Robotic Mining PTY LTD (R.o.M.)

Our business entails constructing devices for space mineral exploration & mining; adapting them to market and sell on earth, to fund lunar and mars mineral exploration. The aim is to use AI and robotics to help people do their jobs faster, easier and safer, NOT to replace them.

Current situation

Around 50 target areas have been analyzed on both sides of the moon. A conceptual model was used to reduce that number to ~20 high-quality target areas. We can see the ore on the ground at some of these sites. At least 3-4 and potentially many more of the target areas may well be viable.

Three Mining consulting firms have been privy to parts of the conceptual model and have seeen around 8-10 of these target areas. A conceptual three-level underground facility (UGF) was designed and costed. Both a patent and a preliminary patent have been filed: a) for sealing & pressuring above ground facilities (AGFs) and b) linking them to sealed & pressurized underground declines and tunnels. This is required to mine the moon or mars or to construct underground habitats and tunnels.

Around ten devices that are required for mineral exploration and mining have been designed conceptually. The technology and/or design differ significantly to anything others may be designing or considering, and in application - even where the device looks similar in appearance. They also relate back to real-world mineral exploration & mining and are practical, so will work in practice; R.o.M's devices are essential items required for space mineral exploration and/or mining; they are not just arm-waving

exercises designed to gain government or private-equity funding.

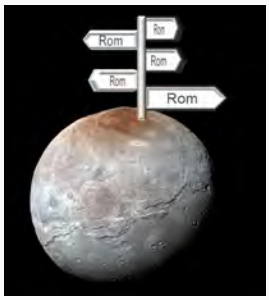
Vision & Mission

Mission statement: *"reach for the stars and transform the world to a Star Trek future, using robotics & AI to increase efficiencies & improve processes, NOT to replace humans"*

Vision Statement: *"taking you to the future, today"*

CEO & Managing Director

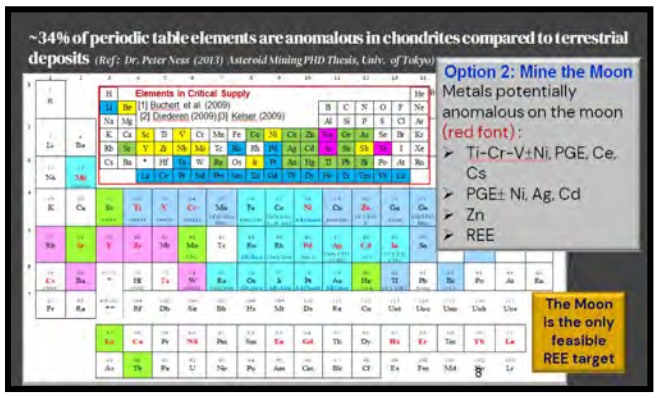
Dr. Peter K Ness graduated with a PHD in Complexity, Science & Engineering from the University of Tokyo in March 2013. His thesis was on asteroid mining. He has an MS (in geology) and an MBA from the University of Western Australia, a M.Comms (in Finance) from Curtin University of Technology, a Company Director Diploma from Sydney University and his initial degree was in Applied Science majoring in Applied Geology (& Geophysics) from SAIT (now the University of South Australia).



All roads lead to R.o.M.

Without low and zero gravity devices that can be robotically automated, the technology to seal & pressurize underground tunnels, to locate target areas, or to drill deep penetration holes and collect unbiased, uncontaminated samples most large-scale mineral deposits will not be easily mined.

After 11 unsuccessful attempts the Soviet Union managed to land Luna 9 on the moon on Feb 3, 1966. On June 2nd, the same year, NASA landed Surveyor 1 in Oceanus Procellarum on the moon. The Apollo program soon followed. Viking 1 landed on mars near Chryse Planitia on July 20, 1976 and Viking 2, south of Utopia Basin on September 3, 1976. The above image shows a summary of other "key" space programs. [Ref- Viking 1&2 missions, NASA, JAXA, ESA websites)



The above Periodic Table shows the element abundances that are anomalous both in meteorites and on the moon. Bright pale blue exceed terrestrial mining cut-off grades, darker blue are anomalous in most, and green, in a few chondrites & Ni-Fe meteorites. Pink are anomalous in HED and Fe-poor meteorites. The "Red font" are anomalous in Lunar samples [ref- Peter K Ness (2013) PHD, The Univ of Tokyo].

The problem we need to solve

Space mining has a long and drawn-out history. Following the Apollo missions (1969-1972), little happened in manned space exploration for close to 50 years, which frustrated many people. The reality is that robotic probes still do not yet have the capacity to collect more than one or two samples from either asteroids or lunar regolith, yet many tens or hundreds of thousands of samples are required to develop ("prove up") a mineral deposit.

To illustrate the issue: in the last eight years, from 2012 to 2020 robotic missions went from collecting ONE

Apollo Missions were well targeted

This is where we tell you that the Apollo missions were extremely well targeted, but the missions failed on implementation and sample bias. Never-the-less, Shoemaker was a genius; Apollo geochemical abundances contain at least THIRTY mineral anomalies. Three of the Apollo sites contain metals at concentrations that, if found on earth, WOULD be mined.

The above RHS image shows that 34% of the periodic table geochemical abundances are anomalous in chondrite meteorites (and hence in asteroids). Option 1

sample from the asteroid Itokawa to ONE or TWO samples each from Ryugu and Bennu. This is clearly insufficient.

Plus, after 50 years, and despite dozens of probes being sent to mars, the basic questions of life, water, methane or even the color of rocks on mars still remain largely unanswered. The problem is NOT the quality of the work or technology, it is the way things are designed.

Thus, Robotic Mining was born out of frustration of (a) researchers seemingly "researching forever" using probes that are clearly NOT fit for the purpose of grass-roots mineral exploration, and (b) people with absolutely zero mineral exploration and mining experience claiming to want to mine the moon, mars and asteroids based on *Dunning-Kruger* expertise ... they just want to be trillionaires, at any cost -- which increases risk of failure and represents a disaster just waiting to happen .... and it WILL.

Asteroid mining myths, legends and just plain deliberate lies ....

The idea that ANY asteroid contains quadrillions of dollars of gold, platinum and other precious metals is FAKE news. To start with, virtually everything we know about the metal content of asteroids is based on meteorite falls. NONE of those meteorites are sourced from the asteroids people claim they want to mine; so, other than the albedo of the asteroid there is no validation of the metal content of those asteroids.

Don't any of these Dunning-Kruger experts and billionaires do even basic due diligence before making public claims and marketing hype?

To claim that an asteroid has significant commercial value requires many thousands of samples and an "Ore Resource" calculation; and that means one needs to drill holes into the asteroid to depth to confirm the metal content at depth. To even identify that an asteroid has a resource worth investigating would require at least 30-40 and up to 100 or more samples. The technology to drill holes to any depth in an asteroid so does NOT exist and may be decades away from even being invented; so, when a billionaire or firm claims they are going to mine an asteroid they are selling FAKE news. It's just a scam to secure NASA funding.

The typical sample size in mineral exploration is ~1kg for a sample and two "mirror" samples are required from every 1-2 m of drill core or sample chips; you need a back-up sample to provide to those that audit your work; so they can confirm that you haven't "salted" the data and can reproduce your geology models and mining schedules to confirm ore variability. Calculations from remote sensing data are easy to rig, so no-one will believe them without many physical validation samples.

It is FAKE news to claim that you know the metal or chemical composition of an asteroid based on just 1-2 samples, especially when you only have a few grams of sample (and even if you are correct in hindsight); but, there are several papers in prestigous mainstream journals signed off by dozens of professionals that make such claims. As an aside, ... if you sub-split a single sample into 1,500 it is still just ONE sample folks. Don't be scammed. Get educated.

Most claims about Lunar and asteroid mining are as accurate as taking a cup of water from the ocean and proclaiming there are no whales because you never caught one in your cup!

Also, any mineral exploration samples need to be collected in such a way that the method does NOT contaminate the entire asteroid, or lead to an invalid sample. *Samples MUST be representative and non-contaminated to be valid.* If you blast a hole in an asteroid you WILL contaminate the entire surface of that asteroid. The blast fragments take ~16 to +20 hrs to fall back onto the surface; so, any further samples collected are biased and invalidated by your actions. They cannot be used for any Ore Resource calculations

is to mine asteroids, the technology is clearly still decades away; we still cannot collect samples without contaminating the entire asteroid, and drilling holes in asteroids is still NOT yet technically feasible. Option 2 is to mine the moon - again deep-penetration holes are still not feasible and few drilling & sampling methods collect representative, uncontaminated, unbiased samples; Robotic-Mining plans to rectify this. Option 3 is, of course, to mine Mars; the issues here are (i) drilling through pockets of pressurized CO2 gas, and (ii) terrestrial conceptual orebody models do NOT always apply, making it MUCH harder to locate metal anomalies using standard terrestrial techniques.

An uncomfortable truth ....

"*We come in peace for all mankind*". Not true. At the time NASA was run by the military. The purpose was to win the cold war. Except for Harrison Schmidt, who was a geologist on the Apollo 17 mission, virtually all the astronauts were either military or ex-military.

NASA's sacred sites .... *keep telling yourself that they are protected*

We only need look at history to see the sheer contempt of large mining companies and billionaires for indigenous sacred sites and other heritage, how they continually flout environmental and other laws, and manipulate legistlators to suit their own greed and egos. The idea that large mining firms or billionaires will abide by any NASA agreement or law that enshrines the Apollo or landing sites on the moon or mars as "areas of international heritage" is a joke. To start with, it will probably fail in court on the basis that many of these programs were designed to help win the Cold War and had nothing at all to do with "peace" or "all mankind"!

Even if a mining exclusion zone of 50km is placed around every single Apollo or other lander site (on the moon or mars etc), it is still far easier for a firm with no respect for such "sacred" sites, environmental or international laws or a huge ego to deliberately, accidentally on purpose, dessigrate such a site as compared with on earth. There is always someone who will be keen to go and collect a piece of history.

.... After all ... in space no one is watching!

Lunar gravity is 1.62m/s-2. Fly rock from a blast in a large iron ore mine can travel over 3.5km, so on the moon it may travel 21km to 30km or more. It will be easy to land and collect relicts of previous missions. It will be even easier to deliberately detroy a NASA "Sacred site", by accident, on purpose; just add way too much explosive to a "controlled" detonation blast ...

"*Oops there goes another Apollo site! Its 60km away and we still scored! Wow! Just how cool was that?*" ... then act real surprised ... like, you never expected THAT to EVER happen ..... So the ONLY way to be certian that you can protect the site is to collect the relicts and store them in a museum, on Earth. Setting up a no-go exclusion zone or putting up signs only stops honest, ethical, people and none of those aspire to be space-mining trillionaires.

Metal content of asteroids ...

The metal content of NO asteroid or lunar deposit target area mined will EVEN CLOSELY match the demand-supply curve of metals sold on earth; thus, one cannot just mine the moon or an asteroid and sell everything that you mine and/or process. The bulk of precious metals simply cannot be offloaded on terrestrial markets without crashing the Commodity Markets and sending the world into a long-term Global Depression - and many mining firms broke. *But that is the plan of some people, who think they can corner the market that way.* The content of some metals is way too high so most precious metals mined need stockpiling for decades; they do not add to the revenue stream and

or even for research. It precludes an asteroid from EVER being mined because the accuracy of any further samples taken cannot be relied on with any certainty.

Some Steel Mills claim to be interested in mining asteroids for the iron content. The idea that one can mine most asteroids for the iron content is LaLa Disneyland, akin to religious fake news. Few have high enough iron content to start with. The price of iron is way too low and precludes it; plus, the phosporus content of asteroids is too high, and that affects the hardness and strength of the steel.

Many asteroids rotate on one axis and spin on a second, and some even wobble which indicates that their spin axis is unstable. Many asteroids, like Itokawa, are rubble piles and/or are composed of several large fragments which is a big neon sign saying "*Leave me alone*". Therefore, if you blast an asteroid, apply pressure to it to divert its course, or try to mine it in space the consequences can be significant, hard to model and uncontrollable:

a) it can change the spin axis and force the asteroid to tumble out of control,

b) the asteroid may break up into several large and many smaller fragments, making one dangerous object and possible extinction event into many,

c) the trajectory of the asteroid will change, and it may not change at all predictably,

d) blast ejecta go in all directions so you just created a whole plethora of potential spacecraft killers, and

e) many asteroids contain water and CO2, so if these are exposed (and they will be) you may start the asteroid degassing, which may change the speed, trajectory, spin and axial rotation of the asteroid and cause it to break up or eject large fragments and a hail of debris in various directions; again, it is unpredictable. Plus, a loose rubble pile will rearrange itself.

If you are still keen to mine an asteroid so you can be a trillionaire, crash a stock market and create an extinction event .... that doesn't make you a super-hero; it makes you a super-moron! There is a difference.

The myth that NASA, JAXA or ANY billionaires are somehow experts on space mining can only end very badly for planet Earth; with a 100% certainty of an extinct event or market crash caused by willful ignorance and deliberate misinformation by people with huge egos that confuse self-marketing with science fact and self-confidence with *Dunning-Kruger* ignorance.

If one wants to mine asteroids in the next 30 years, the only safe strategy is to target asteroids that orbit further out than 2 AU to the sun; that way, if an issue arises there is ample time to respond and still time to develop any technology required. The idea that we currently have the technology to mine or even divert large asteroids is a religious myth sold by faith healers.

need to be treated as waste. If a firm expects to sell everything it produces it WILL go broke and if it tries to sell everything it WILL crash the market.

Further, most metals exist as inclusions in other metals, so "liberating" each individual metal from many others is really difficult. That will reduce the metallurgical *recovery* of many metals substantially. If firms ignore this warning they will end up with less than 25% of planned revenues and WILL go broke.

It took BHP over 2-3 decades to work out how to liberate zinc. South Africans took 25 years to develop CIP leaching for gold. McArthur River Mine was placed on hold from 1960 to the 1990's because metallurgical methods could not liberate ultra-fine metal inclusions from other metals. And you think you are a "special" case? Most asteroids and lunar mines will have between 5-6 and up to 10-15 metals like that. The technology does NOT yet exist and may take decades to develop.

Many lunar mines and ALL asteroid mines will be multi-metal mines, and even if you manage to liberate the metals using lasers or some other method to melt the ore, you are still faced with the prospect of never being able to sell more than 10-15% of the ore that you mine on terrestrial markets and having to stockpile it for decades. Will billionaires and those driven by greed do that or will they just crash the market? (*It's a rhetorical question*). Get real. Get educated.

Swarms of robotic miners, or swarms of lying researchers trying to score free NASA funding?

Its a rhetorical question. *Robots are supposed to help humans, to make life easier for us, NOT replace us*. These people have lost the plot; the objective is for humans to move into space NOT to create a spacefaring AI to replace us and eventually wipe us out. BUT that seems to be the long-term goal of many researchers. Greed and lack of ethics drive their motives.

After 50 years of NASA's robotic probes they STILL haven't been able to collect more than a few BASIC rock samples or answer most basic questions. 2021 is the first time a rock sample has been drilled and collected from mars, robotically, to send back to earth ... a single sample of JUST a few hundred grams of rock. In contrast, Apollo missions that relied on HUMANS brought back 500 rock samples between 1969 and 1972; that was before the robots took over, and before the researchers lost the plot. That shows just how far NASA have progressed with automated robotic probes in the last 50 years.

AND yet dozens of researchers, most who have NEVER worked on a REAL mineral exploration program or in a REAL operating mine, continue to publish papers claiming that they can mine millions of tonnes of lunar rock each year, crush and grind it, sieve it to various size fractions, upgrade and beneficiate the ore, then refine it ... ALL on the moon, ALL using robotics ... ALL without ANY human presence?

Lets be real clear: if a process cannot be automated on earth yet then it cannot be done on the moon, yet.

The last time we looked, there were NO fully automated mines with swarms of robotic miners and a ZERO human presence at any of the tens of thousands of mines on earth. The closest analogy are the Rio Tinto iron ore mines that use driver-less Haul Pak and/or other trucks to deliver the ore to the crusher. AND these automated trucks CANNOT repair themselves. They CANNOT grease themselves each day. They CANNOT change their tires by themselves, CANNOT repace leaky hydraulic pipes, weld up their chassis, or make other repairs to themselves; these mines STILL require a DAILY human

leaky hydraulic pipes, weld up their chassis, or make other repairs to themselves, these mines STILL require a DAILY human presence of MANY workers.

So, the idea of swarms of robotic miners on the moon mining millions of tonnes of highly abrasive rock each year, and working out the Grade Control, the geology, drilling holes to +100m depth to extend the Ore Reserves, logging the rock-chip geology samples for these and the Grade Control drill holes, AND also repairing themselves ... is far removed from reality. And we haven't even discussed the time delay in signals between the earth and the moon and how that affects robotic probes on the moon "driven" from earth as yet. As soon as a robotic miner breaks down these mines will STOP functioning, NOT for a few hours or days but while they wait for HUMANS to fly to the moon to FIX the robotic equipment, which could take many months or years. In the meantime, the plume of yellow dust hovering over these lunar mines will be visible by the HUMAN eye from anywhere on earth, so these *wanna-be trillionaires at any cost* WILL be closed down REAL soon; one cannot just spray water everywhere to suppress fine particles of abrasive dust on the moon, which has NO atmosphere. Oops! (... has anyone told these Dunning-Kruger experts this yet?).

Technological Progress 101 for dummies:

For technology to progress it has to follow certain steps in a certain logical order, if a step is missed technology cannot progress at the same rate.

NASA has proven that there is a great deal that robotics and AI can do in space; it just can't do 99% of what most researchers claim it can do. It can, for instance, be used to automate simple repetitive tasks, and to collect samples, just not many hundreds in a single day like the Apollo astonauts did WAY BACK in 1972. And, that is the FIRST basic STEP required in automating robotics for use on the moon and mars. Jumping steps wastes time and resources. Incremental change is more effective than major change, and leads to major change; that is how the Japanese and Korean electronics firms brought laptops and mobile phone technology to the world. NOT by missing steps but by focusing on incremental change.

Yes. Some basic, limited, automation can be, and is done in mines on earth. However, swarms of large-scale automated miners like that sold by Lunar researchers or Disneyland movies is still decades from reality.

This highlights the point that 99% of what is written about lunar and asterioid mining is based on deliberate lies and fake news that is marketed and sold by people who who have never even been to a mine let alone worked in one, who would say anything to score free NASA or JAXA funding. One wonders if those dishing out billions of dollars of FREE funding at NASA really are morons? After 50 years of automated robotic probes that promise the moon and mars but never deliver more than basic DINKY TOY science, that too, is rhetorical.

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