57 years in the Mining/Exploration industry 1960 - 2017

- Reminiscences of a Geriatric Geologist".
- Comments on changes in the industry;
- Critique of exploration by the various companies I have been employed by - or Juniors I have listed over those years;

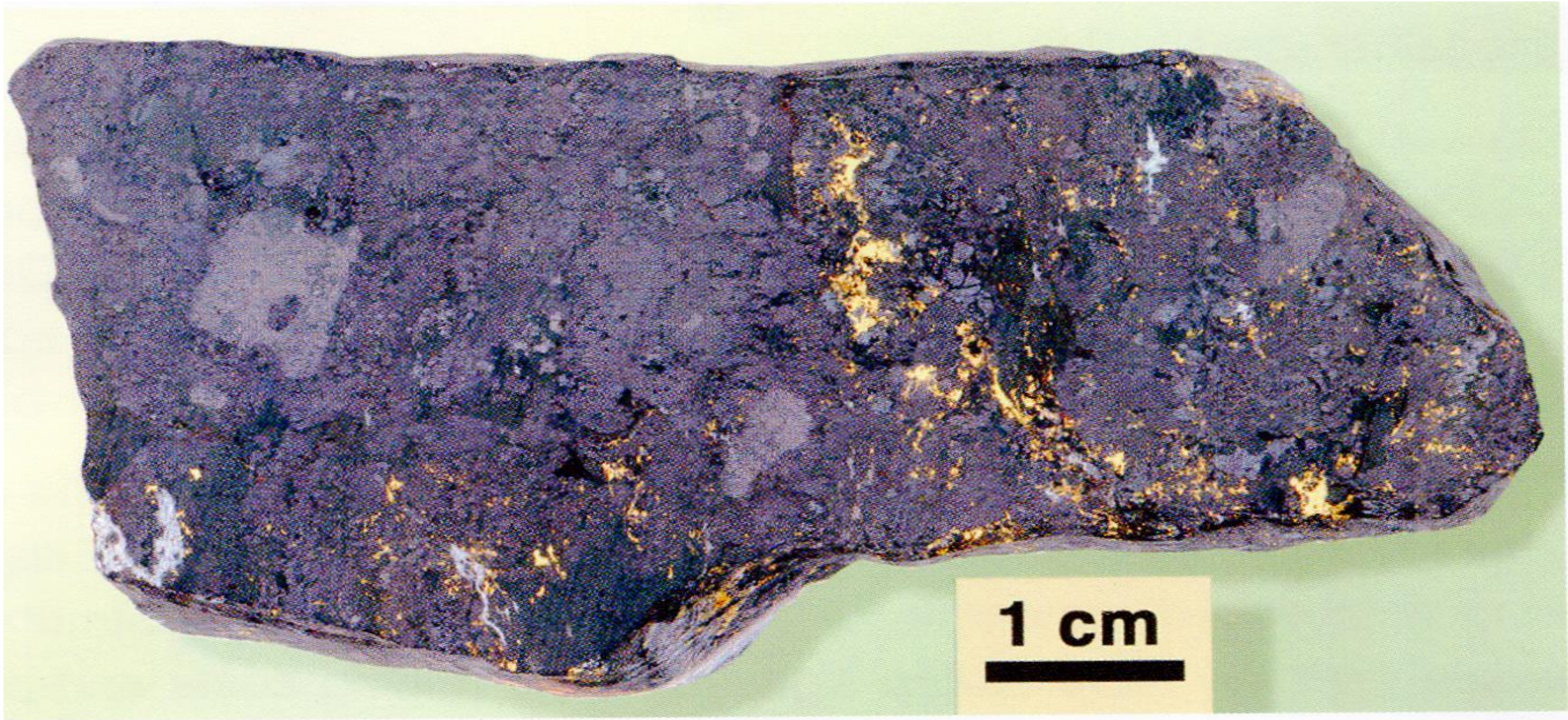
My Background

- Retired 7 years ago aged 77
- BSc Hons 1959 and MSc 1981 – Geology - University of Tasmania
- 26 years employed by large and small mining/oil companies
- 32 years juniors - four of which we created - listed on ASX/ or TSX V
- Peko/Kennecott/Nickel Boom/Union Oil/Exxon/City Resources/Macmin – NGG Group/Torque

Tasmania Mines Dept – Tarkine regional mapping – 3 weeks in, 2 weeks out. Early helicopter work. Salary 1250 pounds

Peko/Peko Wallsend/ Geopeko – Tennant creek 1960 – 1965

- **Peko/ WMC most successful explorers, in terms of new mines developed, in the 1960's. Exploration predominantly by mining companies – not junior explorers**
- **Peko in 1954 milled 24,000t at 7.64%Cu and 6.6g/t Au. Major expansion of Peko Mine provided exploration funding – 4 discoveries while employed**
- **Orlando – 1959 – 11m at 39.9g/t Au; 250,000t at 18g/t Au and 1.1%Cu**
- **Ivanhoe – 1961 – 370,000t at 4.5% Cu and 4.6g/t Au. No surface expression**
- **Warrego – 1962 – 23m at 3.92% Cu and 3.0g/t Au. Developed initially late 1960's as copper mine. In 1972 a 50m crosscut yielded average grade over whole length 2030g/t Au. Total production 1.3m ozs Au 8g/t Au. No surface expression. Not initially considered economic.**
- **Juno – 1964 – 15.5 m at 286g/t Au, total production 939,000 ozs at 54.8g/t Au. No surface expression**



Visible gold metal in the Juno ore indicated exceptionally high grades. It justified careful mining procedures and some less scrupulous miners found it might pay to take such attractive pieces home in their lunch tins!

Why was Peko successful in the 1960's ?

- John Elliston persuaded Board, Chairman, John Proud, success depend on <u>significant/ constant funding for exploration – average about 30% of Peko Mine cash flow was allocated.</u>
- Team effort, John Proud, John Elliston, geologists, geophysicist, realistic mining engineers.
- BMR aero magnetics. John Elliston recognised the significance and opportunity this provided Peko if they moved rapidly
- We had to peg 40 acre Mineral Claims for title over significant anomalies – before competitors became interested. No El's
- <u>Drilling anomalies was the exploration concept</u>
- Most anomalies had no surface expression. Major commitment for a small mining company

- **Understanding of geology and drilling conditions developed. Lew Richardson developed successful magnetics modelling program**
- **Deviation of drill holes/wedging holes, Core size was small- mainly AX – no wireline yet, rods pulled every drilling run.**
- **First explorers missed Juno - holes diverged 50 degrees. Accurate surveying of holes was essential – difficult using Tropari's before downhole cameras**
- **Early /quick decisions/development. Peko Mine was a central processing site/Orlando, Ivanhoe and Juno – part of Warrego.**
- **Reduced capital costs - development fast tracked. Decision to mine Orlando was taken after only two drill intersections – high risk.**
- **These mines were high grade – No environmental regulatory restrictions.**

Tennant Creek in early 1960's

- **The change from Tasmania was a major cultural shock .Scrape the frost from the windscreen – no heating/ defrosting in those days.**
- **Two days to fly to Tennant Creek from Launceston – overnight stop in Adelaide. Tennant Creek balmy 32 Degrees .**
- **I had, still have, a wife and at that time one 5-month-old baby. We had a further two children at the small Tennant Creek hospital – one GP doctor who seldom stayed more than 6 months. Flying Doctor for emergencies.**
- **We gave no thought as to how our respective parents might consider our disappearance. Tennant Creek other side of the world with few amenities.**
- **Magnificent salary of 1400 pounds –arrived savings of $100 to last a month to my first pay. Two months for a few belongings to arrive by train/road**

- **The bush flies – this was before any repellent was available – you had to use a complete veil to use a theodolite.**
- **No OH&S, U/G cage at Peko Mine had no gates, merely an iron bar.**
- **At Orlando lucky escape – no record kept of who went underground so surveyors and geologists were at risk as blasting was carried at any time – not just crib or shift change. I was approaching a drive face when I smelt cordite – I ran still blown over. Luckily no other damage. Incident caused necessary changes.**
- **U/G channel sampling using a small air hammer/chisel – no water or dust protection. I would come home black from magnetite/silica dust. <u>Five years ago, I was diagnosed with emphysema – never smoked - the dust a likely contributing factor</u>**

We had to become bush mechanics -Replacing shackle bolts and springs in the field

Highway – Alice Springs to Port Augusta – near Coober Pedy. Travelled four times in Simca Staion wagon. Need to be prepared! Rocks were a hazard

Track/Road –Tanami to Gordon Downs, Halls Creek 1963

Near disaster trip Tanami to Gordon Downs, East Kimberley's with spinifex seeds choked radiator.

This is an example of how dangerous and unforgiving the Australian outback can be without proper preparation - particularly in 1963

Kennecott – 1965-1970

- Era of USA/Canadian mining companies/Oil Companies. Kennecott was a good employer – in 1965 exploration in Qld, S A, W A and PNG.
- Excellent porphyry copper research group in Salt Lake City – Dick Riley and I attended a workshop in the Western USA in 1969 run by the research group.
- Australian Manager, Bob Hutchinson, insisted we take a round the world first class ticket and arranged stopovers in several places – such as Tokyo, San Francisco, Tucson, Hibbing Minnesota, Sudbury Canada, London, Singapore.
- Kennecott considered American geologists a cut above Australian geologists and we had several with modest talents sent out to join us in WA – on expatriate conditions which meant they were paid more than Australians.
- One instance a PhD from USA, went to Kalgoorlie; no knowledge of WA /not interested in advice, rented a car for Cosmo Newbery 150 kms east of Laverton.
- No spare tire, no water. He was lucky to be found a day after he broke down.

Kennecott – S.A./Indonesia 1965-1968

- **Stratiform copper/ Flinders Ranges, SA – model Zambian stratiform copper. Program terminated/ focus on nickel in WA/porphyry copper in PNG. Continued exploration would have moved west and perhaps discovered Roxby Downs before WMC – Tim O'Driscoll in 1970's.**

- **Molybdenum deposit on Spilsby Island in Spencer Gulf.- outcropped on a wave cut platform - extended under the sea – waste of funds!**

- **In early 1968 reviewed tender blocks in Indonesia. Services in Indonesia poor – I was supposed to fly to Manado in NE Sulawesi but all flights cancelled - no jet fuel in Manado and none available for a month. Newcrest ultimately successful here. Flight Jakarta to Pudung – 2 attempts to take off.**

- **Sukarno deposed/military everywhere/necessary to get the local commander's approval anywhere in Java and Sumatra. George Gonadi, later Chief Geologist at Ertsberg, a third of the Geological Survey staff disappeared – part 500,000 people killed after Suharto took control.**

- **In West Sumatra held up by two soldiers who demanded a lift. When my guide demurred, suddenly, he had a rifle in his ribs. We made room.**

- **Military governor of a region often required you to leave passport with him. When I tried to leave Pudung in West Sumatra, my passport could not be found. My guide suggested that $US10 would help find it - and it did!**

West Australian Nickel boom —– 1968 to 1975

- **For any of you that had the luck/opportunity to be part the WA nickel boom, stock market boom, as result of WMC's Kambalda discovery – we will never see anything like it again! You had to live/work through it to appreciate it. Kalgoorlie was boom town.**
- **30-year-old with 8 years' experience I was transferred by Kennecott to Perth in early 1968 and within a few months was managing a several million-dollar budget and perhaps 30 geologists plus twice that number in ancillary staff. .**
- **Exploration hectic/secretive – pick a greenstone belt. EL's did not exist – mineral claims pegged/ registered. Single day, Kennecott, 1989 pegged 160 - 80-acre mineral claims Banya greenstone belt NE of Laverton.**
- **Exploration straight forward/ simple. Fly aero magnetics, aerial photography, prospect gossans, soil geochemistry or air track geochemistry, and then RC/diamond core drilling.**

- **Reverse Circulation/Air core came into its own at this time – cheaper than diamond core. Also AA/Atomic absorption analysis for geochemistry**
- **Start of boom junior exploration companies – funds could be relatively easily raised on the various state stock exchanges with little or no regulation.**
- **Vastly optimistic press releases /no oversight – Tasminex announced discovery bigger than Poseidon – shares moved a few cents to $70 overnight. They had nothing!**
- **Poseidon in a few months went from 50 cents to $280. I bought at 90 cents and sold 100 at $220. I held on to Administration – frightened of the tax implications**!

Carr Boyd Minerals (1970)
Tenneco/Minops (1971/72)

- **Tenneco/Minops had JV projects in the NE Goldfields for nickel – 50/50 with Minops (a junior at that time) with Tenneco providing all the funding.**
- **They were good to work with in that most money went into drilling of one sort or another but again they got cold feet after only two years and left minerals/Australia**
- **Sent to Indonesia to review the potential of East and West Timor. Boarded a Garuda DC8 at Jakarta, the aircraft did a fast turn near the terminal and sheared 3 feet off the wing! Flying has always been hazardous in Indonesia**
- **<u>Tenneco, as a major US conglomerate, should never have moved into minerals – they did not understand the minerals business and did not stay the distance.</u>**

Union Oil 1973/76

- Union Oil (discovered Moonie gas field) moved to minerals in 1972, nickel exploration in WA/massive sulphides elsewhere
- Again, If you don't persist you are unlikely to be successful.
- Tasked with selling equipment – both technical, scientific and cars/caravans. In retrospect Union management in LA did not care what we did with all the equipment. We could have sold it to ourselves for a pittance!
- All staff were given 4 weeks' notice, had to work out. No redundancy.
- Three weeks into notice period I received a call from LA on a Friday – be in LA on Monday to discuss possible transfer to Tucson Arizona as Exploration Manager SW USA! In 1976 this was not easy – I managed to fly via Singapore and Guam.

A reflection on American Companies – Nickel boom

- **Australia considered a good place to develop minerals – politically/geologically.**
- **A lot of funds went into WA – much wasted as the build-up was too rapid for efficient exploration/people were hired who in other times would not have been – for example school teachers.**
- **Most exploration shuddered to a halt with the election of Whitlam. American companies greatly cut back on exploration or left Australia. American companies were not prepared to wait out Whitlam.**
- **<u>This is the bane of exploration – politics/ boom and bust, no persistence resulted in much wasted funds.</u>**

Union Oil - Tucson 1976 to 1978

- **May 1976 Tucson, Arizona/ Regional Exploration Manager. Five geologists/geophysicists and a budget of about US$ 1.0 million/annum.**
- **Exploration focus porphyry copper, minor emphasis roll front uranium**
- **The porphyry copper exploration was largely a waste of time and money -governed by an oil company mentality. Endless surface exploration but any drill hole required approval from head office in LA. Drilled no holes for porphyry copper in 2.5 years.**
- **In 1978 acquired Molycorp (Molybdenum Corporation of America) - underground molybdenum mine Questa, Colorado and rare earth mine at Mt Pass in (bastnasite and monazite – mainly lanthanum) Nevada.**

- **Unwisely I wrote a critique of exploration policy/ wasting money/ never be successful unless focused on risking drill holes – or focused solely on acquisitions such as Molycorp.**
- **Moved sideways to newly created position Manager Special Projects/ tasked with assessing uranium possibilities/Australia/ South Texas.**
- **In Australia Union had a one-man office downtown in Sydney/ program not going anywhere. South Texas – in-situ recovery of uranium roll front deposits.**
- **After completing reports on both those subjects, I was summoned to LA for annual medical - including what passed for a colonoscopy.**
- **I reported upstairs, was promptly told my position of Special Projects Manager was redundant. I was terminated with 4 weeks' notice – to be worked out. Again no redundancy payments.**

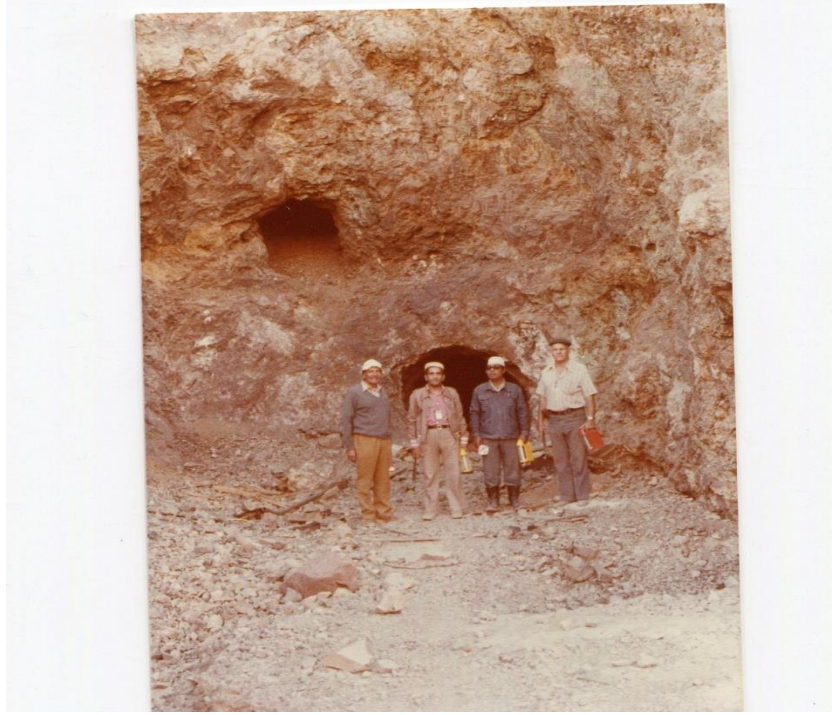
Comments on Union's programs

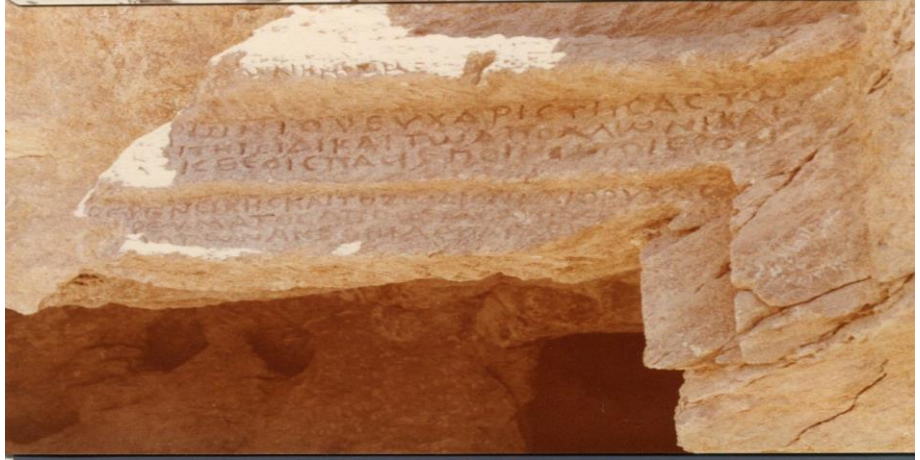
- **Union's mineral exploration in both Australia and the USA, like <u>most oil company's move into minerals was a waste of time and money.</u>**
- **Minerals/ other than iron ore and perhaps coal seldom compete in profitability with oil**
- **There was never real long-term commitment or follow up - both of which are essential to success.**
- **Union exited all minerals in the early 1980's except Mountain Pass which they sold in the early 2000's**

Exxon Minerals 1978 to 1985

- I had US residency, so, although stressful, termination positive for me.
- Joined Exxon Minerals based in Houston - New Countries Group – a small group identifying mineral opportunities around the world.
- Carried out geological/political assessments on mineral potential or projects in France, Morocco, Egypt, Greece, Thailand, Indonesia, PNG, Uruguay – month in Houston, month away – no days in lieu. Egypt/Thailand highlights
- Exxon Minerals employed three mineral economists who attempted to forecast future metal prices. They forecast 1979 that copper prices would double or triple (they actually soon went down).

Nugress village
- Emerald,
gold workings
Eastern desert.
Pharoah,
Greek and
Roman.
Greek temple
400 BC.
Slaves lived in
caves/
stone huts.
Water??





I.

Nugres Village remains of rough stone houses emerald mines. Greek/Roman about 400/600 BC. Grave for Norman White, New Zealand at Um Garaif Gold Mine, south of Aswan, near the border with Sudan. In 1905, Norman died age 28, this must have been among the remotest parts of the planet. There were several other graves also remarkable with headstones- not a healthy place - not a very successful venture financially.

Travelling in Thailand 1979 – adjacent Laos

- A year assessing mineral and political potential of Thailand. Politics too difficult for Exxon.

Papua New Guinea - 1980 to 1985

- 1980 - bullish projections, copper price Exxon embarked on major grass-roots exploration. A base established Lae – a US$ 3m dollar compound/ office built.
- PNG best combination political framework/ potential discover copper deposit impact Exxon's bottom line. GM Esso Papua New Guinea Inc. – no oil activity.
- Objective of PNG program to discover a Bougainville. Such a deposit plus possible skarns would have a recognisable magnetic signature.
- Esso applied for PA's (precursor to Exploration licenses) some 70,000 sq kms in five separate areas – agreed to fly aero magnetics over all areas.
- Cost of doing business in PNG underestimated (we had budgets of approximately US$6 million each year for 4 years); difficulty/cost of following up numerous anomalies; logistics; difficulty hiring staff; topography, access and the weather.

- **Two discoveries of significant, previously unreported porphyry copper mineralisation - still being explored by Coppermoly Ltd.**
- **In 1980/81 the gold price spiked – Exxon not immune/ also partly result of the Lihir, refocused from copper to gold (the copper price had not spiked as forecast by our mineral economists). This necessitated a different exploration approach – largely geochemistry and prospecting.**
- **Esso made numerous discoveries of unreported gold mineralisation/ none were followed through before Exxon quit minerals**
- **These discoveries continue to be explored today, two small gold mines developed by Juniors.**

Helicopters inherently dangerous in PNG
Daughter Lisa went down in this one – stopped rolling down hill by pig fence
Pilot error

Geologist lost in crash into sea here on Feni

Comments on Exxon Minerals

- **Minerals middle management had vision. Exxon located many previously undocumented mineral occurrences/ for most companies would signify success.**
- **Most are still being explored 40 years later.**
- **Cost structures much tighter in minerals compared to oil. Exxon superimposed oil company cost structure/ management on mining – reduces profitability for any minerals development. It was great for employees.**
- **You can produce oil from a discovery hole - development of a large mineral deposit takes years with much capital cost locked away**
- **Exxon was not focused on projects likely to meet Exxon's minimum size/profitability. Exxon had too many projects worldwide; and policy was influenced by metal price fluctuations.**

- **Few mineral deposits/mines make a difference to Exxon's bottom line – and they should have realised that.**
- **Excellent minerals research section. Many hundreds of millions over 10 years/still succumbed to changes in focus and spread effort too widely which negated much of the effort.**
- **Exxon and other oil companies should never have diversified into minerals. Should have realised minerals are a very different business to oil.**
- **In 1985 Exxon management decided minerals were not for them – as did most oil companies that had diversified into minerals**
- **PNG projects initially joint ventured to City and Suburban Properties (became City Resources) in 1985/in 1986 Exxon sold all Australian/PNG mineral's to City Resources for about $US50 million – loan from subsidiary of the State Bank Victoria. Hard to imagine this happening today.**

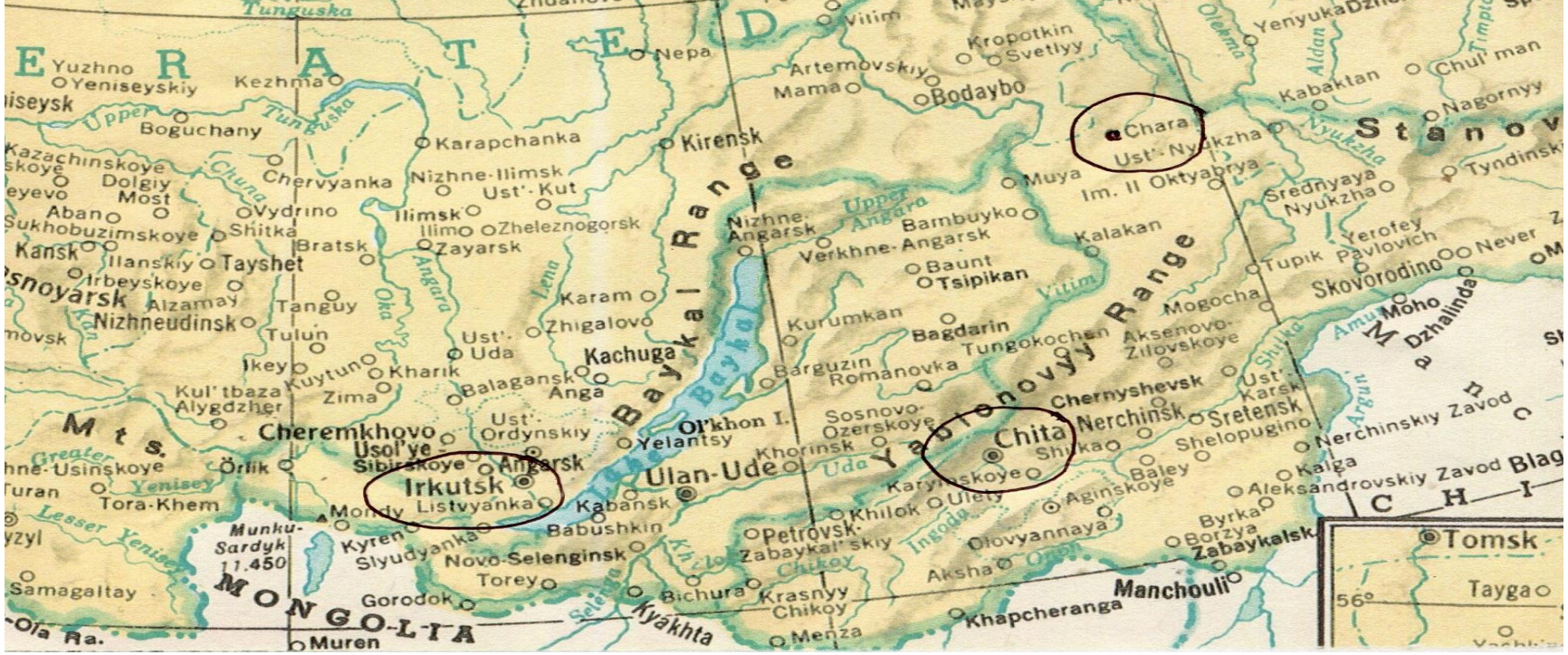
City Resources – 1986 to 1990

- Era begins of junior exploration/ mining companies. Boom from 1985 to 1988, although short was in many ways similar to the nickel boom.
- Who remembers City Resources? City is a story on its own/only a few points.
- No junior like it at the time or since. Portfolio from included 100 or more projects Other projects acquired in Vanuatu and Canada. City dabbled in China.
- Offices set up Lae/Rabaul in PNG, Gold Coast/Perth in Australia, Santo in Vanuatu and Vancouver in Canada. Associated companies formed to raise funds/listed on the Hong Kong Exchange (City Asia) and Vancouver Exchange (City Canada).
- To service/explore required many staff including consultants, geologists, mining engineers, metallurgists, accountants - about 70 – huge number in the circumstances.
- I don’t recall how much funding was raised and spent over those years, was very considerable.

- **Exploration followed Exxon's work/good results achieved many projects – two developed by others later as small gold mines in PNG and in Australia St Barbara developed Gwalia Deeps. All mineral occurrences/projects continue to be held and explored today.**
- **Received an education in promotion! TC Coombs, a London based broker, produced glossy research brochures and reports – which were very ambitious with unrealistic comments and projections. Not be permitted today.**
- **They also held live-in promotional venues with company presentations at Brockett Hall near London. Australian brokers also got on board; JB Were's undertook a promotional tour of PNG and City projects.**
- **It all started to unravel with the 1987 stock market crash. Although exploration persisted into 1989 it became difficult, then impossible to raise funds.**
- **In mid-1989 Barrick Resources of Perth provided JV funds and in late 1989 acquired City Resources. Most staff, including myself were retrenched – four weeks' notice only.**
- **Barrick itself, because of silica project in WA , difficult market conditions went into Administration in 1991 the City projects were relinquished**

Comments on City Resources

- **Les Ward and Laurie Johnson showed vision in acquiring Exxon's projects - Most projects had significant mineralisation/ $100m or more in sunk costs.**
- **Should have rationalised portfolio, focused on "best" 10/12 projects. Expanded too fast/spread too thinly meant the best projects not advanced to development in short time frame to obtain cash flow**
- **Whether the market would have accepted this or whether City valued highly because of many projects I don't know. Lack of focus contributed to City's demise – expanded too much too fast - perhaps its demise was inevitable after the 1987 crash/drop in metal prices.**
- **<u>1990- 1993</u> - Very difficult years for mining companies/mining professionals/ junior exploration companies with no cash flow.**
- **I marketed a large study of Thailand - data from Exxon/some consulting – an assessment of the Udokan copper system in Eastern Siberia**



Udokan Copper Sedex Deposit in syncline

- Billion tonnes of 2-3% copper – 100's kms of tunnels, drill holes
- Trip delayed by attempted Gorbachev coup – went late September – cold, plenty of snow.
- Remote – near Chara on BAM railway – Chinese believed had deal to mine and ship concentrate to China
- Chinese mining smelting company/Hong Kong entrepreneur/ Greg Kater – list on ASX - my role to review data! Visited offices in Chita, Mine site at Chara, data held by several organisations, all in Russian, not allowed to copy anything – impossible to review. Much drinking!!!, KGB security, KGB compound built by Japanese POW
- Russians had different ideas to Chinese – after a couple of years all fell over. Now supposedly being developed by Russian Group

Macmin Silver/New Guinea Gold/Tasgold (Frontier)/Coppermoly -1994 to 2011

- 1990's began the age of juniors in numbers and in respect to exploration expenditure – compared major companies. Early 1970's juniors numbered in the 10's; early 1990's perhaps 100 or so, 2022/ 1000 or more.
- 1993 Denis O'Neill, Peter McNeil and I put together a suite of projects from PNG, Queensland and Tasmania – into an IPO for Macmin Ltd, supported by Morgan's and raised $4.2 million.
- PNG projects discovered by Exxon and partly explored by City Resources. Two companies, Frontier and Coppermoly remain listed.
- Jointly, until 2012, raised about $100 m for exploration/development/further $50m spent on the properties by JV partners.

- **To obtain Morgan's backing in 1994 joint ventured the Wapolu project on Fergusson Island in PNG, which was ready for development, to Rob Murdock's Union Mining.**
- **Union funded development/initial capital costs for 51% stake and were operators. Wapolu resource of 300,000 to 500,000 ozs gold**
- **All went well for a year or so, then gold dropped to US 275 /oz and milled grade dropped to 1.7g/.t from a reserve grade of 2.4g/t.**
- **A review of the grade problem indicated 30% of the material milled originated outside the planned pit – inadequate supervision resulted in excavator drivers digging outside the pit boundary. The ore was free digging.**
- **Rob Murdoch can be a prickly character and we sold out our interest to Union.**

New Guinea Gold Corporation

- **In 1996 the best / lowest dilution option to raise funds was to spin out associated company to acquire PNG projects. Backed by Canaccord, New Guinea Gold Corporation (NGG) formed, listed TSX V/ raised CAD$5m. Macmin retained 30% interest NGG and was operator.**
- **NGG JV'd Feni Is (look alike to Lihir and along trend from Lihir) with Union; the Simuku porphyry copper with Placer and later Mt Nakru copper with Barrick. Union dropped out of Feni after a couple of years; Placer drilled several holes at Simuku but after being taken over by Barrick had a reorganisation, moved away from copper, and relinquished Simuku back to NGG.**
- **Barrick also achieved little at Mt Nakru and walked away after a corporate reorganisation to move away from copper. Placer and Barrick spent $8m but did not achieve any of their objectives – basically wasted their funds.**
- **In 2007 brought in Canadian junior, Vangold, to fund gold exploration on Feni/ Mt Penck West New Britain. Canadian partners could never accept how expensive exploration is in PNG.– this caused a few acrimonious JV meetings.**

- **In 2007 NGG spun off the two copper porphyry projects, Simuku and Mt Nakru into Coppermoly, raised $8 million, listed on the ASX. Coppermoly continues to explore these projects – albeit now essentially owned by Chinese interests.**

- **NGG to focus on Sinivit in 2007 to obtain cash flow . South of Rabaul the Sinivit gold/telluride project had an indicated plus inferred resource of about 700,000 ozs (not all oxide). Sinivit was undercapitalised. To raise initial capital our Vancouver brokers pressured reduce capital requirement to unrealistic minimum.**

- **To raise funds for expansion of Sinivit, NGG took on new Canadian shareholders. Imwauna and Weioko projects were sold for cash and shares into a new TSX V company - PNG Gold – not managed by NGG. There was significant gold at these projects on Normanby**

- **PNG Gold promptly raised CAD$35m – connections – to put Imwauna into production. New management had no idea how to operate in PNG - not interested advice – built luxurious camp, drilled a few more holes and where rest of the money went?**

SINIVIT MINE – EARLY MINING – 2007

Preparing vats – once filled overlain with heaps – grade about 4 g/t

- **In the 5 years it operated Sinivit produced about 40,000 ozs, was cash flow neutral but to access much of the resource it needed additional capital in 2009 – partly achieved by sale of Imwauna and Weioko.**
- **Many disagreements with new Board and a major shareholder over management/direction of NGG and other associated PNG companies. I was pushed out of management in 2009, accepted a payout in 2011 – I was 73 and realised I could not win.**
- **The NGG Board hired a new MD – paid him about $500,000 per year, gold plated new offices in Brisbane and hired new staff, all their cash reserves disappeared and went into Administration in 2012.**
- **Today all the former NGG Projects are held by other juniors, supposedly being explored but I suspect that funds are minimal.**

Macmin Silver

- Macmin focused on developing the Texas/Twin Hills silver deposit. Queensland projects were dropped or JV'd , Tasmanian projects spun off into Tasgold. Macmin had interest/association with Malachite Resources.
- Macmin had shareholders/support in Europe and listed on Frankfurt Exchange. By early 2005 almost 50 % of shareholders were listed on Frankfurt.
- Both good and bad – good in it propped up the share price but disadvantage in that shareholders could not participate in SPP's or Rights Issues.
- The European shareholders tended to be silver bulls – from about 2005 onwards silver was supposed to double or triple in price.

- **Macmin pressured to move Texas to production ASAP so it could take advantage forecast boom in silver prices – which did not happen.**
- **Texas total silver resource of about 56m ozs – reserve of 30 m ozs. Production commenced in early 2007 at a cash cost of about AUD$13/oz which was marginally profitable. In the process of increasing production by 50% in mid/late 2008 when the GFC struck.**
- **At that time Macmin had $2m in the bank and $2.5 worth of silver bullion.**
- **The silver price dropped to about US$8/oz Texas was producing at a loss. Had funds to last 3 months/ the Company Secretary and Independent Directors got cold feet and to protect themselves appointed a voluntary administrator - which did allow staff and creditors to paid out.**
- **<u>The irony of this decision is that the AUD$/US$ dropped to 50% within 3 months/ silver price in AUD$ increased to $22 – we could have survived.</u>**

Twin Hills layout – 2008 – pit bottom centre, first heap top centre, pregnant pond etc top left. Ultimately heaps covered much of photograph area

Frontier Resources

- **Tasgold raised $4m, listed on ASX about 2000. Tasgold later became Frontier Resources, managed by Peter McNeil. Frontier moved into PNG in 2004/acquired a suite of projects based on Peter McNeil's long association and knowledge of that country.**
- **Frontier acquired the Kodu porphyry copper project (fairly close to Port Moresby) – ultimately proving up about 1m tonnes of copper equivalent at a grade of 0.5 % copper equivalent – still open ended.**
- **Unfortunately, politics reared its head – Kodu was adjacent to but did not physically impact on the Kokoda track. Under pressure from Australian interests Kevin Rudd persuaded the PNG Government to revoke Frontiers EL with promises of support to establish a world heritage area. 15 years later nothing has happened.**

- **After the revoking of the Kodu tenement Frontier focused on Mt Andewa in West New Britain and intersected substantial widths, 106m@.75g/tAu and 0.35%Cu of possibly ore grade copper and gold mineralisation.**
- **3D IP delineated many substantial targets at depths of 300/400m.**
- **A JV with Newcrest produced more encouraging drill results – however after expenditure of about $3m, Newcrest terminated the JV due to a corporate reorganisation and lower gold/copper prices.**
- **Frontier's story is much more detailed than described here is but beyond the scope of this presentation. Frontier never really recovered from the Kodu action although it is still listed on the ASX – Peter or I no longer have any interest in Frontier.**
- **Frontier was brought down by Australian government action re Kodu although falling copper and gold prices and political concerns re the PNG Government also contributed.**

What lessons from the Macmin/ NGG group

- **Juniors need a regular source of funds – enough funds to deliver results to feasibility**
- **Focus is essential - cannot sustain more than one or two projects – yet the conundrum - the market seems to demand that juniors have large portfolios of projects.**
- **Juniors need to keep reinventing every few years to retain market support**
- **The Macmin/NGG group achieved funding partly by spinning off projects to new IPO's or other juniors – reducing equity. In NGG's case Sinivit was the only project it retained at 90% and for Macmin the Texas Project was owned 100%**
- **Government actions/ policy changes may cause high risk – even disaster.**
- **Project development by a junior is high risk if you don't have the funds or cash flow to sustain the company through technical problems or decreases in metal prices.**
- **Joint ventures seldom achieve their objectives – major mining companies relinquish JV's their own corporate reasons unrelated to results achieved.**

Golden Tiger 2007-2010

- Non executive Chairman
- Projects in southern China centred on Nanning
- Gold
- Joint Venture with Nanning Geological Survey –try to drink you under the table
- After three years proved impossible to work with the local authority
- Tried to sell projects - plenty of interest but bureaucracy eventually killed everything
- <u>Don’t try to develop projects in China as a Junior Explorer</u>

Torque Mining Ltd – 2012 to 2017 – Tasmania

- **Torque Mining spun off from Frontier to advance Tasmanian Projects. Frontier provided financing for extensive 3D IP survey and additional drilling to prove up resources on one project.**
- **Torque unsuccessful with IPO – in 2013. To obtain cash flow Torque JV'd with BCD/Beaconsfield Gold, Torque provided small gold resource/BCD provided plant at Beaconsfield. Ore trucked 130 km.**
- **BCD produced a positive feasibility study, predicted processing cost of $30/oz. Cost after six months production was $54/oz – so much for feasibility study.**
- **Mine to be run by a JV committee meeting monthly equal representation BCD as Operator. Problem with this arrangement – Operator ignoring instructions of committee.**
- **If the latter happens the only recourse is legal action which not practical for short term projects – particularly in this case when BCD went into Administration during the project – caused by????**

- **There were numerous problems – a discrepancy of 10% in the amount of ore shipped from site compared to that supposedly milled. Not resolved before Administration.**
- **BCD did not have facilities to produce gold dore on site at Beaconsfield (this was missed in our due diligence) and consequently gold on carbon was shipped to Perth.**
- **There was a further unresolved discrepancy here – an amount of $1.5m in Torque's favour when the value of gold on carbon by assay was compared to gold sold after refining.**
- **Although Torque was able to pay off staff and all debts except those to me after selling its assets it could not recover and in 2017 faded away.**
- **Failure to secure an IPO; BCD's Administration; lower gold price of about AUD 1200/oz compared to today's AUD$2400/oz; an unrealistic feasibility study with processing cost underestimated by 50%; problems reconciling ore mined with ore processed; and discrepancies between gold on carbon with gold sold all contributed to Torque's demise.**
- **In retrospect the 3D IP survey was a waste of money as the anomalies were never able to be followed up**

How things have changed in exploration

- **Early 1960's – prospecting, geological mapping, aerial photos, magnetics, aero magnetics, radio metrics – geophysics in infancy – no widespread geochemistry, no regulation or environmental restrictions. Exploration carried out by mining companies.**
- **By late 1960's – Exploration largely prospecting; development AA allowed widespread geochemistry; advances in IP and EM. Drilling such as RC and air core widely used, much improved diamond core – wireline, improved core recovery. Various remote sensing developed**
- **Juniors start to appear with nickel boom – still very few compared to today – no regulation of juniors – say what you like in press releases. Mid/late 1980's juniors start to dominate exploration and by 21st century dominate.**
- **3D IP common after 2000 but 3D IP can be a mixed blessing – it defines numerous anomalies which can only be tested by drilling. This becomes a lottery as there is seldom enough funds to test more than a few such targets.**
- **Major companies now mainly into acquisitions – little meaningful regional exploration.**

Conclusions for Success

- **Metal prices and grade – these are most critical for development by juniors.**
- **For exploration and pre development – need long term commitment and regular funding**
- **Ability to complete many drill holes. No long-term commitment, no regular funding, no drill holes, no discoveries**
- **Adequate capital for development – enough allow for problems which will occur in start up – feasibility studies are just guides, poor at that.**
- **Politics – be aware!**
- **Luck**
- **Discoveries are seldom made by individuals – team effort. Lihir for example or Peko discoveries– Peter McNab and Ken Raeder acclaimed as discoverers of Lihir – only part of the story (Gavin Thomas – Kennecott).**