting US$77 million, a US$130 million-dollar improvement from Q2 and an impressive US$174 improvement year over year. We also paid back US$72 million of debt in Q3, and an additional US$50 million post-quarter end, which deleverages our balance sheet even further.

What is timeline for the development of Media Luna?

The project is on track and, based on the PEA concluded in 2018, promises to provide our operations in Mexico with an additional decade of mine life – notably we have only drilled a third of the magnetic anomaly. The feasibility study is scheduled to be concluded in mid 2021 and first production is scheduled for Q1 2024. The work at Media Luna has been progressing in three key areas: the feasibility study, infill drilling that will convert 7 to 9 million tonnes from the inferred to indicated category, and early works. In terms of financing for the project, the significant cash flow we are generating from ELG will fully fund the project even at a conservative gold price of US$1,400/oz, as well as service any outstanding debt.

What progress has been made with Muckahi technology?

In 2019, our test objectives focused on breaking rock – including testing the monorail system on the level. There are strong indicators that the technology is effective in reducing capex and improving productivity, and we were encouraged by the 2019 and 2020 testing results. This year's testing has been on rock transportation and on the efficiency of the integrated system as a whole. Looking forward, we are working to establish a plan for the commercialization of Muckahi, as we are convinced in the widespread applicability of the technology across mining operations globally.

What is Torex Gold's strategy for 2021, and does the company intend to expand through M&A in the coming years?

We are actively seeking growth opportunities that enable value accretive geographic diversification. TXG's goal is to become a 1 to 1.5 million oz producer. We are constantly scanning the horizon for appropriate opportunities, but given the health and cash flow generated from our flagship asset, we are well-positioned to be patient on M&A activity.

Our primary focus is to deliver reliable and consistent cash flow from ELG, pay down debt and internally fund and bring Media Luna into production by early 2024 – while continuing to leverage potential opportunities to extend the current production profile of ELG through 2023 and into 2024. Additionally, since 75% of the Morello gold property is unexplored, we plan to invest in exploration on the broader land package in 2021. We have a winning combination consisting of a great asset, a great team, industry disruptive technology and momentum, and each of those will support continued value generation and a very bright future for Torex. ■

Ruben Padilla

President & CEO
SABLE RESOURCES (TSXV: SAE)

> Our work has now progressed to the point where we have targets with high potential for drilling and still have land to keep generating more drill targets and feed our pipeline of projects.

This year marks a transition for Sable Resources (TSX.V:SAE | OTCQB:SBLRF), from portfolio generator into a multiple target ready-to-drill company. How has this transition played out?
For close to seven years Sable has been successful in its strategy to secure land in key areas. We have also completed the basic work to recognize drill targets within the land package. In mineral exploration you cannot jump from idea to discovery right away, so exploration is a process that takes time. Our first objective was to generate exploration concepts and secure land and Sable was patient waiting for prospective land to open up and to be able to stake it or option good ground under favorable conditions. Our work has now progressed to the point where we have targets with high potential for drilling and still have land to keep generating more drill targets and feed our pipeline of projects. We have a number of good quality projects that are ready for drilling, increasing our chances to discoveries economic mineral deposits.

Can you speak to the prospectivity of Sable's assets in Mexico?
Sable is focused in Latin America because of its prospectivity and endowment. We also chose jurisdictions where the legal framework and permitting are very straightforward. Our initial acquisition of land was in Central Mexico in an area that goes from north of Mexico City all the way to the City of Chihuahua. This region is referred to as the Central Mexico Silver Mineral Belt and it is the richest silver mineral belt in the world.
Sable searched for properties in this area for years, and over time, the Company has acquired over 1.1 million hectares in mineral applications and 40,000 hectares in mineral titles. We are now one of the largest landholders in the silver mineral belt region of Mexico. We have done a lot of work on our properties, and we have identified 140 anomalies or targets to be evaluated. Three of these projects, Vinata North, Vinata South and El Escarpe are currently ready for drilling. In the same region we discovered the Margarita Silver deposit, which was recently sold for Can$7.5 million after an initial investment of only Can$1.5 million – a clear example of Sable's capacity to generate value through mineral discovery.
With these projects, Sable has built a sustainable high-quality portfolio from which we can explore, drill, discover or divest at any given time. The permitting process is very straightforward in that part of Mexico, the infrastructure is great, and there are no problems with local communities. Further, the exploration and drilling costs are also very competitive with the leading jurisdictions in the world, so we are confident in the value that these properties will generate.

How does Sable weigh the risk and reward of operating in San Juan, Argentina?
This is a province that has proven to be a very stable jurisdiction for mineral investment, and it is important to note that in Argentina, mineral resources are managed by the provinces, not by the federal government; therefore, every province is completely different. San Juan is very professional and companies that are responsible and follow the rules can work very well in San Juan.
In particular, San Juan has a long record of simple and efficient permitting. Regardless of the political leanings of the central government in Argentina, San Juan has always been supportive to its mining industry.

Sable's share price more than doubled over the course of 2020. Aside from appreciation in the price of silver, what factors have caused the market to turn more bullish on Sable?
In this business, investors are high-risk takers and they now recognize that Sable has done the necessary work to put us on the path of a possible discovery. Sable has multiple good quality drill projects and we have the money to test them, so the market has rewarded us for that. What also helps, is that we do not over-hype our assets. The first thing I tell people is that this is a very risky business. Whatever we do, we try to minimize the possibilities of failure. You do that by having good quality projects and good execution. I want Sable's share price to reflect the Company's progress and the hope that our assets will be advanced, not our ability to generate hype that inflates the share price. ■

Doug Ramshaw

President
MINERA ALAMOS (TSXV: MAI)

> When we look at any project we want a base resource we could start up an operation on but also visibility on a geological potential to increase that resource and the corresponding production profile of a project.

How is progress at Santana coming along, and to what extent have external factors such as the pandemic and the rainy season impacted its timeline?
Prior to Covid, when we did the financing for the mine build at the beginning of the year, our guidance was six to eight months construction time. When Covid hit, mining in Mexico was not classed as essential, so everything shut down for April and May. Considering that we were only able to start construction in early July, we are happy to say that it should be finished by around the end of Q1 2021, just exceeding the top end of our pre-Covid guidance. The rainy season was not bad this year, but government agencies being short staffed has slightly slowed down some red tape issues. We have definitely benefited from our team all being largely based in Mexico. We still expect first gold toward the end of Q2 and expected Santana free cash flow (FCF) by the end of 2021.
The drilling we are currently doing at Santana remains centered around final pit-optimization, rather than what I would consider raw discovery focused drilling. Once this has been completed we will move to test the other pipes at Santana. We know these are gold-bearing, but they have not been drilled yet. The success of this drilling will dictate whether Santana is a nice 45-50,000 oz/y operation, or what we believe the project can grow to – a 100,000 oz/y operation from a series of discrete pits to a central pad.

Can you tell us about the Cerro de Oro (CDO) acquisition made in August and the value you believe it adds to the company?
At CDO we saw a project which mimicked the El Castillo mine that our team built under the Castle Gold banner. Both are gold discoveries from the early 90s with a 600,000+ oz starter resource to build a low capex, open-pit, heap leach operation on. Similar to Santana, it should be around C$15 million capex, so a real simple build for our team that can be moved into production quickly before being expanded. We hope to have it permitted for a construction decision around the end of this year if all goes well.

What did the resource update for CDO released in November 2020 reveal?
The maiden resource at CDO was a conservative first look at the potential that will serve to support our permit applications that we expect to submit early in 2021. We applied very conservative parameters but as we add our own drilling in 2021 and further metallurgical work to that which had been done in the past, we think that there are many ways to refine and enhance the overall scope of the project from this very nice start. When we look at any project we want a base resource we could start up an operation on but also visibility on the geological potential to increase that resource and the corresponding production profile of a project. CDO most certainly lends itself to a project that could scale considerably over time.

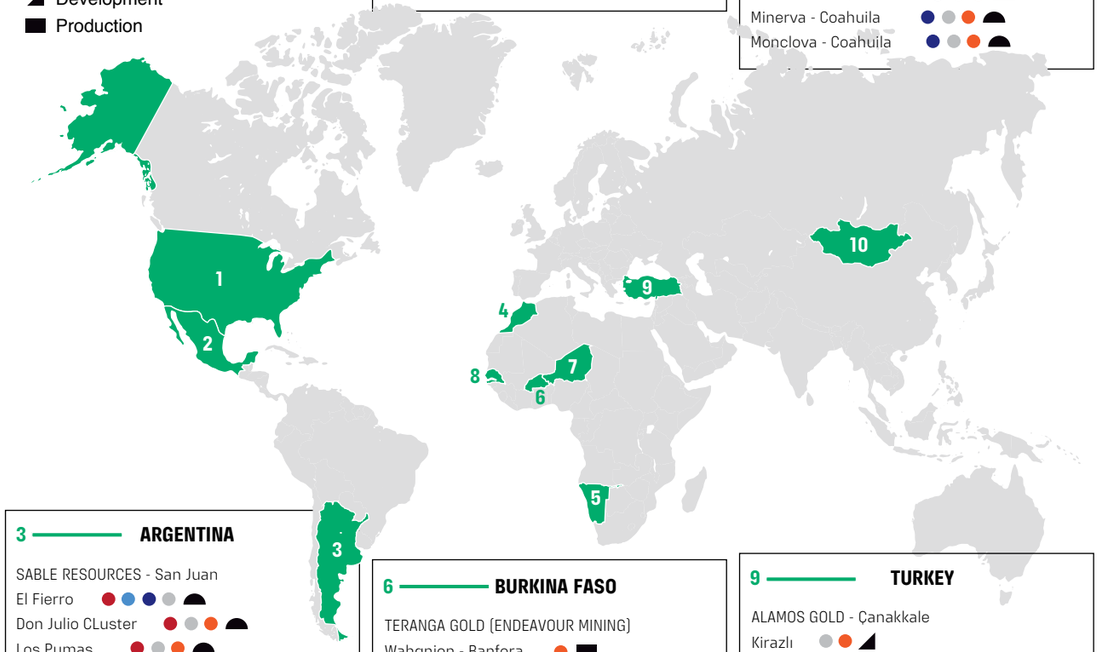
What does the acquisition of CDO mean for La Fortuna, and should we expect to see exploration results from the project in 2021?
La Fortuna is a fantastic project, which will be a high-margin project in any gold environment. The PEA from 2018 showed a sub-US$500 AISC, and a low capex of US$27 million for a 50,000 oz/y operation. The thought is that it would be quicker to get Santana and CDO up and running first, and by having two mines running we may not need to take on any debt to build La Fortuna. Even more critically, the PEA was based just around a high-grade starter pit with a 5-year mine life. We know there are extensions to that pit, as well as greenfields discovery potential on the extensive land package.
Whilst it has been pushed down the pipeline, it will not be put on hold, and we will be able to add a lot of value drilling the asset in 2021 to look to add ounces. We also did the PEA at US$1,250/oz, so it will be remodeled for slightly higher gold prices, but still taking a conservative approach at around US$1,450. A 7-year LOM is really the minimum starter point we look at for our projects. ■

GLOBAL REACH MAP

LEGEND

Mineral
- Gold
- Silver
- Lead
- Zinc
- Copper
- Vanadium

Status
- Exploration
- Development
- Production



1 USA

ALAMOS GOLD - Oregon
Quartz Mountain Project

REVIVAL GOLD - Idaho
Beartrack-Arnett

HIGHGOLD MINING - Alaska
Johnson Tract

MILLENNIAL PRECIOUS METALS - Nevada
Mountain View
Wildcat
Dune
Eden
Marr
Ocelot
Red Canyon

2 MEXICO

TOREX GOLD - Guerrero
El Limon Guajes (ELG) Complex
Media Luna

ALAMOS GOLD
Esperanza Project - Morelso
Mulatos Mine - Sonoro

MINERA ALAMOS
Santana Project - Sonoro
La Fortuna - Durango
Cerro de Oro - Zacateca

SABLE RESOURCES
Vinata - Chihuahua
El Escarpe - Queretaro

DISCOVERY METALS
Cordero - Chihuahua
Puerto Rico - Coahuila
Minerva - Coahuila
Monclova - Coahuila

3 ARGENTINA

SABLE RESOURCES - San Juan
El Fierro
Don Julio CLuster
Los Pumas

4 MOROCCO

TRIGON METALS - Anti-Atlas
Silver Hill

5 NAMIBIA

TRIGON METALS - Kombat
Kombat Mine
Gross Otavi

6 BURKINA FASO

TERANGA GOLD (ENDEAVOUR MINING)
Wahgnion - Banfora
Golden Hill - SW Burkina Faso

7 NIGER

GLOBAL ATOMIC CORP. - Arlit
Dasa Uranium

8 SENEGAL

TERANGA GOLD (ENDEAVOUR MINING) - Kedougou
Sabodala-Massawa

9 TURKEY

ALAMOS GOLD - Çanakkale
Kirazlı
Agi Dagi
Çamyurt

GLOBAL ATOMIC CORP.
Befesa Silvermet - Marmara

10 MONGOLIA

STEPPE GOLD
ATC Project - Dornod
Mungu Project - Dornod
Uudam Khundii - Bayankhongor

Golden opportunities in the USA

The best place to find another mega deposit is Nevada, and we have a 10-year plan focusing on the models that drove the discoveries of the late 80s and 90s.

- Mark Bristow, President & CEO, Barrick Gold

NEVADA

The USA's impact on the gold industry goes far beyond its production, as the unprecedented fiscal stimulus announced by the federal reserve in response to the pandemic propelled gold to its all-time high in August 2020. In the midst of all the noise from Washington, it should not be forgotten that the US is home to world-class mining jurisdictions such as Nevada, ranked number one in the Fraser Institute's "investment attractiveness" index for 2020.

The tier-one Nevada Gold Mines joint venture between the world's two leading gold producers, Newmont and Barrick, contributed significantly to each company achieving record FCF in 2020. "Nevada has worked so well that people have taken it for granted, but to take a 3.5 million oz producer, with 7,100 employees and 4,000 contractors in the US, with two completely disparate cultures, and stick them together, throw in the uncertainties of the US election year, plus Covid – the team did a spectacular job," reflected Barrick chief Mark Bristow.

When quizzed on where he sees most potential for new discoveries, Bristow suggested: "The best place to find another mega deposit is Nevada," revealing that Barrick has a 10-year plan focusing on the models that drove the discoveries of the late 80s and 90s.

About 35 km south of Barrick's Cortez Gold mine, lies Millennial Precious Metals' Red Canyon asset, one of five properties that the early-stage exploration and development company intends on advancing in Nevada. "Two of these assets have a historical resource base that Millennial can add ounces to quickly and cheaply, and we have been open to looking at things that were missed by other groups. For example, at Wildcat and Mountain View (two of the properties acquired from Waterton), located in Nevada's Hycroft district, no one to date has really understood the plumbing system and the high-grade nature of it," outlined president and CEO, Jason Kosec.

Out of the gate, Millennial has close to 1.2 million oz of oxide on the books, and that has attracted a strong base of well-respected institutional investors seeking to back the company. Among them, Eric Sprott is set to own 8.2% of Millennial, as it plans to make its initial public offering in Q1 2021, with US$24 million in the bank.

The vision for the next 18 months, according to the company, is to drill a minimum of 20,000 m on Wildcat, Mountain

View and Red Canyon. Millennial also intends to undertake an updated resource on these assets, as well as a PEA. "We have a very aggressive strategy, because I think most people do not understand that one of the biggest killers of junior companies is a lack of news flow," said Kosec, later adding: "Not being aggressive enough is a big pitfall, and Millennial is lucky that its three assets that are going to be drilled this

year are very low hanging fruit, and we can add ounces, very quickly and cheaply."

IDAHO

Also in the top 10 of the Fraser Institute's top global mining jurisdictions list for 2020 is the state of Idaho, where Revival Gold (TSXV:RVG) is focused on its Beartrack-Arnett project, the largest former producing gold mine in the state. Over the last three and a half years, Revival has built up a resource of 3 million oz and released results in fall of 2020 of a PEA on the first phase to restart the operation. It is an open pit heap leach mine, estimated to produce 72,000 oz/y of gold. According to Hugh Agro, president and CEO: "The bigger opportunity at Beartrack-Arnett is to construct a mill and process the mill resource, which is contemplated at 20,000 tonnes per day."

Revival is now working on exploration to continue to build out the resource and technical information for the larger mill project in a second phase of the operation.

One of the big advantages of mining in Idaho is that communities have proven to offer skilled labor in abundance and are supportive of the industry. "We have a supportive state government and supportive communities. The community of Salmon, Idaho, in which Revival is located, understands the benefits and rewards that come from having a responsibly operated mine in their backyard. The community remembers the successful days when Beartrack-Arnett was in operation in the late 90s and early 2000s," Agro declared.

ALASKA

Even further north, in "America's Last Frontier," sits HighGold Mining's (TSXV:HIGH) Johnson Tract project, which is held by an Alaskan native land interest and has a resource estimate of 900,000 oz of gold equivalent (AuEq) at about 10 g/t AuEq. Despite the challenges presented by the pandemic, HighGold proceeded to complete 16,500 m of drilling between July and the end of October, expanding the zone of mineralization. "What makes the project special is that it has incredibly long intervals of high-grade gold and a unique combination of very high-grade mineralization over very wide widths," said HighGold president and CEO, Darwin Green.

According to the company, which is also working to progress its Munro-Croesus project in Timmins, one of the drawbacks of operating in Alaska is that drilling costs are around double what they are in Timmins. However, the payoff stands to be far greater in Alaska if successful. In Green's words: "The threshold for a deposit to go the distance is lower in a place like Ontario than it is in Alaska. However, Alaska is elephant country. There are some monster deposits there and it has got tremendous potential. That is the offset."

Another of the US states seen as favorable for mining investment, Alaska moved from 9th spot in the Fraser Institute's ranking in 2019, up to 2nd in 2020.

Mongolia's bright mining future

Since opening its markets to foreign investors in the 90's after nearly seven decades as a Soviet satellite with a centrally planned economy, Mongolia has become well known for its prospectivity. In the South Gobi region, towards the border with China, lies one of the world's richest sources of metal. The giant Oyu Tolgoi copper mine is held 34% by the Mongolian government and Turquoise Hill, with majority-owner Rio Tinto holding the rest. It started producing above ground in 2011, and expansion underground should see total output of copper climb to 500,000 mt/y—placing Oyu Tolgoi as the third largest copper producing mine in the world.

The mine has become a symbol of the new, open for business, Mongolia. It is a crucial part of Mongolia's economy, as it is not only the country's biggest source of foreign direct investment, but it also provides thousands of well-paid jobs. Developing the mine has not been entirely smooth sailing, as Rio Tinto has come under pressure in Mongolia, where the government is seeking an independent review into delays and huge cost blowouts in the underground expansion of Oyu Tolgoi. However, few are questioning the country's commitment to creating an auspicious environment for foreign mining companies.

Steppe Gold (TSX: STGO) has made immense progress since entering Mongolia in 2016. STGO began producing gold at its flagship Altan Tsaagan Ovoo (ATO) mine in March 2020, which was built in just 14 months with under US$20 million of capex and is now ramping up output. Steppe also owns the Uudam Khundii (UK) gold project (an 80:20 joint venture between Steppe and the Bayankhongor provincial government) and the Mungu gold and silver discovery, located immediately northeast of its current resource at ATO.

Aneel Waraich, Steppe's executive vice president pointed out: "We are very proud to be able to bring production online during a global pandemic. Steppe Gold (STGO) has now completed two quarters of production and produced over 25,000 oz of gold, while selling an equivalent amount to the Mongolian Central Bank. We generated over US$24 million of operating profit in our first six months, and overall, it has gone well given restricted travel."

Steppe's operating team is 100% local, and this turned out to be an advantage when the effects of Covid began to play out around the world. "Steppe has shown that a local skilled labor force exists in Mongolia. Importantly, by having a local team in place, we do not need to rely on expats to run our business. This means we have not had to curtail or delay production," Waraich underlined.

In addition to their local labor force, the CEO and half of STGO's board are Mongolian. By being a Mongolian entity, the company receives support from all levels – local, provincial, and federal. As a result, they received endorsement from the newly established sovereign fund, called the Mongolia National fund, which put US$1.5 million into Steppe in January 2020. The Central Bank-backed Gold 2 program,

> *The market for uranium is completely different to that of precious metals, as demand is dictated by the nuclear power utilities, and with over 450 reactors operational now and huge growth expected over the next 10 years, the demand for uranium fuel will be enormous.*
>
> ***- Stephen Roman, President & CEO, Global Atomic Corp.***

which was created to encourage increased gold production from primary sources, also awarded Steppe US$10.5 million in debt financing to extend its Phase 2 program.

2021 is set to be another year full of catalysts, with a maiden resource update on Mungu, as well as the other three ATO deposits coming in early 2021. On the back of that, STGO intends releasing a revised feasibility study on the phase 2 expansion, followed by new drill and exploration programs continuing on both projects and first time drilling on the UK project.

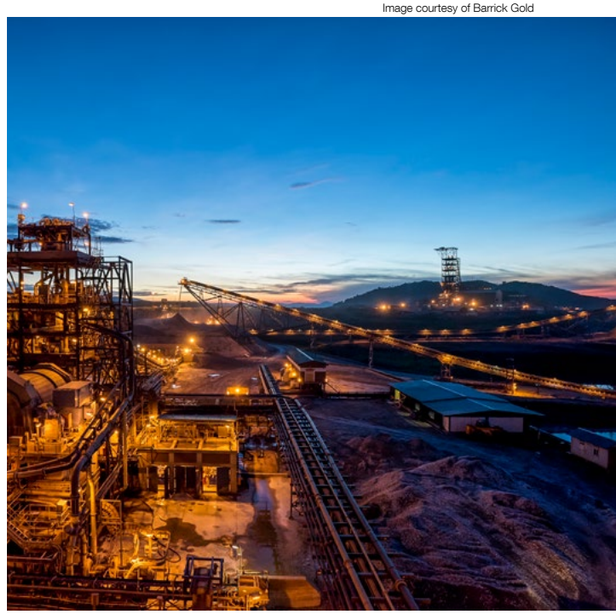
African projects in the spotlight

From an M&A standpoint, one of 2020's biggest transaction involved a merger of near-equals in Africa, as Endeavour Mining acquired Toronto-based Teranga Gold (TSX: TGZ) for a US$2 billion all-share deal in November to create a top 10 gold producer which will list in London.

The transaction came on the back of Teranga's acquisition of Barrick's Massawa gold project in Senegal, which combined with its Sabodala mine to form the Sabodala-Massawa complex. "The pre-feasibility study points to a 5-year production profile of 384,000 ounces per year at all-in sustaining costs of less than US$700 per ounce," said Richard Young, TGZ's president and CEO, demonstrating the potential for value-accreditive M&A that creates assets stronger than the sum of their parts.

The uranium market reignited in 2020, appreciating 21.14% as strained supply due to Covid shutdowns combined with solid demand on the horizon improved market sentiment. Global Atomic Corp (TSX: GLO) is a unique story for a uranium junior due to its Turkish zinc smelting operation which has been profitable since 2009, negating the need for frequent dilution as the company works to develop its flagship Dasa uranium project in Niger.

Image courtesy of Barrick Gold



In May 2020, GLO released a PEA for Dasa at a conservative base case price of US$35/lb, resulting in an AISC of less than US$19/lb, which would put the company in at the lowest cost quartile of companies producing uranium. "Not many junior developers can claim to have operating costs similar to that of Cameco and Kazatomprom," stated Stephen Roman, GLO's president and CEO, adding that drilling in the area delineated as the Flank Zone resulted in a close-to-surface high grade uranium discovery. The PEA outlined a low-capex, high grade asset, with an after-tax NPV of US$211 million and an after-tax IRR of 26.6%, based only on the Phase 1 Mine Plan. With GLO receiving its mine permit in Q1 2021, its aim of commencing production in 2024 is viable even at current uranium prices, according to Roman.

Although West Africa represents the continent's current mining hotspot, a number of upcoming countries are looking to take advantage of rising metals prices and to attract foreign investment with mining-friendly regulations. Trigon Minerals (TSXV: TM) is looking to restart the Kombat copper mine in Namibia, as well as exploring the Silver Hill project in Morocco, which it acquired in August 2020. "These are some of the best mining jurisdictions in Africa," claimed Jed Richardson, TM's president and CEO, who has the backing of Eric Sprott as a major investor.

While Sprott and Sllvercorp were attracted to Trigon's greenfield silver opportunity in Morocco, the rising copper price and the September 2020 resource update from Kombat that expanded the asset from 7 million to 39 million tonnes, offers two-pronged optionality to the Toronto-based junior. "When we put together Trigon, it was on the thesis of a growing demand for copper and the potential for Africa to supply that demand," revealed Richardson, who expects a bankable feasibility study for Kombat in 2021, as well as a maiden resource for Silver Hill. ■

Jason Kosec

President & CEO
MILLENNIAL PRECIOUS METALS CORP

> **The base of our portfolio consists of seven assets. Each of these assets has not been in the public markets and nothing has been done on them in over a decade. Millennial just put its Maiden Resource Statement for 1.2 Moz in two pits of inferred oxide, with 700,000 oz of potential, and that has attracted a strong base of well-respected institutional investors seeking to back the company.**

What is the story behind the founding of Millennial Precious Metals and how has the company gone about acquiring its current portfolio of assets?
Me and my partners Ruben Padilla (CEO, Sable Resources) and Terry Harbort (CEO, Talisker Resources) were looking into gaining a toehold into the United States, and so we decided to focus primarily on assets in the southwestern United States and ultimately identified great opportunities in Nevada.
Our team ran hundreds of desktop reviews and made over 30 site visits in order to pinpoint development and exploration assets that had an existing resource base or presented great exploration potential, while also making sure that those development resource base assets had enough potential to significantly grow.
Fortunately, we got first crack at Waterton's exploration portfolio in Nevada. From there, we acquired six of their properties, and one other asset from a private company called Red Canyon, and that is how Millennial, and its portfolio came to be. Two of these assets have a historical resource base that Millennial can add ounces to quickly and cheaply, and we have been open to looking at things that were missed by other groups. For example, at Wildcat and Mountain View (two of the properties acquired from Waterton), located in Nevada's Hycroft district, no one to date has really understood the plumbing system and the high-grade nature of it.
We have been putting things together that could build the base for the next exploration and development company focused in top-tier mining jurisdictions like Nevada, and we now intend to advance the assets we acquired over the past year and a half.

What were the biggest highlights of 2020 and what is Millennial's strategy moving forward?
The base of our portfolio, which consists of seven assets. Each of these assets has not been in the public markets and nothing has been done on them in over a decade. Millennial just put its Maiden Resource Statement for 1.2 Moz in two pits of inferred oxide, with 700,000 oz of potential, and that has attracted a strong base of well-respected institutional investors seeking to back the company.
We plan to take Millennial public sometime in Q1 and we are coming out at a US $68M market cap with US $24M in the bank and Eric Sprott will own close to 8.2% of the company moving forward.
The idea over the next 18 months is to drill a minimum of 20,000 M on Wildcat, Mountain View and Red Canyon. We also intend to do an updated resource on Wildcat and Mountain View, as well as a PEA. We have a very aggressive strategy. I think most people do not understand that one of the biggest killers of junior companies is a lack of news flow which will hurt the momentum of the story. Not being aggressive enough is a big pitfall, and Millennial is lucky that its three assets that are going to be drilled this year are very low hanging fruit, and we can add ounces very quickly and cheaply.

What makes Nevada such an appealing jurisdiction?
Millennial's Red Canyon asset is about 35miles south of Barrick's Cortez Hill Gold Mine, so we feel that we are in a great location. From a permitting perspective, Nevada is amazing. It allows us to do things quickly and the infrastructure that you get is world-class. Between our two development assets there is a road that goes right up to the project and the rail line cuts between the two projects. There is also a powerline that goes right over top of the deposit, and the rail line connects all of the major deposits. So a lot of important infrastructure is already in place.
In remote areas in Canada, the drilling window is short. It takes a lot longer with more money and dilution to add economic ounces to your books because of the weather. In Nevada, you can operate year-round. What would take someone in the Golden Triangle three years to do, we can do in Nevada in eight months.
What people have not been doing in Nevada, is going back to the fundamentals of geology, and doing systematic scientific work looking for the next Cortez Hill. With Millennial's portfolio, we believe we can have another major discovery and I am certain that if it is there, our team will find it. ■

Aneel Waraich

Executive Vice President
STEPPE GOLD LTD. (TSX: STGO)

How much do you expect to produce at Steppe Gold's ATO gold mine?
We are currently in Stage 1, Phase 1. Right now, we are set up to produce 50,000-60,000 oz for 2021, and similarly for 2022. If we did nothing else, or there was a delay that did not allow us to bring the CIL plant online, we would continue to run the oxide mine for another year or two beyond that. The run rate for production once you get the Phase 2 up and running will be ~150,000 oz on a gold equivalent basis, which we believe will translate into a 10 year mine life to start.

What are the benefits and challenges of operating in Mongolia?
STGO does not see a lot of the challenges that others do because of the way we run our business. We consider ourselves a Mongolian company. Our CEO and half of our board are Mongolian, as well as 99% of the staff in country. By being a Mongolian entity, we receive support from all levels – local, provincial, and federal. As a result, we received endorsement from the newly established sovereign fund, called the Mongolia National fund, which put US$3.0 million into Steppe in January 2020.
The Central Bank-backed Gold 2 program, which was created to encourage increased gold production from primary sources also awarded Steppe US$10.5M in debt financing to extend our Phase 2 program. We have been able to mitigate potential risks by operating locally. ■

Hugh Agro

President & CEO
REVIVAL GOLD INC. (TSXV: RVG)

Revival Gold (TSX.V:RVG) announced positive results from a PEA on the company's Beartrack-Arnett project. What did these results reveal?
The operation produces 72,000 oz gold per year at an AISC of US$1,057 per oz of gold, putting Beartrack-Arnett's costs near the bottom end of costs for heap leach operations in the US. In terms of return, the study revealed a 25% IRR after tax at a US$1550 gold price, NPV of US$88 million after tax, increasing to almost US$200 million at US$1850 gold. There is a lot of upside leverage to the gold price as this is a pure gold project wholly leveraged to the price of gold.
The thing that really attracted Revival to Beartrack-Arnett is that it is a brownfield site. We also have the former general manager of the operation on staff, so we have a lot of background information with respect to the site. This means there is relatively low technical and execution risk for the project, and we are in the United States, which is safe from a geopolitical point of view. The other advantage is that Beartrack-Arnett lies an hour's drive from a town of 3,000, which means there is no requirement for a camp or special logistics and inventory management. It is a relatively straightforward project; Revival's team has a lot of experience with the property and the initial capital cost for the first phase restart is modest at only about US$100 million. It's a nice project for Revival to get going to produce cash in the current gold cycle. ■

Jed Richardson

President & CEO
TRIGON METALS (TSXV: TM)

In September 2020, Trigon Metals announced the mineral resource at its Kombat project in Namibia How has this transformed the project?
This has revolutionized Kombat, taking it from a small, interesting project, to something with over half a million tonnes of contained copper. We think there is still a lot of potential beyond that, as the mineralization extends at depth beyond where the resource has been defined, so we are consolidating the land around the deposit.

What have early exploration results at the Silver Hill project in Morocco?
In August 2020, we reported some holes that showed intercepts of 2.5 m of 267 g/t silver with 4% copper, as well as a mineralized halo around the high-grade section. Ee have expanded the strike length to explore down dip from where the initial holes were drilled.
I truly believe at Silver Hill we are on the cusp of a significant discovery. Morocco is really underexplored and has enormous potential. What we are seeing looks comparable to the Sierra Nevada in Mexico, with rich polymetallic silver vein type structures like First Majestic, or the Andean style large bulk-tonnage copper porphyry-related mineralization. ■

THE BATTERY MATERIAL SUPPLY CHAIN

"The hard part is that there have not been any users or processors of battery materials that are resident in North America. You need the downstream to get established in order to justify the capital investment necessary to create the upstream part of it. Fortunately, it seems to be coming together now."

- Don Bubar,
President & CEO,
Avalon Advanced Materials

Image courtesy of Avalon Advanced Materials

The Battery Material Supply Chain

EV DEMAND RECHARGED FOR A PROMISING DECADE AHEAD

Whenever an industry newcomer overtakes its entrenched incumbents it is a compelling story. In the case of Tesla, it now has a market cap topping the largest nine automakers combined (as of January 2021); a signal that the electric vehicle (EV) market is set to fundamentally transform the automotive industry in the coming decade.

In order to live up to this rich valuation, financial markets are anticipating an acceleration of EV adoption, with Tesla dominating sales. This means that demand for lithium, nickel, cobalt and other materials used in the makeup of batteries is set to spike substantially in unison. Unfortunately, in order to obtain the necessary battery materials, North American manufacturers are reliant on potentially adversarial countries, namely China.

Made in North America

In its Made in China 2025 initiative, Beijing identified a diverse array of industries with considerable emerging strategic and economic significance. This included autonomous and electric vehicles, along with the batteries that power them. As outlined in their strategy, the country that leads this transition will set the standards and terms of trade for the future of transportation. Key to leading the transition is ownership of the EV supply chain, from minerals to markets, and China has worked hard to exert vast control over the mining and processing of the critical minerals necessary for the batteries and components in EVs and other advanced fuel vehicles.

China's lead is at present indisputable. More than 70% of global EV battery manufacturing capacity is in China and, of the 142 lithium-ion battery mega-factories under construction worldwide, China will be home to 107 of them, according to Forbes. China also produces more than 60% of the world's cathodes and 80% of anodes for batteries, and the majority of the world's permanent magnets used in EV motors.

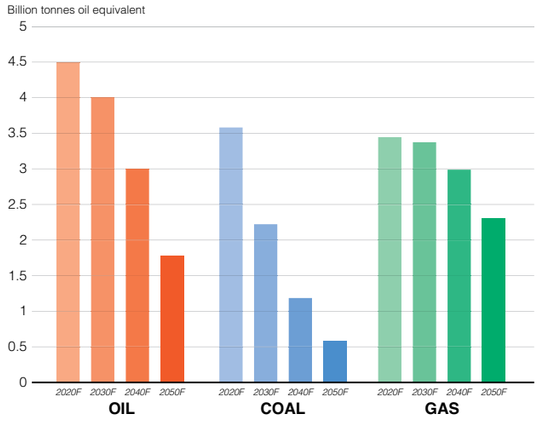
If left unchecked, this dominance will become a strategic vulnerability for North America akin to the oil market being dominated by OPEC. There is also the risk of failing to capitalize on the societal benefits of a push toward zero-emission vehicles, which are anticipated to create an abundance of well-paying jobs.

INCREASING BATTERY METAL DEMAND

Source: Glencore

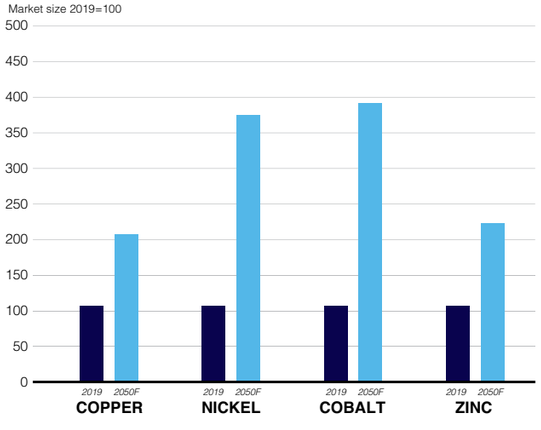
Decarbonising energy demand...

FORECAST FOSSIL FUEL DEMAND UNDER A RAPID TRANSITION 1.5°C PATHWAY



...needs significant metals suply growth...

FORECAST COMMODITY DEMAND UNDER A RAPID TRANSITION 1.5°C PATHWAY



We do not see this as a cycle, but a shift from fossil fuels to cleaner, greener technology.

- Ali Haji, President & CEO, ION Energy Corp.

For this reason, on January 9th 2020, Prime Minister Trudeau and President Trump announced the Canada-US Joint Action Plan on Critical Minerals Collaboration. The plan is an important step in diversifying the supply chain such that North America is no longer a bystander in the global battery arms race. It aspires to secure critical mineral supplies for defense and strategic industries and loop in private businesses. That involves working with industry to facilitate developing investment into Canada and parts of the US where the minerals are located. It is also about making sure that these materials are mined in a reliable, safe and environmentally friendly way.

Companies like Avalon Advanced Materials (TSX:AVL) have been pointing out that Canada's current vulnerability is not caused by of a lack of adequate resources in the ground, rather it is a matter of having the right circumstances in place to be able to develop them. Avalon CEO, Don Bubar suggested: "The hard part is that there have not been any users or processors of battery materials that are resident in North America. You need the downstream to get established in order to justify the capital investment necessary to create the upstream part of it. Fortunately, it seems to be coming together now."

ESG-Friendly Cobalt

One signal of progress in the effort to build a more localized battery material supply chain is the federal government and Ontario's pledge to contribute C$500 million to help the Ford Motor Co. upgrade an existing auto plant in Oakville to work on electric vehicles. In addition to this support, Canada's First Cobalt Corp (TSXV:FCC) secured C$10 million in government loans and grants, allowing it to accelerate start-up and expansion of North America's first cobalt refinery.

The refinery will convert cobalt hydroxide into a pure, battery-grade cobalt sulfate material used by manufacturers of electric vehicle batteries. According to the company's timetable, construction will start in the second quarter of 2021 to boost production capacity at the plant to 55 tons per day, roughly five percent of the world's cobalt refinery capacity.

"The objective is to retool Southern Ontario assembly jobs northwards and marry them to mining jobs. That linkage will require a midstream supply chain including refiners like First Cobalt and cathode manufacturers," said First Cobalt Corp CEO Trent Mell.

Arguably, the timing for these investments is opportune because the World Economic Forum's Global Battery Alliance estimates demand for cobalt used in batteries will grow fourfold by 2030 as a result of the EV boom.

Given that 70% of the world's cobalt is produced in the Democratic Republic of the Congo (DRC), and 15 to 30% of the Congolese cobalt is produced by artisanal and small-scale mining, the commodity is often associated with human rights issues in mining operations. Furthermore, China controls 60% of the refinery supply. These dynamics make the cobalt supply chain inherently risky as companies become increasingly conscientious about how their product materials are sourced. Consequently, there will be attractive opportunities for companies in North America to redefine the supply chain.

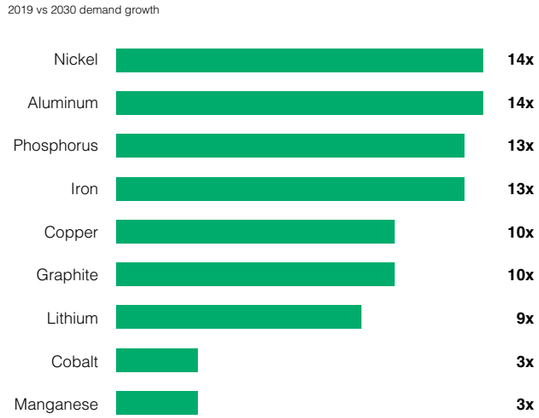
Lithium's sound fundamentals

In 2020, lithium prices managed to snap their multi-year decline and record a 22% rise thanks to ESG and electrification

gaining serious momentum. The EV outlook improved even further for North America after the Democrats clinched control of the Senate and House of Representatives, opening the path for Joe Biden's government to implement an ambitious carbon reduction plan. The US president has pledged in his Build Back Better Plan to install 500,000 EV charging stations; a five-fold increase in the country's EV infrastructure. That scale of buildout could drive the sale of some 25 million electric cars and trucks by 2030, as per estimates by Bloomberg New Energy Finance. That kind of expansion will no doubt provide a huge lift for battery materials like lithium.
Ali Haji, president & CEO of Ion Energy Corp. (TSXV:ION), active in Mongolia with its Baavhai-Uul lithium brine project, noted that one of the silver linings of the pandemic has been a "reset" about how the world uses and consumes energy. Indeed, the decarbonization push is now becoming increasingly global and synchronized, buoyed by stimulus from the European Union's €750-billion recovery fund which devoted €20 billion directly to EV subsidization and gigafactory development in the EU. The UK followed suit with £1 billion for a similar purpose, and the US decided to classify battery metals as metals of strategic importance.
Haji elaborated: "Government spending has caused a vertical integration in the battery metals space unlike anything we have seen in the resource sector, prompting the likes of Mercedes-Benz to invest in a battery manufacturer in China by the name of Farasis Energy, which then invested in an offtake agreement from a lithium producer in Australia."
ION's leadership maintains we are now entering into a green revolution period. "We do not see this as a cycle, but a shift from fossil fuels to cleaner, greener technology," said Haji.
Avalon's Advanced Materials Inc is similarly bullish on lithium and is prioritizing its advanced stage Separation Rapids lithium project. The company signed a letter of intent with Rock Tech Lithium in Northwestern Ontario in fall of 2020 and has stated that the plan is to collaborate on establishing a battery materials processing facility in a central location like Thunder Bay that could serve both companies' needs. They also intend to work with other emerging producers of lithium mineral concentrates in Northern Ontario to convert into battery materials. "The opportunity is a big one for northern Ontario. There are at least 100 similar lithium hard rock deposits in northwestern Ontario that are known already," said CEO Don Bubar.

DEMAND FROM ELECTRIC VEHICLE BATTERIES

Source: Bloomberg

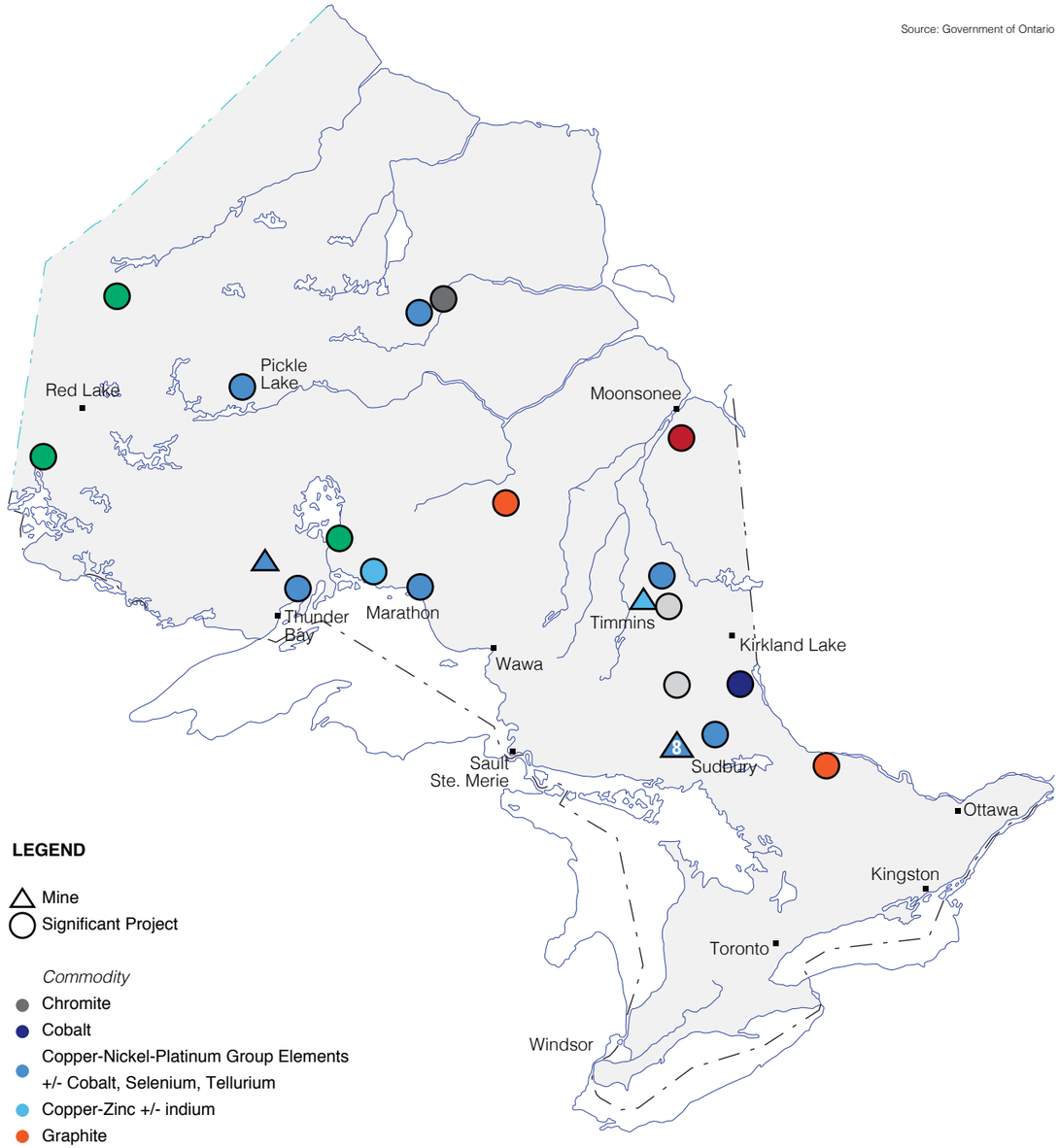


Please Mine More Nickel

"Tesla will give you a giant contract for a long period of time if you mine nickel efficiently and in an environmentally sensitive way" were the words uttered by Elon Musk on Tesla's Q2 2020 earnings call. Nickel makes batteries energy dense so that cars can run further on a single charge, and Tesla needs the metal more than ever as it looks to ramp up production of vehicles that are heavy users of nickel. There are fears that supplies of battery-grade nickel could run short as early as 2023, and BloombergNEF expects a tight balance in the next two to three years as lithium-ion battery demand picks up.
Canada Nickel Company (TSXV:CNC), which has a fast-growing, high-grade, advanced nickel resource at its Crawford project, north of Timmins, responded to Musk's plea by outlining the capabilities of their newly established subsidiary, NetZero Metals Inc. Mark Selby, the company's CEO, asserted: "More than 100% of the supply growth for nickel in the last five years has come from nickel pig-iron mined out of Indonesia, which needs a lot of electricity to be processed, and that electricity is generated from coal. In this context, you need to burn at least 25 tons of coal to produce one ton of nickel, which generates almost 90 tons of CO2 per ton of nickel."
The solution then was to look into how to produce nickel, cobalt and iron with zero-carbon emissions and that is Canada Nickel's intent at Crawford.
The company also feels that Canada and the Timmins region of Northern Ontario in particular is well suited to facilitate the rapid development of its project, which is ranked in the world's top 10 list of nickel sulphide projects. "The Timmins region of Northern Ontario is an established mining hub, which means large-scale mining operations can be permitted and built in a relatively timely manner. We are confident that coming out of the completed PEA and Feasibility Studies we would be ready to advance Crawford's development in a rapid manner to deliver nickel sulphide to the market by the middle part of this decade," said Selby. ■

CRITICAL MINERALS SIGNIFICANT PROJECTS AND OPERATING MINES

Source: Government of Ontario



Ali Haji

President & CEO
ION ENERGY LTD. (TSXV: ION)

Which exploration targets have been identified at the Baavhai-Uul lithium brine project?
The geology of the region is an endorheic basin, which means that all precipitation which has fallen on this basin since the Cretaceous period has never exited to an external body of water. That is indicative of what you would find in the Lithium Triangle, and we believe the mineralization could cover the entire basin.
Our exploration campaign, which started on October 27th, began with Geophysics (CSAMT) testing on the two targets where the initial samples came from, which will give us a sense of where the aquifer lies. We then planned to move on to reflective seismic in late November, which, in tandem with the geophysics work, will allow us to determine the thickness, width and depth of the aquifer body. However, Mongolia had their first community transmission case of covid in November, and since then we have been in lockdown. We anticipate continuing our onsite work in Spring 2021, with drilling to commence soon afterwards. We expect the early exploration results in Q2 2021, and this will give us an indication of what a potential resource could be on this licence.

What were the steps that led to ION Energy's IPO, and how was this impacted by the pandemic?
ION Energy had intended to go public shortly after PDAC in early 2020, but did not have conditional approval from the TSX until April 2nd – a time when the world was very much upside down. The silver lining over the course of the summer came about as governments around the world were feeling the ramifications of economies shutting down and distributed unprecedented recovery funds. One of the primary focuses was a reset in how we use and consume energy. For instance, €576 billion of the European Union's €750-billion recovery fund had a footnote that spoke to sustainability, with €20 billion of this being directly attributed to EV subsidization and gigafactory development in the EU. The UK followed suit with £1 billion for a similar purpose, and the US decided to classify battery metals as metals of strategic importance.

> **Being 24 km from the Chinese border, ION is well positioned to service the largest lithium refiner in the world, which refines 80% of all global lithium, consumes 53% of all lithium, and produces 73% of all batteries.**

This government spending has caused a vertical integration in the battery metals space unlike anything we have seen in the resource sector, prompting the likes of Mercedes-Benz to invest in a battery manufacturer in China by the name of Farasis Energy, which then invested in an offtake agreement from a lithium producer in Australia. ION Energy began its roadshow in August, on the back of what ION believes is a green revolution. We do not see this as a cycle, but a shift from fossil fuels to cleaner, greener technology. By August 28th, we had raised twice the minimum amount required by the TSX, and not only started trading on the venture exchange on August 31st under the ticker ION, but were set to embark upon a fully-funded exploration program.

Considering the noise surrounding the EV market in 2020/21, particularly from Tesla, how do you walk the line between supplying frequent results to the market and preparing sufficiently?
ION Energy will work on its existing licences and then speak with potential strategic partners at a time when we have significantly de-risked our assets and are in a position to transact at a higher currency. We recently acquired an additional licence, Urgakh Naran: Rising Sun, which covers an area of approximately over 19,000 hectares of highly prospective lithium terrain. This acquisition brings the total land area held by ION to over 100,000 hectares, and fits into our long-term growth objectives.
Tesla is a formidable company and exciting to North American investors, but China buys three times as many EVs per capita than anywhere else in the world. Being 24 km from the Chinese border, ION is well positioned to service the largest lithium refiner in the world, which refines 80% of all global lithium, consumes 53% of all lithium, and produces 73% of all batteries.

Where would you like to see the company by the end of 2021?
By the end of 2021, we would like to show that our lithium brine projects are world class assets that can be brought to production fairly cheaply, and can service the growing the demand for lithium in the years to come for this green, clean, energy revolution. ■

Don Bubar

President & CEO
AVALON ADVANCED MATERIALS (TSX: AVL)

Can you provide an update on Separation Rapids?
Avalon's Separation Rapids lithium project remains our top priority and it is an advanced project. Over the last year, we have seen increased interest in establishing new lithium battery materials supply chains in North America as people began to recognize that secure supply of these critical materials for new technology is at risk if we do not start to build these supply chains. Canada has adequate resources in the ground, but the hard part is that there have not been any users or processors of these battery materials in North America. You need the downstream to get established and justify the capital investment necessary to create the upstream part of it. Fortunately, it seems to be coming together now.
As a result, Avalon is accelerating its work on Separation Rapids and we recently announced that we have signed a letter of intent with another aspiring lithium producer in Northwestern Ontario, Rock Tech Lithium. The plan is to collaborate on establishing a battery materials processing facility in a central location like Thunder Bay that could serve both companies' needs, along with potentially other emerging new producers of lithium mineral concentrates in Northern Ontario.

What are the factors that make the development of critical minerals so challenging?
It is a long and very difficult process because of the challenges of finding customers who will commit to buying the materials before you have started production. You must show customers what the product will look like in order to get the offtake commitment, to then justify investing further capital into development. It is a completely different process from traditional commodities, where in the early stage it is just about drilling holes in the ground. ■

Trent Mell

President & CEO
FIRST COBALT CORP. (TSXV: FCC)

What have been the main milestones achieved by First Cobalt in the last 12 months?
First Cobalt has continued to work on its three assets, including our cobalt project in Ontario and flagship asset in Iron Creek, Idaho. However, the most salient accomplishments of First Cobalt in 2020 had to do with our refinery. This has been our core focus because it is the closest pathway to cash flow. Since First Cobalt's interview with GBR in 2019, we have completed a feasibility study and advanced a whole series of work streams including permit amendments, commercial discussions, and financing. The optimized definitive feasibility study (DFS) in September 2020 showed a US$60 million capex and an operating cost which is competitive with our peers – most of which are located in China. . In December 2020, the Government of Canada and Province of Ontario announced an investment of CAD$10 Million in our Refinery in Northern Ontario. In the beginning of 2021, we announced long-term cobalt hydroxide feed arrangements with Glencore AG and IXM SA, a fully owned subsidiary of CMOC, which will provide a total of 4,500 tonnes of contained cobalt per year to the First Cobalt Refinery commencing in 2022.

How do you think juniors in the EV space can balance the need to develop assets thoroughly with a market hungry for quick results?
There is a mismatch between a retail investor that wants news every week and an industry where objectives have a long-term timeline. We need to expect ups and downs, but we are also cognizant that certain investors behave around near-term catalysts. It is best to have a solid base of institutional investors and attract a healthy investor mix that includes mining, technology and ESG investments. As we get closer to production, the First Cobalt story will become ever more attractive for investors within these thematics. We can create shareholder value very quickly because our path to production has a short timeline and low execution risk. ■

ENGINEERING, CONSTRUCTION AND CONSULTING

"Culture eats strategy for breakfast. If you do not have the culture and if you do not have a value set and a purpose, people will not get behind what you represent."

- Zimi Meka,
Co-Founder & CEO,
Ausenco

Image courtesy of Argonaut Gold

Engineering & Construction

TRANSFORMING PRETTY ROCK INTO VALUABLE ASSETS

Today, in mature mining jurisdictions such as Ontario, projects are becoming more challenging, and ostensibly less economical in comparison to those in more fledgling geographies. Yet, in the past two decades there has rarely been a time in which projects in stable jurisdictions such as Canada, the US and Australia have been in such favor with investors. The assumption was that as world–class mineral resources in low-risk areas became exhausted, mining companies would venture into frontier areas, where country risk was increasingly acute. While certain 'riskier' jurisdictions, such as West Africa, have had success in recent years, the 'tier-one' jurisdictions remain the most attractive.

A thriving mining climate in higher cost geographies with technically complex projects would not have been economically feasible without creative engineering. It is also the ability to develop and deploy new technologies along with social and environmental resource planning that is driving an industry resurgence in several Canadian provinces.

James Lill, manager for Eastern Canada at Mining Plus, a mining technical services provider, affirmed this: "Ontario is a jurisdiction that embraces international mining practices and has an appetite for innovative equipment and solutions. The interest to develop projects here is a lot higher than it has been in the past, and we are witnessing more accommodating regulatory legislation to support this."

Lill considers that mine infrastructure planning is a strength for Ontario miners, and the jurisdiction is a leader in this area.

Zimi Meka, co-founder and CEO of Ausenco, echoed Lill's sentiment that Ontario, and Canada in general, is an appealing destination to build, permit and operate a mine. "Working on projects in 70-80 countries all over the world, Ausenco has a very good understanding of the favorable and more difficult jurisdictions. Canada presents itself extremely well."

Ausenco is partnered with Argonaut Gold to build the Magino mine located 14 km southeast of Dubreuilville, and the construction of the US$380-million open-pit gold mine and processing mill is set to begin in Q1 2021. Meka commented: "Ontario has a good process to get projects approved and permitted, and interactions with local communities and governments are well defined and well understood."

Underground Mining Trends

The Northern Ontario Heritage Corporation's grant awarded to Cementation Canada for its innovative method of transporting ore and waste rock from underground mines to surface is emblematic of a widespread push to improve the economics, safety and environmental footprint of underground mining.

Traditionally there are a number of ways to bring ore from an underground mine to the surface, including haul trucks, hoists, or conveying. However, Cementation saw an opportunity that could lower a mining company's capital spend and acted on it. As Roy Slack, director of Cementation America's explained: "Injection hoisting is about pumping ore to surface through pipelines, which lends itself to the concept of continuous mining rather than batch mining."

This involves crushed material, which is pumped through a pipeline in a medium, and once the ore reaches surface, it is separated from the medium and then goes on to the processing plant, while the medium is recycled. According to Slack: "The technology eliminates the need for haul trucks and for a major hoisting plant. If you are accessing from a shaft you still have a hoist to bring personnel and equipment up and down, but you do not need the large rock and ore hoist that we typically put in."

Another trend that is becoming increasingly prevalent underground is battery electric vehicles (BEVs). Because BEVs are still more expensive up-front than their diesel counterparts, it is important to look at the value over the full lifecycle of the unit. Maarten van Koppen, product manager of mine operations at MacLean Engineering, asserts: "This is why a lot of interest is coming primarily from new projects, where we help consultants and customers see what an all-electric fleet would look like versus a diesel fleet. That is where you can start saving on ventilation infrastructure, ventilation costs, and fuel infrastructure that you do not have to invest in."

This is particularly true in deep mines where it is hot. In addition, it can be an important strategy in achieving carbon reduction targets along with providing a healthier and safer environment for the operators in the absence of diesel exhaust fumes.

2020 saw a heightened focus on health and safety, a trend expected to continue in 2021 as Covid-19 cases continue to rise. "We always talk about health and safety, but the mining industry has always really been focused on safety," commented Roy Slack, observing that injury prevention had previously taken priority over health. "Now, the pandemic has dramatically increased the industry's focus on the health aspect, on the challenges of remote work, and on mental health issues," he said, adding that the systems and protocols to prevent workplace injuries have been adapted to prevent the spread of the pandemic.

These systems include technology to monitor worker health, such as Synaptic Technologies' Therm-Assure App. Christina Visser, CEO of Sudbury-based Ionic Technology Group, which consists of six companies, including engineering house Black Rock Engineering and software development firm Synaptic Technologies, explained that Therm-Assure includes a FLIR-equipped Android device which can rapidly screen groups of people for elevated temperatures. On the topic of other pertinent mining trends, Visser observed a resurgence in copper-related automation projects. "This industry has seen an uptick in market activity and as a result, there has been an increased demand in automation for copper refineries." ■

Consultancies advise on innovation

While technologies will open up new ways for mining companies to optimize the value of existing resources or allow access to new ones, they are not the core business of miners, and therefore can be seen as unchartered territory when incorporating them into business models, processes, and potential social and environmental externalities.

Companies like EY, for example, help clients to navigate these challenges and opportunities by applying their Now, Next and Beyond framework, which serves as a guide for enterprise-wide, digitally enabled business transformation. Too often, business transformation is composed of unconnected pockets of experimentation, and this framework helps companies unify these efforts across a company. Theo Yameogo, co-leader mining and metals at Ernst & Young, observed: "Most companies are now less reluctant to adopt digitally enabled platforms for supply chains, with an uptick in demand for things like human resource information systems for payroll and employee management. This is a major shift compared to the industry adoption rate in recent years."

Yameogo suggested that the pandemic has created an opportunity to rethink operating models, with companies exploring capabilities to reduce the gaps between physical and digital. "We hear about more discussions and appetite in equipping key assets and activities with the right technologies that would enable visibility in terms of monitoring performance and even remote operations when the context is appropriate," he explained.

Pierre Labrecque, principal consultant and practice leader at SRK Consulting Canada, also noted a substantial uptick in companies embracing new technology to improve project economics as deeper, lower-grade deposits become more common. "In the past, around seven or eight out of the 10 initial digital twins that SRK modelled for mining companies would confirm that a project would meet the desired production rate, but in the last five years this has dropped down to two or three out of 10… Companies need to start looking at new technologies, primarily automation of material movers like loaders, LHDs or trucks… Most of the new projects we are working on will only work if this is enabled".

ESG at the forefront for investors

In May 2020, Rio Tinto triggered a public outcry when it blew up parts of the Juukan Gorge in Western Australia's Pilbara region as part of an expansion to extract US$135 million worth of iron ore. The fallout after the destruction of the Aboriginal heritage site caused CEO Jean-Sébastien Jacques and iron ore head Chris Salisbury to step down, and will likely result in major compensation after an Australian parliamentary inquiry presents its findings to the Senate.

"The recent outcry over what happened in Australia at the Juukan caves with Rio Tinto raises a broad concern about whether standards are being respected, and that investors have really understood what they are being told," commented Adam Matthews, investment team director for the Church of England Pensions Board, and co-chair of the Investor Mining & Tailings Safety Initiative.

The latest high profile mining disaster came less than 18 months after the Brumadinho tragedy in Brazil left 259 dead

One of the biggest issues for miners in Canada is they cannot discharge the water as they used to in the past, because there are new, more stringent regulations taking effect."

- Eric Lannegrace, Managing Director & Founder, minera Environmental Solutions

after a tailings dam collapsed at a dormant iron mine operated by Vale. In fact, it was this catastrophe that led to the creation of the Investor Mining & Tailings Safety Initiative, led by a group of asset owners and fund managers, including the Church of England Pensions Fund, the New Zealand Superannuation (NZ Super), as well as Swedish and Dutch pension funds. The current group now controls over US$24 trillion in assets, according to Matthews, who stressed that "investors do not invest in a vacuum" and sector-wide reform is necessary if mining companies expect to retain investment.

This sentiment was echoed by Daniel Ricica, partner energy and natural resources at KPMG Canada, who observed that, as long as investors are demanding ESG friendly practices, companies will adopt for fear of being left out of future investments. "If a company cannot access investment dollars because it does not have a well-structured and controlled ESG program, then that is bad business on their part," he stated.

In the wake of Brumadinho, the International Council on Mining and Metals (ICMM) conducted a multi-stakeholder review with investors and the United Nations Environment Program (UNEP), which resulted in the Global Industry Standard on Tailings Management being launched in August 2020.

The investigation led by the Investor Mining & Tailings Safety Initiative revealed that around a tenth of tailings dams – 166 of the 1,635 dams studied — have had safety issues in the past. Considering there are over 3,500 tailings dams globally, the challenge at hand will require buy-in from all parties, and not just the larger ICMM member. Tom Butler, ICMM CEO, weighed in on the subject: "I have spoken to a number of companies and private equity funds who invest in smaller companies who have made it clear to the companies they invest in that the Standard must be adhered to."

Butler also added that the UN has had a lot of interest in the Standard from countries who want to make sure that this is applied.

For Doug Morrison, CEO of the Centre of Excellence for Mining Innovation (CEMI), the industry must recognize that the increasing delay in getting approval for mining projects is almost always related to environmental impact. Moreover, the failings at Brumadinho and Samarco were the result of a flawed approach to tailings management. "Nothing about the nature of these tailings ponds was going to change by simply leaving them there. If you rely on human beings to execute perpetual care and maintenance for decades, if not centuries, eventually mistakes will be made."

Morrison suggests that the two mainstream methods of tailings management – subaqueous deposition and dry stacking – are set up to fail as they require perpetual human intervention. CEMI's Mine Tailings Consortium has come up with a radically different way to manage tailings, by splitting the waste stream into two in an SST process (separation, sequestration and treatment). "Secondly, we were looking for a useful way to use the benign tail that is left behind, and once the contaminated material has been recycled or stored, then the benign material can be used for agricultural purposes," elaborated Morrison.

Navigating Water Regulations

Typically, as mining projects become more complex and markets more knowledgeable, increased community and regulatory engagement is involved. As a result, companies must be skillful in managing water because it affects the economics of the project and it is essential in gaining social license to operate.

Stephan Theben, mining and minerals sector leader Canada at SLR Consulting, a firm that specializes in integrating the mine operators, engineering and ESG components of a project, stressed the importance of having a good water management strategy: "There are very few mining projects where water is not a key social and environmental issue, or even the main one. Either there is not enough water, often the case in South American projects, or there is too much water, as is the case often in northern climates such as Ontario and British Columbia. Understanding water is key to maintaining and securing the support of local communities, avoiding unanticipated capital expenditures and limiting post-closure liabilities," he said.

When asked how the mining sector's view on water has changed in recent years, Eric Lannegrace, founder and managing director of minera Solutions, replied: "Water treatment is now taken seriously and upstream of any project. It is a result of having more regulation. It is also that there is a greater sense of awareness of those environmental issues that threaten mining companies. They are tackling the challenge head on and trying to take the best course of action."

Inevitably, one of the factors driving increased diligence pertaining to sustainable water practices is the implementation of more stringent regulations. The metal and diamond mining effluent regulations (MDMER) are taking affect in 2021, and this will limit unionized ammonia. This means that if Canadian mines discharge unionized ammonia at a concentration higher than the new limit, mine owners will have to make additions to their treatment systems, which could include adding new filters. "Mining companies are implementing more and more biological systems in order to treat for this ammonia. As always, because of the nature of the business, they have a lot of total suspended solids (TSS) that are in the water. Overall, there are a lot of opportunities related to TSS, metals and ammonia in Canada," Lannegrace acknowledged. ■

Zimi Meka

Co-Founder & CEO
AUSENCO

We will also be looking to grow our consulting business, in particular in environmental services, and we are looking closely at potential acquisitions.

Can you provide an overview of how Ausenco has evolved and expanded its presence globally?

We founded Ausenco in 1991 in Brisbane. The first 10 years were tough, because there was a recession in the mining industry and consequently, a lack of business around. The key decision we made was to take our business abroad in 2002. We followed our clients, building projects in Africa and Asia, and felt that we had a market offshore where Ausenco could prosper. We spent the next 5-10 years looking at opportunities on how to develop Ausenco's presence in the Americas, because we saw the region as an important part of our business moving forward. In 2008, we bought three businesses which gave us a presence in Canada, US, Chile and Peru.

One of the deals was the acquisition of Sandwell, which gave us the footprint we needed in Canada. 35% of our revenue now comes from Canada and about 45% from South America, which validates the risks we have taken over the years.

Can you shed light on the challenges of operating in Canada and how it compares with other jurisdictions?

Canada presents itself extremely well. It has a good process to get projects approved and permitted, and interactions with local communities and governments are well defined and well understood. We have done a lot of work in Ontario, British Columbia and Alberta, and our experience has been very positive. In Nova Scotia and Yukon, Ausenco has brought local people in and worked with the local suppliers and contractors, who have all been good and consistent.

Rising costs remain on the radar across the industry. Do you agree that this is an immediate risk?

We are not seeing that sort of pressure on basic costs. The longer we stay in lockdown, perhaps the more pressure we will see because it is pretty hard to move labor across borders. For example, Western Australia is closed to the rest of the country and, with the iron ore price where it is and production where it is, they are short of workers and they cannot bring them from the rest of Australia. In that situation there is pressure in that specific location. However, if the borders were open I do not think we would be seeing that pressure. Moving forward, I think with all of the printing of money and quantitative easing, we are probably going to see some inflationary pressures come through, but that it is yet to come.

What would you say are the key ingredients of building a successful global team?

Very early on, we identified that we wanted Ausenco to have a specific culture and value set and we created a framework on what our values meant. We talk about it constantly. For example, at every company meeting, before we begin, we have what is called a values model. Here someone shares an event, recognizes people or a specific situation or some innovation that exemplifies our values. Then you overlay the purpose; and that is about finding a better way to do things and solve problems. We are always asking, is there a better way?

What are the key milestones Ausenco is looking forward to reaching in the next two years?

From a project perspective, successful completion of the Magino project for Argonaut will be big for us. We also have a project in Chile that we are about to announce, and that we are very keen to make sure is successful. SilverCrest in Mexico is another particular beachhead for the company.

From a corporate perspective there are a lot of opportunities, we just want to make sure we do great work for our clients and maintain the integrity of the Ausenco brand. We will also be looking to grow our consulting business, in particular in environmental services, and we are looking closely at potential acquisitions. Lastly, Ausenco has some exciting things happening in the coal space that are a little off the track, but very innovative and different in terms of green energy. ■

Roy Slack

Director
CEMENTATION AMERICAS

In February 2020, Cementation Canada was awarded the Northern Ontario Heritage Corp. grant for its innovative way of transporting ore and waste rock from underground mines to surface. Can you explain injection hoisting to us?
Traditionally there a number of ways to bring ore from an underground mine to the surface, including haul trucks, hoists, or conveying. Injection hoisting is about pumping ore to surface through pipelines, which lends itself to the concept of continuous mining rather than batch mining. It involves crushed material, which is pumped through a pipeline in a medium, and our original proposal was to use a mud-style medium (a viscous material instead of water) that lifts the ore to surface. Once the ore reaches surface, it is separated from the medium and then goes on to the processing plant, and the medium is saved. The pipeline gives you a continuous loop, where ore is entered at the bottom, injected into the system, and then separated at the top. The next step to develop the technology is a full-scale demonstrator model, and we would like to find a partner to put this technology in a mine and test it.

If injection hoisting becomes popular, how would it change underground mines?
The technology would eliminate the need for haul trucks, and eliminate the need for a major hoisting plant. If you are accessing from a shaft you would still have a hoist to bring personnel and equipment up and down, but you would not need the large rock and ore hoist that we typically put in.

What are some of the standout projects Cementation Americas has worked on in the last 12 months?
Glencore's Onaping Depth in Sudbury is a standout project for the company. We first worked on the engineering of the project in 1998, and the shaft is actually being sunk now. Cementation has been working in partnership with the Kitikmeot Inuit community from Nunavut for 15 years, starting and still working at Diavik for Rio Tinto, and now working with them at Hope Bay for TMAC and Amaruq for Agnico Eagle. We also completed Resolution Mining's deep number 10 shaft, and have been brought back to work on the number 9 shaft.
Within the Cementation umbrella, Merit, our construction management group, has been involved with the construction management of Continental Gold's Buriticá project in Colombia, and Terra Nova Technologies (TNT), which works with large-scale material handling systems, have developed very efficient systems to move dry-stack tailings. Cementation and TNT recently combined forces to carry out a successful material handling system project for Newmont at their Musselwhite mine in North Western Ontario. The concept of providing a wider range of service offerings to clients also provides the opportunity for turnkey and design build solutions.

Considering mining is as an essential industry, and governments will be eager to revive economies, do you think we could see more streamlined processes to move from exploration through to production?
Canada has some unique challenges. Mining works under both provincial and federal law, so the rules are different depending on the jurisdiction. Perhaps the most high-profile case of challenging project development is the Ring of Fire, which has been on the table for many years and involves a lot more than just a permitting process. Infrastructure, indigenous partnerships and community impacts all come into play. Location is particularly important. If you are looking at a drilling program in a well- established mining community, that is one thing, but areas like the Ring of Fire are not as simple.
While every jurisdiction would like to speed up processes, if I take off my mining engineer's hat and think as a father or grandfather, we do not want to speed things up to a point where mines are rushed and mistakes are made. Furthermore, as a taxpayer, why would I fund a mine where the stock holders and senior management are going to make all the money? Québec decided to take a stake in projects instead of simply funding them, which is an interesting approach from the perspective of a taxpayer. ■

> **Injection hoisting technology would eliminate the need for haul trucks, and eliminate the need for a major hoisting plant.**

Theo Yameogo

Co-leader –
Mining and Metals Canada
ERNST & YOUNG LLP

To what extent has the pandemic been a catalyst for technological adoption in mining?
The first thing that stands out is the adoption of digital and tele-remote work. Historically, the culture has favoured face-to-face, "human touch" interactions between stakeholders, however, the arrival of Covid-19 has challenged that approach. The environment has accelerated quickly with a move to distributed workforces, but also the adoption of technology that enables those workforces to work effectively.
We have noticed that most companies are now less reluctant to adopt digitally enabled platforms for supply chain — with an uptick in demand for things like human resource information systems for payroll and employee management. This is a major shift, compared to the industry adoption rate in recent years. Companies are further exploring capabilities to reduce the gaps between physical and digital. We hear about more discussions and appetite in equipping key assets and activities with the right technologies that would enable visibility in terms of monitoring performance and even remote operations when the context is appropriate.

Decarbonization and Green Agenda routinely land near the top of EY's opportunities and risks list. How does this influence the actions of mining companies?
While prevalent before, the ESG discussion has really morphed since the beginning of 2020. Covid forced the world to shut down a lot of its industrial production, and social media played an important role in driving the discussion on how the environment would fare better in a reduced carbon footprint world. Whether a consequence or just by coincidence, we're witnessing a renewed push by some shareholders for mining to embrace ESG principles and to act on becoming less energy intensive, more environmental-friendly and more community-supportive. In speaking with industry executives, we are learning that although productivity and capital allocations are still on the agenda, more and more pressing questions and demands have risen about ESG — including health and safety performance, sustainable support from communities, environmental protection, tailings, energy sources and energy use.
Our top 10 business risks and opportunities report confirms that mining and metals executives would agree that a focus on ESG and decarbonization are critical to sustain a competitive advantage and build stronger license to operate.

Can you speak to the role that metals will play in the global transition toward renewable energy?
Every industrial revolution or civilizational transformation has been somewhat anchored on mining and metals: The Stone, Bronze and Iron ages, gold rushes, coal in the first industrial revolution, silicon for processors and, of course, copper for economic development today. With the transition to renewable energy being played out, the world is seeking transition metals — including copper, aluminium, nickel, cobalt and lithium. The difference between today and past industrial revolutions is that today's consumers have a heightened awareness of, or the strong desire to know, where and how mining sources the materials. Miners must be cognizant of the growing trend toward ethical sourcing. It's not impossible that sourcing becomes a key differentiator that would drive premium pricing; in which case, a de-commoditizing era might open up for what we call "commodities" today.

Many of the most esteemed voices in the field of AI research have come out of the University of Toronto. How are these breakthroughs being applied and adopted by mining companies?
A major hurdle mining and metals companies face in effectively adopting AI and other emerging technologies is culture and education. While many companies understand that digital transformation is critical to sustainable productivity and margin improvements, they're strapped with the challenge of getting employees to understand and embrace the upside of digital ways of working.
If we take exploration, for example, there's a lot of previously collected geological, geochemical and geophysical data available that can be leveraged to support the advanced definition of drilling targets. For an industry that prides itself in good geosciences, geological targets and rich orebodies, exploration is definitely a good candidate for machine learning. The industry needs to continue to build use cases around the adoption of machine learning in exploration to help address the hesitations and cultural barriers that exist today.
Companies cannot dismiss the importance of having a strong culture to foster innovation and technology adoption among all employees — from the boardroom to the front lines. Luckily, as more employees work remotely and use digital tools to access information, the culture shift is already starting to take place. Companies now will need to continue the momentum forward to drive a digital-centric culture. Once culture and education gaps are overcome, AI can be a tool that has the potential to be transformational for the industry. ■

Pierre Labrecque

Principal Consultant & Practice Leader
SRK CONSULTING CANADA

What led to the merger between Labrecque Technologies and SRK in 2018?
Prior to the merger, we had done 10 to 12 projects together between SRK's Sudbury and UK offices, and the values of the two companies really clicked.

Can you provide an example of a standout project you have produced a simulation model for?
The most significant project is Oyu Tolgoi (OT) with Rio Tinto. This includes numerous iterations of the mine design, simulating the entire life of mine (LOM) of the block cave from the initial development until the last tonne of ore is extracted from the draw point. The model includes all the simulation and development activities on the undercut, extraction, haulage and ventilation levels, and all of the material handling components such as crushers, bins, conveyors and skips.
Hundreds of trade-offs and dozens of decisions at OT have been made due to the modelling work we have done. SRK is also involved on the structural geology and geo-mechanics side of OT, and we have been collaborating with these teams integrating this into our simulation work.

Why do you think new mining technologies have gained traction in recent years?
A lot of mining projects are becoming more challenging, with existing mines going deeper and older mines moving further away from their existing infrastructure. This is compounded by rising costs and more pressure from shareholders for greater returns. In the past, around seven or eight out of the 10 initial digital twins we modelled for mining companies would confirm that a project would meet the desired production rate, but in the last five years this has dropped down to two or three out of 10. Therefore, to achieve the desired production rates, companies need to start looking at new technologies, and primarily automation of material movers like loaders, LHDs or trucks. The bottom line is, by taking advantage of this technology, you are able to get a higher usage rate and produce ore for more hours each day. ■

Stephan Theben

Mining & Minerals Sector Leader – Canada
SLR CONSULTING

Can you introduce SLR Consulting and explain the company's presence in Ontario as well as its global footprint?
SLR is a global leader in environmental and advisory solutions. We help clients across the globe achieve their sustainability goals, and have more than 8,000 live projects at any one time, across 125 countries, with more than 1,600 employees worldwide. The services that we provide are advisory, engineering, environmental management, planning and approvals. In terms of sectors, we work with government, energy, finance, infrastructure, mining and power – including alternative energies.
In Ontario, SLR has 135 staff members across four offices: Toronto, Ottawa, Markham and Guelph.

What is the range of solutions that SLR offers the mining industry?
Our key role is integrating the mine operators, engineering and ESG components of a project. What is often lacking in mine management is interaction between these parties and it cannot be emphasized enough how these interests being balanced contributes to a project's success. SLR also works a lot with tailings dam designs, audits and technical reports for mine closures, and we have been doing a lot of due diligence work for projects in Central and South America.
The scope of ESG in mining has widened significantly in recent years, but it is nothing new for the industry – even if the term is recent. Conducting operations in a way that is mindful of communities contributes to a company's credibility in the market and towards lenders.

Which strengths do you think make SLR Consulting stand out from its competition?
We understand how we fit into the big picture. We find the best package that makes sure that all parties are satisfied and are mindful of all possible considerations such as costs, schedule and environmental commitments. ■

James Lill

Manager – Eastern Canada
MINING PLUS

Prior to joining Mining Plus you worked on the budget planning aspect of mining. How are companies currently dealing with this considering the high metals prices?
The impact of the downturn is still in the industry's memory, as a lot of value was destroyed during the previous boom cycle. As a sector, we are very happy with strong precious metal prices, but there is still an air of caution. There is interest among mid-tiers and juniors to upgrade their technical studies – but we are not seeing a boom period mentality, and companies are looking to consolidate their current portfolios instead of expanding them aggressively. Nevertheless, metal prices have certainly returned interest to some projects that were previously on pause. Mining is experiencing a positive period given the value creation and the interest from investors. We are seeing strong disposition from clients to invest in their assets and in long-term strategic planning, albeit in a conservative and rational way.

Do you think that mining companies are becoming more receptive to new technologies these days?
Adoption of new technologies has definitely accelerated. Mine automation is on the agenda of many mine operators and Mining Plus leans on its experience from Australian markets to guide and support miners in North America. Additionally, an embrace of electric and battery-operated vehicles in North America has been noteworthy. Product offerings such as those from Artisan quickly cemented themselves as real practical substitutes for diesel machinery. While the capex is higher for some of this equipment, the future savings companies can make will more than compensate.
In automation, production haulage over shift-change is an industry trend and focus that is providing a lot of value added, with 15% productivity improvements in tele-remote loaders, development and long-hole drilling. These factors are now being considered from the project stage, including communication technologies such as LTE which give automated equipment better leverage. ■

Christina Visser

CEO
IONIC TECHNOLOGY GROUP

Can you provide a brief history of Ionic Technology Group and the companies that make up the group?
Ionic Engineering was started by Steve Matusch in 1998. Twenty years later, it's a group of six companies. Ionic Engineering is now Ionic Mechatronics, which specializes in automation for mining as well as for heavy and medium industry. Ionic Automation, which started as a satellite office in Cambridge, Ontario, has its own assembly shop and focuses on medium and lighter automation for the auto and medical industries. Over time, we also developed Variant Mining Technologies which designs and supplies mine loading chutes and rail haulage solutions. Additionally, Ionic's engineering group was spun off as Black Rock Engineering in 2014. Ionic Tecnologias in Chile serves the South American market. Finally, Synaptic Technologies is the company's newest branch which focuses on custom electronic devices and software development for mining and other industries.
Ionic's business model and philosophy is that when a product or line or business reaches a certain size, spinning it off into a specialty division helps maintain a specialized focus. That is what we plan to do with SafeBox, which is currently part of Ionic Mechatronics.

What led Ionic to expand its workshop facility in 2020?
Ionic Mechatronics' and Ionic Automation's facilities consist of an office at the front and a large assembly shop at the back. They were always designed to be expandable as the companies grew to need more space. Ionic Automation doubled shop space a few years ago, and now it is time for Ionic Mechatronics to do the same. The plan has been in place for over a year and we have decided to go along with it despite the pandemic and the wider business context. The decision came down to space, which we need to execute multiple and larger projects. ■

EQUIPMENT AND INNOVATION

"If we are going to electrify the economy and tackle climate change, we need to be producing metals at a lower cost to compete with cheap carbon. The only way to do this is through innovation and changing traditional methods that have been in place for years."

- Doug Morrison,
CEO,
Centre of Excellence for Mining Innovation (CEMI)

Image courtesy of James Hodgins, Mining Industrial Photographer, for MacLean Engineering

Embracing the Zoom Economy

COVID HAS ACCELERATED TECHNOLOGY ADOPTION IN AN INDUSTRY RELUCTANT TO CHANGE

As a result of largescale dislocations in society, companies are forced to think differently about how to solve a problem. The pandemic, along with increased pressure from ESG funds, has necessitated a much more open-minded approach from the traditionally reluctant-to-change mining community.

Doug Morrison, CEO of the Centre of Excellence for Mining Innovation (CEMI), observed that prior to the pandemic taking hold, mining companies would often dismiss technologies, commonly expressing that they are uncomfortable with embracing fast paced change. In spite of this hesitancy, Morrison asserts: "The inertia that Covid has brought about creates the opportunity to make changes happen – if the will is there."

The most obvious transformation occurring over the past year has been that companies have had to adapt and reconfigure workflows to function remotely. While this has been an enormous challenge in some ways, it has also presented an opportunity for inventive companies to solve problems for customers. One such company is Centric Mining Systems, which offers a suite of software tools that integrates data across ecosystems, giving mining companies a clear view into the performance of their mine.

Centric's CEO, Chris Novak, explained that traditionally the answer to many problems in mining has been to send somebody underground or into the pit. However, because of travel restrictions, these people may not be on site, and because of health reasons, they may not want 10 people clustered into a stope. "The concept of using predictive and prescriptive analytics – utilizing technologies like AI to make decisions or recommendations – is now becoming accepted. To do this successfully, you must have a well-managed information support framework," stated Novak.

Although remote work has been instrumental in enabling companies to continue their operations as normally as possible throughout the pandemic, mining remains a hands-on job. It is essential, therefore, that when employees are present at the mine site, the work environment has precautions in place to ensure the health of workers. This is critical for the sake of fellow employees, their families and the neighboring communities.

Minetell, originally founded to gather intelligence that provides decision-makers with information that improves critical control performance and minimizes exposure to material risks, was able to create a focused version of its enterprise SaaS risk management platform that exclusively measures COVID-19 risk and control performance. According to founder and CEO, Michael Hartley: "By late April 2020, Minetell had the capacity to screen hundreds of people coming in and out of a mine site on a daily basis. This is typically a time-consuming process that is often circumvented. In doing this, Minetell has been able to provide reasonable assurance that healthy people are coming into a healthy work environment."

Despite the pervasive chatter about innovation being suddenly embraced due to the pandemic, CEMI's Morrison expressed concern that most of the changes that mining companies have made were with respect to coping with the constraints Covid imposed, rather than improving operations. In his view, the two things are not disconnected, as the future of the industry depends on moving to more autonomous, continuous, production systems. "It is still difficult to see how the mining industry will be able to recruit the necessary talent to push this change forward if the job on offer is working 10 hours a day in the dark, underground, on your own. Repetitive tasks that are currently done manually should be done by the equipment itself, and the people managing this technology should be able to work remotely," Morrison stressed.

Automated everything

It is becoming exceedingly clear that automation of the different processes within a mine stands to be a key driver of profitability and safety in the coming years. Human error is always a substantial risk and, compared to the decision-making time of even the brightest, most alert human operator, the ability of self-operated machines to avoid collisions or notice problems far exceeds any human. This can be said for many tasks within a mine. As a result, companies like Drone Delivery Canada (TSXV:FLT) are developing autonomous technologies that are quick to react in any crisis and are able to access difficult and dangerous areas of a mine. The company has a fleet of unmanned drones that cover a range between 30-200 km and can handle payloads between 4.5 kg for their smallest drone called the Sparrow, while their largest Condor model can haul 180 kg of load.

Michael Zahra, president and CEO of DDC remarked: "There is a strong case for drones in any situation where access is difficult for a variety of reasons, be it distance, quality of roads, seasonal roads, and these are challenges many mining sites face in Canada."

Zahra continued, outlining that if a company has a large open pit mine with a C$10 million earthmover machine that is down in a remote part of the mine, as it waits for a C$2 part, every minute that it is holding up a billion dollar mining project is costly. "If DDC can transport that replacement part to the earthmover with a drone in five minutes versus somebody in a truck that will take an hour or two, there is real value in choosing the drone. Time is money or time is lives depending on the situation," he said.

> *When the pandemic hit being able to manage the virus was the difference between operating and care and maintenance. The problem most companies face is not knowing when to act – whether it be case management or a failing control.*
>
> ***- Michael Hartley, Founder and CEO, Minetell***

The drones are also able to carry specialized cameras and sensors capable of detecting gas leaks, estimating inventory and stockpiles and performing inspection in high-risk areas.

Another company innovating in the autonomous drone space is SafeSight Exploration. Safesight is attempting to leverage its drone innovation to create a series of underground transformations in shaft maintenance, as well as standard ground-support areas. To achieve this, SafeSight has a trifecta of services that utilizes Lidar and high definition video technologies in drones, ground-based vehicles, rails and robotics. The company has partnered with Agnico Eagle, IAMGOLD, Pan American Silver, Wesdome, Barrick and Vale and is also involved at several of Newmont's sites.

According to SafeSight president, Mike Campigotto: "The same crew can do 300 surveys per year where they previously did 100. There is three times the digital data to make decisions around reconciliation, compliance and GUAC modelling – which changes the operational flow."

Importantly, the technology is becoming tailor-made to each project and, whereas traditional forensic shaft assessments take 36 hours, SafeSight's technology can do the same process in four hours, without human risk.

Other companies, such as Maestro Digital Mine, are developing products with a vision to change the way underground mines communicate. By stripping out complexity in the automation sector and by utilizing Industrial Internet of Things (IIoT) devices and solutions, the company recently released its Zephyr AQS air quality station, which was designed as a lower cost IIoT device that fills 75% of the applications of its flagship Vigilante AQS. Thus far, the product has performed remarkably well and is one of the reasons the company recorded record sales in 2020.

When asked about future product development opportunities, Michael Gribbons, co-founder and CEO, noted that Maestro identified a strategy wherein they are seeking to automate anything IIoT that is used in a mine and is considered a fixed asset. "Pumps, ore passes, crushers, fans, doors, regulators, paste fill, hydraulic oil, fuel, compressed air, potable water systems all need automation. All require expensive and complex PLC or DCS systems to integrate and control. Maestro will continue to combine embedded firmware and hardware IIoT edge based devices that strip out this complex and expensive equipment," Gribbons affirmed.

As for the OEM's, underground mining equipment solutions provider Maclean Engineering sees big opportunities in automation over the coming five years. "We believe that it will not just be every OEM working in isolation, but rather, there will be a large degree of interoperability so multiple OEMs can work on the same platform," said Maarten van Koppen, product manager-mine operations at MacLean.

In fact, MacLean just commissioned a system at Newcrest's Cadia mine in Australia, where its water cannon works with its own teleoperation system within the Epiroc Mobilaris traffic management and safety system. "This means that the customer does not end up with a multitude of different systems. Instead, they can utilize what is already being implemented on-site and bring more value to the customer," van Koppen elaborated. ■

Doug Morrison

CEO
CENTRE OF EXCELLENCE FOR MINING INNOVATION (CEMI)

Do you think the pandemic has brought about a shift in the way mining companies think about innovation?
Most of the changes that mining companies have made have been to cope with the constraints that Covid has imposed, rather than to improve operations. The two things are not disconnected, as the future of the industry depends on moving to more autonomous, continuous, production systems. However, that will take a particular focus to accomplish, and it is still difficult to see how the mining industry will be able to recruit the necessary talent to push this change forward. Repetitive tasks that are currently done manually should be done by the equipment itself, and the people managing this technology should be able to work remotely.
If we are going to electrify the economy and tackle climate change, we need to be producing metals at a lower cost to compete with cheap carbon. The only way to do this is through innovation and changing traditional methods. Disruption is not comfortable, but it is required if real progress is to be made.

What led CEMI to consider a new approach to the issue of tailings management?
The industry has to recognize that the increasing delay in getting approval for mining projects is almost all related to environmental impact. This is all the general public really cares about. If you have failures in the 21st century that kill nearly 300 people, that is not a perception issue. These facilities at Brumadinho and Samarco had been out of production for many years, and nothing about the nature of these tailings ponds was going to change by simply leaving them there. ■

Ryan McEachern

Managing Director
MINING SUPPLIERS TRADE ASSOCIATION CANADA (MSTA CANADA)

How has MSTA CANADA helped its members through the pandemic?
MSTA CANADA quickly assumed the role of being a source of clear information, helping members understand government support and its implications.

Have you noticed any positive industry trends that have emerged in the last six months?
While the pandemic has been a great challenge, a positive take away is that it has helped demonstrate to governments the economic importance of the mining industry.
In addition, as a result of the pandemic, there has been an acceleration in the adoption of technology to accommodate working remotely. This has become the norm for many people and the practical benefits have become increasingly evident. These new technologies have shown companies the potential and realization in the reduction of costs.

What were the main factors driving business demand for mining suppliers in 2020?
2018 and 2019 were banner years for many mining suppliers thanks to a revival in the mining industry, and there has been a continued focus on equipment and technology that will reduce energy intensity, reduce water consumption and reduce the overall environmental footprint of an operation. In 2020, health and safety (H&S) protocols related to pandemic mitigation and contagion prevention have been the top priority and will become permanent even when Covid-19 is surpassed.

Do you have a final message?
In moments of uncertainty it is worth considering the benefits of union and industry collaboration. MSTA CANADA remains a pillar in the mining suppliers' ecosystem where companies can look to the association to connect them to opportunities to grow their business. I believe 2021 will be a pivotal year with huge upside and interesting opportunities as economies rebound and industry practices are reshaped at an accelerated pace. Technological advances in the use of artificial intelligence, remote work as well as health and safety protocols will be key to innovation in the mining supply and services sector. ■

Paul Bradette

Executive Director
MINECONNECT

What is the mission of MineConnect and what are some of the current initiatives the organization is undertaking?
Our mission statement is: "Suppliers of choice to the world." All of MineConnect's market initiatives are designed around one thing – to help our companies grow their business either regionally or on a global scale. For example, we have recently initiated a lead generation campaign, whereby we drive potential customers to our "Find a Supplier" button where we have categorized the mining industry into twelve specialty areas. If you are a mine operation in Mexico looking for solutions around ventilation, you click on the ventilation tab and it provides you with each of the related categories. We developed this software as a free tool that showcases our members to both regional and international markets.
In our trade program, we actively engage with mine operators around the world, and invite them up to Northern Ontario to visit our suppliers and technology providers firsthand. The Norcat Fecunis mine, an underground R&D facility, has become a great venue for us to bring international buyers into the location where all these companies are showcased. Last August, we invited Codelco to northern Ontario to visit our suppliers within the battery electric space. From that visit, we were invited back to Chile with ten member companies to tour six different mines there. MineConnect provides an opportunity for a soft landing into new markets, and that is one of our primary mandate. We are also working on opening an office in Nevada, planned for March 2021. We will have employees in that storefront, so if one of our companies wants to visit, we can facilitate meetings for them, as well as be there to promote the MineConnect brand and what our members can bring to any mine development.

What impact do MineConnect members have on the economic development of Northern Ontario?
MineConnect members employ upwards of 8,800 Northerners. Our members alone, generate upwards of C$3.5 billion in total revenue, and about 20% of that is export driven. For context, the total output from Ontario mines is roughly C$10.9 billion per year. In general, there is over five hundred companies that employ around 22,000 northerners and generate about C$7.7 billion. The mining supply and services cluster makes up a large piece of this economy, and the supply chain has a significant impact. ■

Don Duval

CEO
NORCAT

Can you speak to the role NORCAT underground center plays in validating new technologies and training workers to operate them?
Located in the City of Greater Sudbury, NORCAT is the only regional innovation centre in the world that has an operating mine designed to enable start-ups, small / medium enterprises, and international companies to develop, test, and showcase innovative and emerging technologies in an operating mine environment.
Our priority is to become the global "one-stop shop" for all that is the future of mining technology, innovation, and skilled labour training and development.
The NORCAT Underground Centre has become the global destination to see the emerging technologies that are poised to transform the mining industry. In doing so, we have helped build and support Canada's global reputation as a market leader in the mining industry. Using this "active laboratory", we help to connect and broker relationships between mining technology companies (the "builders" of innovation) and global mining companies (the "buyers" of innovation) creating an ecosystem like no other in the world.

Can you provide some examples of innovative technologies currently being tested at NORCAT's facility?
On an annual basis, we support approximately 50 projects, be they development, testing, and / or demonstration, from nearly 40 different mining technology companies. What is equally important, is we host, on average, one mining company per week eager to see "What's Next" by visiting and touring the NORCAT Underground Centre. As a result of this activity, we have helped to create multiple "ecosystem collaborations/partnerships" to develop new products and ultimately get business done. ■

Ontario Leads the BEV Revolution

While many parts of the world are just beginning to embrace battery electric vehicles (BEV) in mines, OEM's operating in Canada are all familiar with their capabilities and potential. "Northern Ontario was the first to have a company develop a battery electric vehicle for underground; we were the first region with a mine to adopt it, and we are home to the first all-electric mine worldwide. This technology is a real step changer for the industry. It should enable us to get greener and go deeper into deposits, while also protecting the health and safety of employees working in the mines," proclaimed Paul Bradette, executive director of MineConnect.

Northeastern Ontario is a hotbed for electrical equipment, with Kirkland Lake Gold's Macassa, Newmont's Borden and Glencore and Vale in the Sudbury basin all investing heavily in the technology. Contributing to this push toward electrification is the fact that heavy pressure is being put on mining companies to be greener and improve on their ESG performance. As a result, many companies now have aggressive decarbonization targets. For example, Newmont is looking to achieve their targets by increasing the underground asset portion of their portfolio. "Underground mining, combined with battery electric vehicles (BEVs) that have almost zero emissions can play a big part in limiting carbon emissions and, from a macro perspective, it makes economic sense," said MacLean Engineering's Maarten van Koppen.

Liebherr a leading manufacturer of construction and mining equipment looking to grow its presence in the Canadian market, has also noticed a push for sustainable equipment. Tom Juric, divisional director mining at Liebherr-Canada, observed: "Customers are now asking what we are doing to decarbonize them, because ultimately, with respect to the mining houses, they can only bring so much. It is up to the OEMs and the technology partners to solve the decarbonization issue. Pretty much every company that we are talking to in Canada has decarbonization in their top five priorities."

Juric also noted that each company has a slightly different perspective on the direction they want to take their business in terms of achieving their objectives. As a result, OEM's have to hedge themselves in the way in which they bet on technology. He concluded: "The panacea that everybody is waiting for is in battery technology. If I look at our equipment right now, every single one of Liebherr's mobile pieces of equipment has the capability to adapt battery power in some way, shape or form. The trouble is the power density versus weight and size of the battery. We are not currently looking at developing our own battery tech. Instead, we are looking at partnering with others."

SME's & Startups: Devoted to transformation

One of the inherent strengths of Canada and in particular Ontario, is its devotion to fostering an ecosystem of new technologies, which provides miners with the tools they need to mine profitably, safely, and in an environmentally friendly way. With many of the largest mining companies in the world operating in Ontario, it is a great opportunity for small and medium-sized enterprises (SME) to see their products being deployed in some of the world's most important mining operations.

At NORCAT's Underground Centre in Sudbury an underground operating mine was created to serve as an innovation and training center, which allows startups to test, demonstrate and validate their technology to potential partners and customers. In this environment, buyers of innovation can see and touch technologies in an operating mine environment to inform buying and adoption decisions. Meanwhile, it is also crucial for builders of innovation, as it enables them to demonstrate a referenceable mining "customer" to prove the technology or solution. In turn, this can drive continued sales and adoption by mining companies.

One of the SMEs to have come up through the NORCAT ecosystem is RockMass Technologies, which provides data for miners to be able to better predict what they are going to be drilling, allowing for production optimization and mine planning. Shelby Yee, co-founder and CEO of RockMass Technologies, related that the path to commercialization is challenging in the mining industry, and designing tools that are easy to use for the operator is key: "It is critical to build a solution that is realistic for people to adopt, easy to learn, straightforward and it must integrate with all of the systems that the customer already has."

Startups in the mining industry can also be fostered under the umbrella of innovation-focused companies, such as Sudbury-based Ionic Technology Group, which has a business model and philosophy that, when a product or line or business reaches a certain size, it is spun off into a separate entity, to "help maintain a specialized focus," according to CEO, Christina Visser.

The latest technology in the Ionic Group about to be spun out into its own company is SafeBox, a technology developed almost 10 years ago as a solution to the high number of safety violations recorded around the world. Gabriel Janakaraj, business development manager at SafeBox, explained that rather than the traditional disconnect processes, which involve manual switches, SafeBox uses a field isolation device (FID) that is integrated into the field and conditioned to withstand harsh environments. "Our embedded system manages the physical isolation of energy and is accompanied by sensors to validate a zero energy state. We can accommodate electric, hydraulic and pneumatic systems as well as switches with a range of power ratings of up to 15 kV (kilovolts)," he continued.

While traditional energy management lockouts require an operator to disconnect switches manually, which is time-consuming and prone to human error, SafeBox performs the whole lockout in less than two minutes and guarantees that every motor is in a zero-energy state.

Making Equipment Last

One way to boost the efficiency of an operation is through introducing groundbreaking innovation, but these technologies are not solely being applied to new equipment. In the case of Deep Cryogenics International (DCI), they devoted themselves to making mining equipment last longer. DCI's president Jack Cahn explained that the process works by placing new items in a specially designed, insulated tank, where they are slowly cooled from ambient temperature down to -196 degrees Celsius. They are kept in that cold environment for about two days, and then slowly brought up in temperature. "We can treat many parts at the same time, weighing up to 5,000 pounds each. The process is environmentally green, infinitely renewable and infinitely recyclable as it only uses liquid nitrogen," Cahn pointed out.

As a result of applying the deep cryogenic process, testing has been found to increase the wear life of an item on average between 20 to 40%, which equates to a significant amount of increased uptime, increased safety and reduced costs. According to DCI, the investment is best on high-wear, short-wear life items, especially for small items that are buried deep within a piece of equipment such that when that item goes down, it requires a complete disassembly of the platform.

Moving forward, DCI has received a Federal funding, which provided it with capital to build a mobile deep cryogenic tank, specifically for treating components in Northern Ontario. They intend on developing the product over the course of the next 12 months.

Timberland Equipment, which provides purpose-built mobile Underground Utility Vehicles (UUVs) for the mining industry, with Minejack being one of its principal product lines, is another company that is focused on equipment maintenance and aftersales. Owned by Marcotte since the mid-90s, at the end of last year, a decision was made to bring the companies together instead of operating as separate entities. According to Steve Dunlop, general sales manager at Timerland Equipment: "By merging, we synergized our team in one location utilizing the current experience and the larger Woodstock manufacturing facility to handle the upcoming equipment demand. The company has also become more streamlined, maintaining a robust aftermarket support service office for mobile equipment sales in Sudbury, Ontario." ■

> *The path to commercialization is really challenging in the mining industry. There are a lot of barriers in terms of working in difficult environments and you are also at the whim of the production cycle. It is critical to build a solution that is realistic for people to adopt, easy to learn, straightforward and it must integrate with all of the systems that the customer already has.*
>
> ***- Shelby Yee, Co-Founder & CEO, RockMass Technologies***

Michael Zahra

President & CEO
DRONE DELIVERY CANADA

Can you introduce Drone Delivery Canada (TSX.V: FLT) and provide an overview of the company's business model?
Originally the focus of Drone Delivery Canada (DDC) was on delivering supplies to remote communities. This helped get the Canadian government on board and enabled us to establish a close working relationship with Transport Canada as the regulator. At that time, use cases were twofold – accessing areas that were difficult to get to and getting to places in a time critical manner. This is still the case.
As DDC evolved, we recognized that there were also natural business verticals, such as mining that were well suited for drone technology and we are currently working to expand our business in this area. There is a strong case for drones in any situation where access is difficult for a variety of reasons be it distance, quality of roads, seasonal roads, and these are challenges many mining sites face in Canada and globally. For instance, if a company has a large open pit mine with a C$10 million earthmover machine that is down in a remote part of the mine, as it waits for a C$2 part, every minute that it is holding up a billion dollar mining project is costly. If DDC can transport that replacement part to the earthmover with a drone in five minutes versus somebody in a truck that will take an hour or two, there is real value in choosing the drone. Time is money or time is lives depending on the situation.
Additionally, with the pandemic new use cases have come up. One is limiting person to person contact. Within a mine that could mean getting core or water samples out to a test lab, where you want to eliminate the involvement of people who can bring the virus into the mining camp. The second use case that has come about as a result of the pandemic is related to business continuity and disaster recovery. Many companies realize they do not have a backup supply chain and drones are an ideal backup in the event of a pandemic, natural disaster or adverse weather event.

Can you provide us with an idea of the payload DDC's drones carry and distance they cover?
DDC currently has three drones in its fleet. Sparrow is the smallest drone in use and it has been compliant for commercial operations with the Canadian government since 2017. It is unmanned, electric, with a 30 km range, and can handle a payload of 4.5 kg. Moving up in size, DDC offers two additional models called Robin and Condor. We are wrapping up testing on those and they will be commercially available in 2021. Robin is also electric and has a range of 60 km and a payload of 11.3 kg. Lastly, Condor is our largest drone available and it is unique in the industry, because of its ability to carry heavy loads over long distances. It has a 200 km range and 180 kg of payload. The Condor is also unmanned and uses a traditional automotive gasoline two stroke engine. It is a very reliable and tough machine, so it is different from what you see from an Amazon or Google.

> **In large open pit mines, getting from one point to another is not easy and there is cargo going in and out. There is a need to be able to move around more quickly, efficiently and safely within a mine, and I think drones are ideal for that.**

How does drone technology align with your belief about where the future of mining is headed?
I see drone technology falling under the umbrella of autonomous vehicles. In large open pit mines, getting from one point to another is not easy and there is cargo going in and out. There is a need to be able to move around more quickly, efficiently and safely within a mine and I think drones are ideal for that.
DDC drones can carry cargo, but we can also carry specialized cameras and sensors capable of detecting gas leaks, estimating inventory and stockpiles and performing inspection in high risk areas. For example, if you have just done some blasting and you want to send a drone into the area for inspection safety purposes, DDC drones can perform that task. Throughout the stages of mining from exploration all the way through to closure and reclamation, drone delivery as well as sensors and cameras can be utilized. Today, companies are looking at autonomous vehicles and going with what they are comfortable, which tends to be trucks. However, as they gain in their level of comfort and understanding of autonomous technology, they will get into the kind of drones that DDC offers. It is a crawl, walk, run approach. ■

Michael Gribbons

President, CEO & Co-Founder
MAESTRO DIGITAL MINE

What is the big picture problem Maestro is trying to solve and how do you go about producing a suite of products that achieves these aims?
Maestro's vision is to change the way that underground mines communicate and to strip out complexity in the automation sector by utilizing Industrial Internet of Things (IIoT) devices and solutions. We are recreating the methodology of underground asset automation by greatly reducing expensive and complex hardware, software, and engineered services using simple, mine hardened IIoT devices. The "plug and play" IIoT solutions drive out automation CAPEX and reduce integration times by a factor of 40-70% while providing additional real-time diagnostics that assures maximum uptimes and minimal OPEX.
Maestro Digital Mine started in the underground ventilation monitoring and control sector, primarily because it was globally fragmented, utilized legacy technologies and would benefit with consolidation. The strategy was successful allowing our IIoT devices and solutions to be installed in 34 different countries and over 145 underground mines in less than 10 years. The next phase of Maestro's product and software development was solving the "last mile" communication network with our Plexus PowerNet. Here, we had to figure out how to get high bandwidth data to and from the working face, where any person could advance the network underground instead of using conventional fiber optic solutions that require highly skilled labour with specialized and fragile tools. That has opened the world of data and automation to a lot of companies that could not afford or support complex networks.

> **We are recreating the methodology of underground asset automation by greatly reducing expensive and complex hardware, software, and engineered services using simple, mine-hardened IIoT devices.**

What are some of the key developments Maestro has experienced in 2020?
2019 was Maestro's best year ever and 2020 is on target surpass it, in spite of the current pandemic. Growth in Latin America, particularly in Chile and Peru, slowed in the first eight months, however sales from Australia, Canada, USA and Europe more than made up for this dip. At the same time, profits are up greatly due to improvements in productivity and reduced travel and strategic adjustment of marketing tools to lower costs. Time saved from travel allows for targeted virtual sales meetings from the Maestro home office. It has been a good year and our plan is to increase sales by 40% in 2021.
Part of our success in 2020 can be attributed to sound decision making early on in the pandemic. We anticipated a supply chain problem due to the virus, so we purchased 100% of our yearly raw inventory requirements at the start of the year. That allowed Maestro to manufacture and ship products easily and quickly.

Maestro launched its Zephyr AQS air monitor in 2019. How has it been received by the market?
The Zephyr AQS was designed as a lower cost IIoT device that fills 75% of our current applications. The perception was that we would cannibalize our business, but that did not happen. Our Zephyr AQS is now outselling our Vigilante AQS, with the Vigilante seeing no decrease in sales. Our current Vigilante AQS is going through a redesign currently and will be delivering our first project by the end of December 2020.
The new Vigilante AQS is being built upon a different hardware and firmware platform that will allow all the development to be adapted for new use cases, such as underground door controls, sump controls, inventory management and regulator controls.

What are some opportunities that jump out at you for future product development?
Anything IIoT that is used in a mine and is considered a fixed asset is on our radar. We have decided not to enter the mobile IIoT market. Pumps, ore passes, crushers, fans, doors, regulators, paste fill, hydraulic oil, fuel, compressed air, potable water systems - all need automation. All require expensive and complex PLC or DCS systems to integrate and control. Maestro will continue to combine embedded firmware/hardware IIoT edge based devices that strip out this complex and expensive equipment. ■

Tom Juric

Divisional Director – Mining
LIEBHERR CANADA

To what extent is Liebherr involved in decarbonizing the mine?
Customers are now asking what we are doing to decarbonize them, because ultimately, with respect to the mining houses, they can only bring so much. It is up to the OEMs and the technology partners to solve the decarbonization topic. Pretty much every company that we are talking to in Canada has decarbonization in their top five priorities, with some placing it right at the top because of ambitious commitments made. Each has a slightly different perspective on the direction they want to take their business in terms of achieving their objectives. As a result, OEMs have to hedge themselves in the way in which they bet on technology.
For Liebherr the decarbonization question is solely around how we pair our equipment. For the longest time Liebherr has had an electrical option. As the technology on the electricity generation front becomes more mature and therefore attainable, the electrification of equipment becomes a very interesting topic of discussion.
We have already invested in the electrification of things. Liebherr is now considering what does the non-electrified solution look like for us. We have made some progress in terms of where we are going with this and we are very well placed to meet the demands of the market, whichever way they want to go.
The panacea that everybody is waiting for is in battery technology. If I look at our equipment right now, every single one of Liebherr's mobile pieces of equipment has the capability to adapt battery power in some way shape or form. The trouble is the power density versus weight and size of the battery. We are not currently looking at developing our own battery tech. Instead, we are looking at partnering with people. ■

Stuart Lister & Maarten van Koppen

SL: Vice President of Marketing & Communications
MVK: Product Manager-Mine Operations
MACLEAN ENGINEERING

SL

MVK

How does MacLean go about testing and validating its technologies?
SL: In 2018, MacLean bought a test mine in Sudbury with a 400-meter underground decline. It allows us to do a lot more product development and testing without bothering our customers. This is now the R&D lab for our Advanced Vehicle Technology team working on mining vehicle electrification, automation, and digitalization.

Canada has several flagship mines that are already fully or partially electrified. Are there any lessons pertaining to electrification that can be gleaned from these early adopters?
MVK: Northeastern Ontario in particular is a hotbed for electrical equipment, with Kirkland Lake Gold's Macassa, Newmont's Borden and Glencore and Vale in the Sudbury basin. The first lesson has been that every project and mine has a different reason to go electric. Since electrical equipment has been operating for years now, there has been a lot of lessons in how to further improve safety systems and the efficiency in how these machines operate. It helps that we continue to see more components on the market that are developed for industrial mobile applications we can integrate on our equipment to provide better products.
We also see that not every application is identical, so there is a need to customize the equipment to some extent, in terms of battery capacity and charging capacity. Overall, we have learned that adaptation is surprisingly easy in a lot of cases, and it has been a focus for MacLean to continue to make it as easy as possible for the customer to switch over. The big validation that we saw is that electric equipment, regardless of OEM, has shown that it outperforms diesel equipment by a wide margin. With MacLean equipment, boom trucks for example travel up ramp 50-60% faster than diesel. ■

Gabriel Janakaraj

Business Development Manager
SAFEBOX

What is SafeBox technology and how does it work?
The concept was developed almost ten years ago as a solution to the high number of safety violations recorded around the world. Rather than the traditional disconnect processes that involve manual switches, we created a field isolation device (FID). This is a product that is integrated into the field and conditioned to withstand harsh environments. Our embedded system manages the physical isolation of energy and is accompanied by sensors to validate a zero energy state. We can accommodate electric, hydraulic and pneumatic systems as well as switches with a range of power ratings – of up to 15 kV (kilovolts).

These days mining companies have a lot of technology to choose from. Why should they choose SafeBox?
SafeBox is a key enabler for increasing productivity and an integral part of a mine's digital transformation. It is a low-CAPEX solution that will permanently improve overall performance at a mine. Its contribution is providing a simple, smart, and safe energy isolation process that help mines stick to their commitments, minimize risk and raise productivity. The SafeBox technology is invaluable for mines and mills regardless of the commodity being mined. ■

Chris Novak

CEO
CENTRIC MINING SYSTEMS

Centric pulls together an entire enterprise into one integrated ecosystem. What challenges do you face implementing this transformation into a mine that is already in operation?
It is a bit more difficult to work with a business that has already implemented systems, and I do not necessarily mean technology, but also human processes and attitudes. Historically, the onus has fallen on us to give customers compelling reasons as to why systems being used in their business are not actually adding value, and this is a challenge as people do not like to admit they have been doing things wrong. However, attitudes towards digital transformation have definitely changed in the last couple of years, and not just because of the situation with COVID-19. Technology had already been implemented in mines to generate vast amounts of data, but the part of the business that had been left behind was the layer that allows the business to transform itself with this information.

Which of Centric's solutions have been in high demand in the last couple of years?
The pattern has been towards decision support – maximizing the ROI from the technology pieces that generate data. The emphasis has been on improving the way the data generated from different pieces of technology is integrated and delivered up. Clients want to get more from the data, and we are demonstrating how they can do that. ■

Mike Campigotto

President
SAFESIGHT EXPLORATION INC.

What type of cost benefits would using SafeSight's technology give a company over a traditional method?
Operations that use SafeSight treble their survey production thanks to the ease of use of the technology. The same crew can do 300 surveys per year where they previously did 100. There is three times the digital data to make decisions around reconciliation, compliance and GUAC modelling – which changes the operational flow. Importantly, the technology is becoming tailor-made to each project. Traditional forensic shaft assessments take 36 hours, but our technology can do the same process in four hours and without human risk. We have created a risk assessment matrix for the drone-enabled Lidar package which allows technology adaptability and ensures it is meeting the specific needs of the environment – for example in matters of ventilation. Those capabilities demonstrate a minimum US$250,000 ROI within six months.
An important area of savings is in reconciliation block modelling. Drones capture 95% of data whereas alternative traditional surveying tools capture 50%. That means that operators are no longer guessing at 45% of the data. Tonnage per day collection is improved by time efficiencies and better surveying. The financial downstream impact far exceeds the investment – not to mention the safety improvements linked to removing the human element. ■

During our research, we speak to business leaders across the value chain to gain a qualitative understanding of the state of the mining industry based on their experiences. Through what amounts to several hundreds of conversations, we compile a database of valuable knowledge on a range of important topics. In these pages, please find a brief selection of quotations that we feel best summarize some of the challenges the mining community should expect to encounter going forward, the opportunities to find success, and also thoughts we found to be motivational. Thank you to all of the individuals that took the time to share their insights with us, and we look forward to continuing to learn from you in the years to come.

"Every industrial revolution or civilizational transformation has been somewhat anchored on mining and metals: The Stone, Bronze and Iron ages, gold rushes, coal in the first industrial revolution, silicon for processors and, of course, copper for economic development today. The difference between today and past industrial revolutions is that today's consumers have a heightened awareness of, or the strong desire to know, where and how mining sources the materials."

- Theo Yameogo, Co-leader – Mining and Metals Canada, Ernst & Young LLP

"Mining touches every facet of life, so you are bound to run into challenges. It is the way you manage these challenges that is important. For too long the industry has been more hung up with compliance than actual behavior. Companies that think simply ticking boxes is enough to raise money are in for a rude awakening, as the pandemic has highlighted that the world is not a platform for exploitation."

- Mark Bristow, President & CEO, Barrick Gold

"We still hear, "what you are suggesting is not a pace of change that we are comfortable with," and herein lies the problem: disruption is not comfortable, but it is required if real progress is to be made. The inertia that Covid has brought about creates the opportunity to make changes happen – if the will is there"

- Doug Morrison, CEO, Centre of Excellence for Mining Innovation (CEMI)

"People are often the most undervalued component of a successful exploration program. Good geology and exploration require a large amount of abstraction and tacit knowledge, skills that take a long time to develop. As an industry, we often turn over our young geologists rapidly and throw them into mapping or logging before they have the skills developed to excel."

- Terry Harbort, President & CEO, Talisker Resources

"I think the mining sector has done a really good job reinventing itself over the last few years. The most recent prolonged downturn forced companies to become more financially disciplined, improve corporate and social responsibility and strive for gains in operational efficiencies and productivity."

- Dean McPherson, Head, Business Development – Global Mining, Toronto Stock Exchange and TSX Venture Exchange

"Mining is very competitive in terms of salary and compensation but struggles from a negative perception issue. This hinders interest in the profession. Perceptions can be changed over time, but industry must deliver in health, safety, inclusion and sustainability to attract and retain talent."

- Samantha Espley, President, Canadian Institute of Mining, Metallurgy & Petroleum (CIM)

"There has been an enhanced recognition that we need to urgently ensure our supply chain of critical minerals and metals. Canada, and in particular Ontario, has some of the largest and most exquisite reserves of these critical minerals, and we need to enter into discussions and agreements for their supply to the North American market."

- Hon. Greg Rickford, Minister of Energy, Mines, Northern Development and Indigenous Affairs, Government of Ontario

COMPANY	WEBSITE
Alamos Gold	www.alamosgold.com
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Ausenco	www.ausenco.com
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NORCAT	www.norcat.org
Northstar Gold Corp.	www.northstargoldmining.com
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Revival Gold	revival-gold.com
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