



# Bio-Mine Ltd. Quarterly Newsletter

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[WWW.BIOMINE.CA](http://WWW.BIOMINE.CA)

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## Bio-Mine Ltd. Introduction

3 years ago, Bio-Mine Ltd. was launched to begin commercialization on a series of non-toxic technologies and innovations for the purpose of constructing the world's first "100% Sustainable Mine Site". A very bold undertaking to replace the toxic processes and technologies currently used with equal valued non-toxic versions. This was especially difficult since some of the innovations and technologies needed to achieve this weren't even on the market yet.

Dr. Vasu Appanna, co-founder of Bio-Mine Ltd. happened to possess a huge part and building block to such a dream, an intelligent, programmable bio-technology capable of adapting and thriving in numerous mineralogies in all different environments. Gone were the limitations of bio-mining, in temperature, pH and Aeration.

In January 2017, Bio-Mine Ltd. was selected as one of the top 5 mining innovations in the world in the Disrupt Mining Campaign sponsored by Goldcorp, and that put us in a whole new stratosphere of growth.

Since that time, Bio-Mine Ltd. has expanded in the fields of bio-technology, Nano-technology and advanced molecular science as our network of world leading scientists,

engineers and researchers continue to expand.

We knew as a company, that to accomplish our lofty goals of sustainability on a mine site, we were going to need a collaboration of the best and brightest in their fields, as numerous toxic processes needed to be replaced.

And thus, the **Bio-Mine Ltd. Incubator** was born.

The call went out around the world to the best of the best in the fields of molecular science, with ideas for non-toxic processes. If you think about a mine site, you start to see how much effort will be needed with processes like classification and waste rock through to pre-treatment, recovery and waste/tailings management, along with water and power optimization all leading up to a mine site that can mine, process and recover the desired metals, safe to our planet leaving no waste or tailings behind upon closure.

Bio-Mine Ltd. will be the most advanced environmental research facility in the history of mining.



### New Lab and office facility opens January 1, 2018

Bio-mine Ltd. is very excited about our 2<sup>nd</sup> expansion in the last year, custom designing and renovating a new 7000 ft<sup>2</sup> facility on Lorne street.

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### Cyanide must go...

Bio-Mine Ltd. consortium races to perfect a proprietary non-toxic replacement to cyanide for leaching gold and silver

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### Bio-Mine Ltd. Pledges Support to Super Cluster funding initiative

The Federal government has shortlisted the \$900M funding initiative down to 9, with the mining sector being one. Bio-Mine Ltd has committed its support and resources to this application.

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## NEW FACILITY OPENING JANUARY 1<sup>ST</sup> 2018

It took long enough, but construction finally began on the new facility for Bio-Mine Ltd. and Green Mine Sites Inc.

The state of the art facility will support the growth and development of these 2 fast paced companies.

It will feature some high-level equipment and analysis machinery, along with a large space where a pilot "Bio-Simulation" Processing plant, capable of testing and piloting our non-toxic technologies on bulk sample feeds from anywhere in the world.

*"We couldn't be more pleased with this opportunity, and the support of the building owners Dalron Construction who are providing the space and all the construction."*

**Kurtis Vanwallegham**  
- CEO for Bio-Mine Ltd. and Green Mine Sites Inc.

With the growth Bio-Mine Ltd. is experiencing, this space was a necessity. Projects and mining partners from around the world have flooded these 2 companies with work.

This facility will contain a state of the art lab capable for performing the necessary organic and inorganic testing and analysis needed in the mining industry. Technologies like ICP and HPLC are crucial to our being able to quickly process test results and provide timely reports for our clients.

The facility will also be home to the worlds first pilot "Bio-Simulation plant", designed and built right here in Sudbury Ontario. This plant will be very unique because it will be designed to act as a pre-treatment, recovery OR remediation circuit, with stations that can easily interchange depending on the application. Bio-Mine Ltd. and our partners are designing technologies and engineering that can perform numerous type tasks, in the same tank. If we can design a more generic circuit that can be fitted for whatever the company needs by simply changing the technologies inside, it would save millions of dollars on custom plants needed for pre-treatment, different from recovery, different from tailings management.

And of course, there will be a beautiful office space, and a state of the art board room fully wired with the latest in video conferencing equipment.



Dealing so much with companies now around the world, it was necessary to install a system where we could meet and collaborate on these projects together without having to get on a plane, and travel so much.

Logitech was engaged to supply the hardware, and local companies hired to do the installation.

*"We are very excited to get into this facility where we can really stretch our legs in the world of Non-Toxic Mining Solutions."*



### Activities of the new Facility...

With this expansion, Bio-Mine Ltd. will also expand its researcher incubator network, and divisions to support the high-level research technologies needed for a Sustainable Mine Site...

1. Enhanced Molecular Science
2. Advanced Bio-Engineering
3. Process Design and Engineering
4. CRISPR Genetic Engineering
5. Advanced Organic chemistry
6. Nano-Technology

### In the fields of...

1. Waste Rock management / AMD control
2. Pre-treatment Systems
3. Recovery Circuits / Heaps
4. Water Management Solutions
5. Waste Management solutions
6. Tailings Management solutions
7. Mine-Site Footprint optimization

## CYANIDE MUST GO...



The writing has been on the wall for some time now...

Find alternate ways to get your gold and silver or close your doors. Governments around the world are uniting on this front, as permits, regulations and even the people in the area of the mine sites are all coming together to, dare I say it.. "Ban Cyanide".

Bio-Mine Ltd. has been working with gold and silver for 3 years now, with the goals of creating safe lixivants. We know there are lots of "less" toxic methods, like chloride leaching and non-chemical ways like flotation, but each one of them has their own detriment to the cost and footprint of the site.

For example, yes, Chlorine is less toxic than cyanide, but still has residual discharge rules, so we cannot consider it o-footprint.

For decades, the industry has always baby stepped moving from highly toxic to less toxic, profiting tremendously along the way. Remember mercury... Mercury was used as a recovery method for gold, until one day, regulations decided it was too toxic and shut it down. Cyanide quickly followed which was deemed LESS toxic ; you get the idea. This tiny stepped approach to "toxicity" has helped the mining companies prosper but really didn't do much for our planet.

Bio-Mine Ltd. along with a consortium of partners has opened a mining recovery division fueled by a high-level research team to study, and build "non-toxic lixivants" to recovery precious metals. These lixivants consist of only environmentally friendly elements, and bio-technology with the goal of oxidizing the metals, and stabilizing them for the chemistry needed to bring them into solution.

**Sounds easy... but its not!!**

We believe the answers lie in the Lewis diagrams for precious metals. How can we stimulate the Valence Electron movement, which could make recovery profitable and harmless?

In 2018, when our new facility opens, we will begin the process of using CRISPR gene technology to unlock the organic mysteries behind actually **bio-leaching** gold and silver, along with the continuation of our non-toxic lixiviant system.

Very exciting times for our Gold and Silver Partners!!!!

## Bio-Mine Non Toxic Lixiviant

So, what does a Bio-Mine Ltd. lixiviant look like?

Let's look under the hood at the molecular flow sheet ...

1. Custom Starting Media housing
2. Add and stabilize Au/Ag Oxidant
3. Add pH Stabilizer if necessary
4. Add Catalyst for Au/ Ag oxidant creation and/or recycling
5. Add Au/Ag complexing Agent
6. Stimulate complexing agent reproduction and stabilization
7. Add the ore, mix...
8. Remove Solution
9. Re-solidify Au /Ag
10. Send to Processing

## Where are we going with this?

In 2014, Bio-Mine discovered that our adaptable bio-technology may have somehow chelated with Gold in a small mining ore sample, and solubilized it. From that moment on, we have been researching and piloting to unlock the secrets behind Gold and Silver electron movement, specifically with what can be added in the field of non-toxic technologies to facilitate this movement.

We believe the answers lie in "custom solutions" per each mineralogy. Each lixiviant is built using the best of molecular science and biotech for what's presented in the mineralogy. Not all projects are equal, and neither is the mineralogy.

That's the future for precious metals..

## BIO-MINE PLEDGES ITS SUPPORT TO THE CLEER SUPERCLUSTER FUNDING INITIATIVE

## CLEER - What is it?

The Canadian mining sector's proposed clean resources supercluster in Ontario, Quebec, and British Columbia is on a shortlist of nine groups looking to share in \$950 million in federal funding.

The CLEER (Clean, Low-energy, Effective, Engaged and Remediated) mining supercluster will focus on reducing energy, environmental footprint and water use in Canada's mining sector by a target of 50 per cent in each area by 2027.

The CLEER supercluster was announced Oct. 11 as having made the shortlist. The project is led jointly by the Centre for Excellence in Mining Innovation (CEMI) and the Canada Mining Innovation Council (CMIC).



Image: AlisLuch | Shutterstock.

Bio-Mine Ltd. has pledged its full support and resources to the CLEER supercluster funding.

*"It's a perfect fit to what we are currently doing, as our company has evolved into a pretty impressive **"0-footprint incubator"** for innovations and technologies from researchers around the world, and our mining partner list has expanded at a tremendous pace, giving us access to the necessary projects to demonstrate these technologies. The CLEER, if awarded, would accelerate our pilot projects, and allow us to package these non-toxic technologies and processes into full scale marketable solutions for mining world-wide."*

Kurtis Vanwalleggham – CEO Bio-Mine Ltd.

Bio-Mine Ltd. will bring all of our major mining partners with us, some of which are already signed in as leaders of the CLEER application, and with the CLEER funding support, we can really push the collaboration necessary to build the infrastructure and process engineering to support these replacement non-toxic technologies.

100% Sustainable Mine Sites are close, maybe not quite yet, as 100% is a hefty goal, BUT with the continued research and expansion of the Bio-Mine Incubator, finding and signing the best and brightest in their fields of environmental science, we believe that the design, and construction of the world's 1<sup>st</sup> 100% sustainable Mine Site will happen, and come out of Canada very soon.

CLEER and the support of the Federal Government can make sure of it with acceptance of the CLEER application.