AIG ML/AI IN GREENFIELDS EXPLORATION WORKSHOP
PERTH, WESTERN AUSTRALIA

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Exploration economics in the age of ML

Beyond the Anomaly

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The bottleneck has moved

Machine learning and AI are transforming all aspects of exploration including targeting, mapping, geological and geophysical modelling, and assay data analysis.

This is making one thing better and better: finding.

For most of the industry's history, that was the hard part. That world is ending.

Better targeting now generates more prospects than any junior explorer could ever afford to test.

The constraint is no longer finding targets that warrant testing.

It is choosing between them.

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Prospectivity ranking isn’t choosing

ML and AI rank targets by how likely they are to host mineralisation, and the models get better at it every year.

That is genuine progress. It is also not the same as choosing.

Prospectivity scores tell you which target is most likely to host mineralisation.

They do not tell you which program creates the most shareholder value per dollar spent.

Prospectivity and value creation are different questions.

The industry answers the first with growing sophistication and, in most boardrooms, doesn’t ask the second at all.

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The 69-cent problem

Value created per dollar spent by the global mineral exploration sector#

$0.69

Poker machine return per dollar gambled*

$0.85+

A machine legally engineered to take money off you returns more money than the exploration sector does.

This is about where the exploration dollars went, and how the decision to send them there was made.

#US$135B of estimated discovered value against US$196B of expenditure, 2012–2021. Schodde (2023), MinEx Consulting – IMARC, Sydney, 31 Oct 2023, slides 22 & 30.
*Poker machine minimum return is set by state law, between 85 and 92 cents in the dollar depending on the state.

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Three questions every board should ask

Question 1:

If we spend $500,000 on this program, how much shareholder value do we expect to create?

Question 2:

With four projects and $1 million to spend, what allocation produces the best return on shareholders' capital?

Question 3:

If we ask new investors for $1 million, what return should they expect once the program is run?

If these can't be answered, your program isn't a plan. It's a position.

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This is all about fundability

Over the past decade, the exploration sector delivered about 69 cents of value per dollar of shareholders' money spent on exploration. I spent a fair part of my career on the spending side of that number.

The junior end of the sector depends on retail investors choosing to stay in it.

That means the sector, collectively, has to start giving them a positive return.

How long will investors tolerate a negative return on their investment before they walk?

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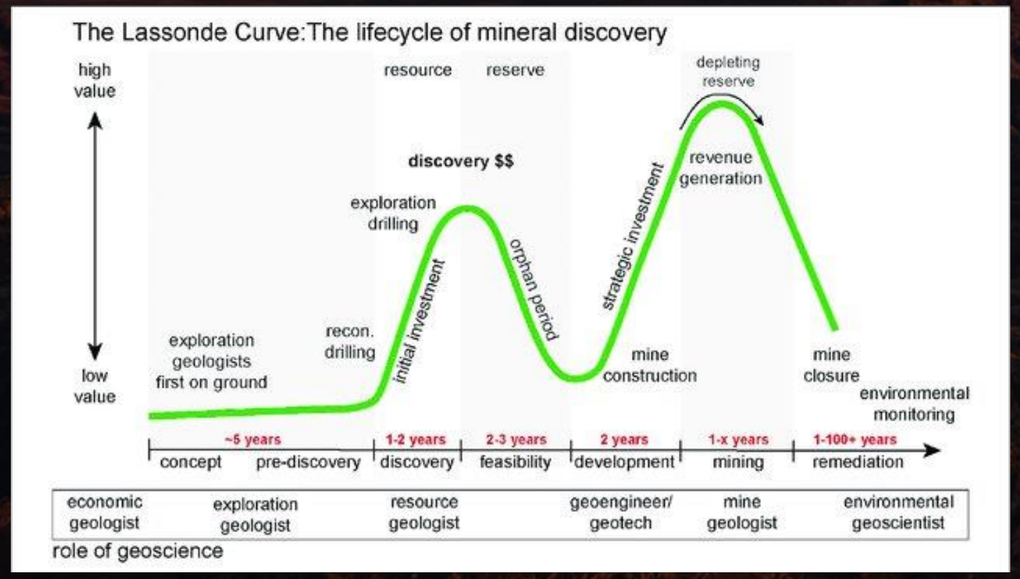
Rethinking the Lassonde Curve

The sector routinely shows this chart.



Discovery, a re-rating, then years of decline through the orphan period, before development finally rewards patience.

What sensible investor signs up for years of declining value, on purpose?

Adapted from Gardiner, N.J., Roberts, J.J., Johnson, G., Smith, D.J., Bond, C.E., Knipe, R., Haszeldine, S., Gordon, S. and O'Donnell, M., 2023, Geosciences and the Energy Transition. Earth Science, Systems and Society, 3, 10072. doi 10.3389/esss.2023.10072

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Value through the whole journey

Where the sector sits today

$0.69

Where a sustainable sector needs to be

> $1.00

We need to create shareholder value at **every stage** of a company's life, not just at the two points of discovery and development.

Again, this comes down to **choosing**, not finding.

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Borrowed, not invented

Oil and Gas Sector

– has priced a prospect before the rig arrives since the 1960s.

Venture Capital

– sizes every cheque against a distribution of outcomes where most investments fail.

Private Equity

– won't hold an asset without an exit thesis stated in advance.

None of this needs inventing.

Exploration just never imported it.

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Why hasn’t the sector adopted this already?

Geologists are trained to discover mineral deposits, not to price them.

The small in-house teams within junior explorers tend to be geoscientists, not financial modellers.

It tends to kill off pet projects and programs backed by gut feel rather than numbers.

Ultimately, because companies can still find a way to raise capital, even if it means accessing non-conventional sources of capital.

It is a missing discipline, with no pressure **yet** to adopt one.

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As easy as pricing up a program

Check 1 – The probability of success is written down

Check 2 – Success is valued before drilling

Check 3 – The expected value is positive

Check 4 – The kill criterion is agreed in advance

Check 5 – It represents the best cheque available

Check 6 – The new dollar's return is statable

Adoption only happens if it is simple.

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The hardest part is checks one and two

How likely is this exploration program to work?

P(success)

What is it worth if the exploration program works?

V(success)

Solve two numbers sensibly.

The rest of the checks fall out with simple maths that can be run in a single afternoon.

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How do you put a number on P(Success)?

Start with the track record

- How often has this type of target, in this ground, at this stage, actually worked before?

Name what's different here

- What specific evidence, geochemistry, geophysics, drilling, makes this one better or worse than that average?

Own the number

- Would you be comfortable being held to it later?

A number can be argued with.

An adjective cannot.

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How do you put a number on V(Success)?

Look next door

- What happened to the share price of comparable ASX explorers when they hit a similar result at a similar stage?

Value the outcome, not the ounces

- It isn't metal in the ground. It's the value the market would add to the company if the result comes in.

Set it before you drill

Locking in the number before the results removes the habit of talking every result into a good one.

What would this be worth to the market, valued the day before the drill bit starts turning?

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A worked example

Prospect A, a blind target under cover. 10% chance and $9.0M of value if it works. Return per dollar spent.

$1.80

Prospect B, a step-out on a known lode. 35% chance and $1.0M of value if it works. Return per dollar spent.

$0.70

Two drill-ready targets, one budget.

The same $500,000 either way.

The higher-probability target is the worse cheque.

Illustrative figures used to demonstrate method. Not a valuation of, or reference to, any actual project or company.

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Start crude. That’s the point.

Your first probabilities will likely be wrong. Mine were.

Your first kill criterion will be honoured awkwardly.

But that’s what the start of a discipline looks like. Not a reason to wait until it’s perfect.

Written estimates get checked against outcomes and improve.

In contrast, instinct and gut feel don’t get checked. Instinct just gets older.

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The choice ahead

This is all about fundability. The pressure to deliver better returns to investors is coming.

The bottleneck has moved from finding targets to choosing between them.

Expect your shareholders to ask about expected return before they hand over the next dollar.

What the next decade returns is (to a degree this sector hasn't taken seriously yet) a choice.

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Let’s run through your next project together

- **Drill-program valuation**
- **Portfolio allocation**
- **The board paper for your next capital raise**

Rocworth runs the numbers, builds the models and delivers the board paper that carries them.

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Requiring the numbers is the board’s job.

Producing them is ours.

rocworth.com.au