Miraculous Touch of Gold
Inventory, Exploration & Investment
Geology and Gold Mineralisation in the
Agnew Mining Camp, WA

Vladimir David

Liberty  Delirium and madness  Slavery
Gold Mining – magic rush

Magic Greed for Yellow Metal - Serra Pelada Gold Rush

Serra Pelada Gold Rush, Brazil, deposit discovered 1979; until 1980 40 - 100 tons of Au hand mined by 70,000 garimpeiros; photo taken by Sebastião Salgado

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How to get gold?

What we are doing today to get Gold?

Melt rocks to get gold!

Super pit Kalgoorlie

Kupol, Processing plant

Drill hole deep holes into ground!

Agnew Mine surface drilling

Dig rocks making big holes in the ground!

Agnew underground development

Bore the tunnels to mine the rocks!

Mill and dissolve the rocks!
How much Gold is there?

**Resources and Production**

- Number of gold deposits 580 – containing 3,758 MOz Au with an average grade @ 1.01 g/t Au;
- Number of mines 199 – producing 36.5 MOz Au with an average grade @ 1.18 g/t Au;
- Number of gold deposits 381 – containing 3,720 MOz Au (extractable 50%) @ 0.89 g/t Au;
- There are still 50 years of resources for gold mining with today's production rate;
- But – the remaining resources have a 33% lower grade @ 0.89 g/t Au.

Data includes reported production and resources. Data for China are estimated.

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July, 2016
World Gold Production

Gold Production & Resources - Countries and Companies

Gold production per countries in M Oz (2015)

Source: Metal Focus

Gold Production in M Oz (2015)

Gold Resources in M Oz (2015)

Source: Metal Focus

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World Gold Inventory

Resources and Grade by Countries

**Gold Inventory:**

1. USA 473 MOz < 1.01 g/t Au;
2. Canada 471 MOz < 1.01 g/t Au;
3. **South Africa** 466 MOz @ 6.04 g/t Au;
4. **Russia** 328 MOz @ 2.02 g/t Au;
5. Australia 258 MOz < 1.01 g/t Au;
6. Chile 147 MOz < 1.01 g/t Au;
7. Mexico 137 MOz < 1.01 g/t Au;
8. Ghana 122 MOz < 1.94 g/t Au;
9. PNG 109 MOz < 1.29 g/t Au;
10. Indonesia 137 MOz < 1.01 g/t Au

**Opportunities (underexplored regions):**

1. Tanzania (2.84 g/t Au);
2. DRC (2.59 g/t Au);
3. Mali (2.27 g/t Au).

(source Visual Capitalist, 2016)
# World Gold Inventory

## Gold Production and Resources

### Gold production in Koz (2015)

<table>
<thead>
<tr>
<th>Location</th>
<th>Gold Production (Koz)</th>
</tr>
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<tbody>
<tr>
<td>Muruntau (Uzbekistan)</td>
<td>1,961</td>
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<tr>
<td>Grasberg (Indonesia)</td>
<td>1,360</td>
</tr>
<tr>
<td>Polyus Krasnoyarsk cluster (Russia)</td>
<td>1,289</td>
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<tr>
<td>Goldstrike (US)</td>
<td>1,055</td>
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<tr>
<td>Cortez (US)</td>
<td>1,000</td>
</tr>
<tr>
<td>Pueblo Viejo (Dominican Rep.)</td>
<td>955</td>
</tr>
<tr>
<td>Yanacocha (Peru)</td>
<td>920</td>
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<tr>
<td>Carlin (US)</td>
<td>887</td>
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<tr>
<td>Penasquito (Mexico)</td>
<td>862</td>
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<tr>
<td>Lihir (Papua New Guinea)</td>
<td>804</td>
</tr>
<tr>
<td>Boddington (Australia)</td>
<td>794</td>
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<tr>
<td>Olimpiada (Russia)</td>
<td>760</td>
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<tr>
<td>Kupol (Russia)</td>
<td>694</td>
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<tr>
<td>Batu Hijau (Indonesia)</td>
<td>675</td>
</tr>
<tr>
<td>Oyu Tolgoi (Mongolia)</td>
<td>653</td>
</tr>
<tr>
<td>Kibali (DRC)</td>
<td>643</td>
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</table>

### Gold resources in MOz (2015)

<table>
<thead>
<tr>
<th>Location</th>
<th>Gold Resources (MOz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pebble (US)</td>
<td>107.7</td>
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<tr>
<td>Grasberg (Indonesia)</td>
<td>104.8</td>
</tr>
<tr>
<td>Olympic Dam (Australia)</td>
<td>97.4</td>
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<tr>
<td>South Deep (South Africa)</td>
<td>76.0</td>
</tr>
<tr>
<td>KSM (Canada)</td>
<td>64.0</td>
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<tr>
<td>Polyus Krasnoyarsk cluster (Russia)</td>
<td>60.6</td>
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<tr>
<td>Oyu Tolgoi (Mongolia)</td>
<td>58.7</td>
</tr>
<tr>
<td>Lihir (Papua New Guinea)</td>
<td>57.1</td>
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<tr>
<td>Mponeng (South Africa)</td>
<td>48.7</td>
</tr>
<tr>
<td>Olimpiada (Russia)</td>
<td>47.3</td>
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<tr>
<td>Muruntau (Uzbekistan)</td>
<td>44.4</td>
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<tr>
<td>Sukhoi Log (Russia)</td>
<td>43.2</td>
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<tr>
<td>Cadia Valley (Australia)</td>
<td>42.8</td>
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<tr>
<td>Reko Diq (Pakistan)</td>
<td>41.8</td>
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<tr>
<td>Donlin Gold (US)</td>
<td>39.1</td>
</tr>
<tr>
<td>Natalka (Russia)</td>
<td>37.0</td>
</tr>
</tbody>
</table>

### Mineralisation Style

- sediment hosted Au
- porphyry Au-Cu (Mo)
- epithermal
- paleoplacer
- orogenic gold
- IOCG deposits

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World Gold Inventory and Production in Relation to Mineralisation Style

MINERALISATION STYLE
- sediment hosted Au
- porphyry Au-Cu (Mo)
- epithermal
- paleoplacer
- orogenic gold
- IOCG deposits

Gold production 38.5 MOz, 2015

Source: Gold Forum, 2016

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Australian Gold Inventory

Australian Gold Inventory of 258 MOz Au and Production of 8.8 MOz Au

- past gold production more than 80% from orogenic gold deposits

- present production – still around 40% from orogenic gold but the largest Australian mines are now porphyry mineralisation
Gold Exploration

Where to Discover Gold – do we have to explore deeper or go somewhere else?

Primary gold deposits >100 kOz Au found in the world

Mature terrains:
• Average depth of discovery is 90m in Australia;
• Average drilling is 700,000 m for deposit >100Koz.

Opportunities terrains:
• Africa - depth of discovery is 9m (excluding SA);

Average cost for discovery (2005 - 2013)

Resolution

Total MOz Au discovered in relation to depth >100kOz found in the world

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Three main periods in modern gold exploration:
- 1975 - 1987 – outcropping discoveries - cost per Oz Au < US$ 20;
- 1987 - 2007 – discoveries under shallow cover - cost per Oz Au around US$ 20;
- 2007 - 2014 – discoveries under cover - cost per Oz Au > US$ 60 with steep trend upwards;
Discovery Rate, Cost and Investment Return in Australia

Mineral Discovery Rate and Exploration Investment

- on average, industry finds three Tier 1, ten Tier 2 and sixty Tier 3 deposits per decade;
- last decade only 1 deposit Tier 1 size.

Tier 1 NPV > US$ 1B;
Tier 2 NPV = US$ 200 M – 1 B
Tier 1 NPV = US$ 10 M – 200 M
Tier 1 NPV < US$ 10 M

Is mineral exploration industry in Australia still a profitable industry??
Gold Exploration – Where are we now and what to do?

Exploration Management, Strategies and Techniques
Where we are going? Are we on right track?

Mineral Exploration Expedition, NSW (Sydney Herald 1878)
Agnew Mining Camp
Geology and Gold Mineralisation

New Holland
Genesis
Hidden Secret
Waroonga
Kim

EMU Shear Zone

EMU Mining Operation
**Agnew Mining Camp - Regional Geological Setting**

**Yilgarn Craton Past Gold Production**

- In total Yilgarn Achaean greenstone belts produced > 246 MOz Au;
- Wiluna Belt produced > 30 MOZ Au.

**Wiluna Belt**

- **Jundee**
  - 6.75 MOz Au
  - Northern Star

- **Bronzewing**
  - 3.5 MOz Au
  - Meltiko Resources

- **Darlot**
  - 2.5 MOzAu
  - Goldfields

- **Tarmoola**
  - 1.2 MOzAu
  - St Barbara

- **Leonora**
  - 7 MOzAu

**Agnew – Wiluna Belt**
- 10 MOz Au

**Leonora Belt**
- 12 MOz Au

**Southern Cross Belt**
- 10 MOz Au

**Kalgoorlie-Norsmen Belt**
- 120 MOz Au

**Boddington**
- 20 MOz Au

**Laverton Belt**
- 25 MOz Au

**Yamarna Belt**
- 6 MOz Au

**Plutonic Belt**
- 7.5 MOz Au

**Tropicana**
- 8 MOz Au

**Modified after Czarnota et al. 2010b**

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Agnew Mining Camp produced 6.65 M Oz Au from 54 known historical and recent mine workings (Wamex and GoldFields Annual reports).

Today there are three operating underground mines:
- Waroonga and New Holland operated by GoldFields - combined production of 250kOz/year; and
- Vivian Mine operated by Ramelius Resources with production of 25 kOz Au/year.
Agnew Mining Camp has produced over 6.6 M Oz Au since 1892 when mining recommenced.

Mining history:

- 1892 - Wells Exploring Expedition travelled in the vicinity of Lawlers and noted potential for gold mineralisation;
- 1894 - Paddy Lawlers prospecting party find gold at Lamehorse Soak;
- 1895 - 1909 - Great Eastern Mine in production;
- 1896 - Lawlers town site gazetted;
- 1895 - Gold first discovered at Waroonga (Agnew) location;
- 1897 - 1911 - Waroonga (Emu) Gold Mine in production;
- 1901 - Gold discovery at Vivian;
- 1903 - 1911 - Vivian Mine in production;
- 1935 - Waroonga Mine re-opened;
- 1948 - Waroonga Mine closed;
Agnew Mining Camp – Mining History

Modern Mining History

- 1976 - Western Mining Company (WMC) acquire Waroonga mining leases;
- 1984 - Forsayth purchases Great Eastern Lease from Mintaro Queen Margaret;
- 1985 – (April) WMC discovered Redeemer – 1.5 MOz (4100 ppb soil);
- 1987 - Redeemer commenced production and operated until 2002 (1.5 MOz);
- 1986 - Forsayth commence modern open pit mining operation at Lawlers;
- 1986 - Discovery of Cox-Crusader (600 kOz) RAB drilling by Asarco Australia;
- 1987 - Asarco and Forsayth Mining commenced producing from Cox-Crusader;
- 1992 - Plutonic Resources purchase Forsayth NL and operate the Lawlers Gold Mine;
- 1996 - Discovery of Fairyland (200 kOz) (RAB) by Plutonic; 1997 open pit mining commenced;
- 1997 - Goldfields started Vivien open pit operation and produced 185 kOz Au;
- 1998 - Discovery of underground resources at New Holland-Genesis (1.3 MOz) and underground mining commenced by Plutonic Resources;
- 1998 - Homestake acquires Plutonic;
- 2001 - Barrick merges with Homestake;
- 2001 - GoldFields Australia purchased Waroonga lease from WMC;
- 2002 - Kim (1.2 Moz) - extensional drilling; Songvong (350 kOz) – magnetics discovered;
- 2014 - GoldFiles purchased from Barrick Lawlers leases including New Holland underground;
- 2014 - GoldFiles operates two underground mines Woroonga and New Holland and produces more than 250 kOz Au per year.

Agnew mill capacity 300 000/ year

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• East Murchison United (EMU) gold mining operation at Waroonga (Agnew) used void of adjacent old open pit as additional water storage;
• Extremely heavy rainfall filled pit to a point where overflow occurred in the area of the separating ‘pillar’ between pits;
• Overflow rapidly eroded pit wall which collapsed and discharged water into Main Open Cut;
• Main Open cut had decline at the pit floor level and miners were working underground;
• Twelve people died including Mine Manager who had gone underground to warn and withdraw miners;

• This tragedy was the worst in living memory for the WA mining industry.

Official report: “a wave of water rushed across the AG Southern Extension, a small portion flowing down the old Emu Shaft while the remainder cascaded over the southern wall of the Main AG Pit. Its flow towards the decline retarded slightly by a bund of road base material which had been built during the day to prevent nuisance water flowing down the decline”.

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Today there are three operating underground mines:
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- Vivian Mine operated by Ramelius Resources with production of 25 kOz Au/year.
Agnew Mining Camp Geology

The lithostratigraphic setting of gold deposits is as follows:

- **Scotty Creek Formation** (~2665 Ma)
- **New Holland-Genesis** Zone 2
- **Redeemer Basalt** (~2690 Ma)
- **Redeemer**
- **Vivien** (~2690 Ma)
- **Waroonga** (~2690 Ma)
- **Lawlers Anticline** (~2690 Ma)
- **Great Eastern** (~2705 Ma)
- **Agnew Komatiite** (~2705 Ma)
- **Cox-Crusader**
- **Songvong**

Gold deposits are hosted through the entire greenstone sequence in every lithology adjacent to structure, commonly on lithological contact.
Norseman-Wiluna Greenstone Belt of Yilgarn Craton;
- Mafic to ultramafic volcanics and sediments folded to form Lawlers Anticline plunging north at 30-40°;
- Folded mafic/ultramafic sequence intruded by granodiorite and leucogranite;
- Clastic sedimentation in the Late Basins - Scotty Creek Formation.
- Waroonga Shear Zone and the Emu Shear Zone.
### Understanding Geology and Terrain Evolution – Structural History

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<tbody>
<tr>
<td>Deposition of</td>
<td>Deposition of supracrustal cover</td>
<td>De1 N-S extension and deposition of ultramafic stratigraphy and Black Flag sedimentary sequence</td>
<td>D1 extension and deposition of supracrustal cover.</td>
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<tr>
<td>supracrustal cover</td>
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<tr>
<td>Tonalite intrusion</td>
<td>D1 Nappe-style folding and gently dipping isoclinal folding</td>
<td>D2 NE-SW compression (~2668Ma)</td>
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<tr>
<td>Erosion of Mafic and</td>
<td>D2 E-W extension, sill-like tonalite intrusion</td>
<td>D2 deposition of the Scotty Creek formation</td>
<td>D3 extension, Late Basins, Metamorphic core complex, doming (2655-2665 Ma)</td>
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<td>tonalite to produce</td>
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<td>Scotty Creek</td>
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<tr>
<td>D1 (layer parallel S1,</td>
<td>Erosion and sedimentation</td>
<td>D2 E-W compression, tonalite intrusion and formation of Lawlers anticline</td>
<td>D4 a and b ENE-WSW to ESE-WNW compression. Upright folding, reverse shearing and sinistral shearing (2645 -2655 Ma)</td>
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<td>gently dipping isoclinal</td>
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<td>folding.</td>
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<td>Leucogranite intrusion</td>
<td>D3 E-W compression leading to re-folding and shearing.</td>
<td>D3 continued E-W compression. Shearing</td>
<td>D5 dextral strike slip along N to NE striking faults (2650 to 2638 Ma)</td>
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<tr>
<td>D2 ENE-WSW shortening</td>
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<tr>
<td>and dextral shearing</td>
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<td>Upright folding</td>
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Controversial structural history by different authors

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Two major mineralisation styles occur over two main subsequent periods (Fletcher et al, 1998):

- **Early mineralisation event - Waroonga style;** controlled by the Emu Shear geometry in a progressing oblique-reverse faulting in the compressional tectonic environment (deformation event D2);
- Deposits have vertical extension over 1000 m and moderate strike extension up to 200m; deposits are steep (60° -70° to west); hosted in monomict unsorted mafic conglomerates; large size: Waroonga, Redeemer and Cox-Crusader.

- **Later mineralisation event – Holland style - Genesis** hosted in Scotty Creek Formation between the Waroonga and Emu Shear in a right lateral-reverse tectonic environment;
- Deposits are gently plunging to south and occur as multiple flat laying veins in a vertical succession limited to the coarse greywacke sandstone; large to medium size: Genesis and New Holland.
Main Mineralisation Styles in Agnew Mining Camp

Mineralisation Geometry

Waroonga style mineralisation style

New Holland – Genesis mineralisation style

Kim Ore body – level 500

Series 500 Westerly structure
Mineralization occurs at the contact of Scotty Creek sandstone and ultramafic breccia where intersected by NNW trending shears and right deflection;

Mineralisation comprises several quartz/quartz breccia lodes from 1m – 5m wide;

Mineralisation dips 55º to the west, plunges 65º to the north.
Scotty Creek sandstone in the Hw and Mine conglomerate (SKCU3) in the Fw;

Central zone of veining and hydraulic breccia - referred to as the Kim core breccia; width from 20cm to 6m and Au-grades from 10 – 20g/t Au range, locally up to 100g/t Au;

Adjacent to the core breccia are the Hw and Fw alteration zones are comprised of amphibole-arsenopyrite assemblage with numerous veinlets both parallel and orthogonal to the core breccia.

Au-grades and widths of the Hw and footwall alteration zones are highly variable. Locally, the Hw alteration zone in the immediate contact with the core breccia can have a higher gold grade than the core breccia itself.
Waroonga - Kim Mineralisation

1085N ore drive – Kim ore body. Face grade 11.80 g/t on the northern end of the ore zone.

High grade Quartz Breccia

Ultramafic footwall breccia

Visible gold in drill core

Kim mineralised structure in drill core
New Holland - Genesis Geology

Long Section with Major Westerly Lodes

Drilling and underground workings in background

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Cross Section with Major Westerly Lode and adjacent Easterlies

New Holland Gold Deposit
Photographic Montage Showing Vein Styles across the Tasman Structure

- **Crucifix Fault** - early thrust structure, pre-mineralisation. Predominant movement west side north.
- **Tasman Structure** to the west of the Crucifix Fault 1-10g/t
- **Dilational Veins** 0.1-2g/t
- **Chaotic Veining** Associated with the western margin. 0.5-2g/t.
- **Confluence of low-angle west-dipping Tasman structure and steep, east-dipping, reverse shear veining 2-50g/t**
- **Crack Seal Veins** along the Tasman Structure. Some are stylolitic. Top margin often sheared. Associated with galena, sphalerite, sulphides and visible gold. 10-200g/t
- **Normal shear veining**, shallow east-dipping, quartz-carbonate veins 2 - 20 g/t
- **Reverse shear veining**, east dipping quartz-carbonate veins with visible gold, 2-50 g/t
- **Vein terminations** along the eastern sandstone contact. Visible gold often present along sheared contacts with siltstone 5-100g/t.

**Western Domain**
Less mature Medium to Coarse Grained Sandstone

**Eastern Domain**
Mature Coarse to Medium Grained Pebbly Sandstone

Source Homestake archive

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New Holland - Genesis Mineralised Vein Styles

Vein geometry

Low angle (30°) highly mineralised type 2 shear vein

Extension Veins with progressive development of sigmoidal younger veins

Flat lying, sigmoidal shear vein

Quartz vein associated with joint/ fractures

Extension Veins with capped Hw

Horizontal veins associated with vertical interconnecting veins
Vein Development Kinematics

- Multiple quartz veins developed in Hw - extensional field;
- No quartz veins developed in Fw - compressional field – capped Fw;
- Progressive deformation (strain) and rotation of local stress axis;
- Developed of different vein geometry during the some kinematics event.
**Vein Geometry**

- Semi-brittle reverse shear zone in sandstone lithology (reverse structure);
- Syntectonic quartz vein formed during reverse displacement;
- Drag folded quartz vein implies progressive deformation in a simple shear tectonic environment.

**Vein Mineralisation**

- Gold mineralisation is concentrated along lower contact of flat lying vein within wall rocks in an intense silicified wall rocks.
- Gold is associated with brecciation, silicification, chlorite and biotite alteration, disseminated arsenopyrite.
- Gold occurs with galena, pyrite, pyrrhotite and sphalerite.
New Holland – Genesis Gold Mineralisation

Gold Mineralisation - Microphotography

- Crack-seal veinlets with visible gold on the quartz vein margins;
- Gold associated with pyrite, arsenopyrite, galena and sphalerite.

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New Holland – Genesis Gold Mineralisation

Nugget Effect of Gold Mineralisation

- Mineralisation is discontinuous – structurally with a pinch and swell character and a very high nugget effect in gold grade.
- Gold-grade correlation had to be conducted in conjunction with structure style, quartz type, quartz thickness, alteration style and structure type.
- Mineralised structures often if reactivated along shears locally can be constrained by a capping structure (Tasman-style) where Hw of Fw have a sharp cut in gold grade impaling a compression zone and kinematic of a lock-up environment with no displacement and no structure opening.
Geological features:

- Deposit is located on the Eastern Limb of the Lawlers Anticline within NE dipping, medium-grained diorite emplaced between arkosic metasediment to the NE and talc-carbonate-magnetite phyllite to SW;
- The NW trending synthetic shear zones in Vivien dolerite host and NE accommodation structure;
- Mineralisation in SE dipping shear zones/quartz veins in multiple NE plunging ore shoots.

Historical facts:

- The earliest recorded mining activity date from 1901 with a full-scale production by 1903;
- Large-scale mining ended in 1911, having produced 76,816 OzAu ore grading 11.2g/t Au;
- Smaller-scale operations continued in 1912-1914, 1936 and 1940-1941;
- Goldfields developed the deposit as an open pit operation in 1997 and produced 185 kOz @7.6 g/t;
- Currently deposit is mined by Remelius Resources as an underground operation;
- Historic production ~350 Koz from original underground and recent open pit.
Vivien Deposit

Mineralisation Style

- Vivien mineralisation occurs as moderately (30-50°) dipping shoots (quartz veins) gentle plunge to north-west;
- Mineralisation is characterised with multiple vein sets limited within NE overlapping shear zones associated with massive sulphide veins (po, cpy) within a halo of disseminated sulphides (py, po, cpy).
Great Eastern Deposit

Historically, Great Eastern produced 235 kOz@11g/t Au @16.3 g/t Au.

Gold mineralisation is hosted in felsic intrusion (tonalities) and on the contact felsic intrusion and mafic.

Mineralisation is controlled with E-W trending, 20m - 30m wide zone of Caroline structure delineated with Eastern and Lawlers shears.

Mineralisation occurs as multiple pinch and swell array of quartz veins and breccia zones interconnected with tension gashes.

Mineralised shoots are steeply (80°) dipping to north with a gentle plunge to west; with a strike >800m and depth extension >400m.

Source of gold is probably magmatic.
Mineralisation Trap - Structural Control

Structural Control – Compressional - Transpressional Thin-skinned Tectonic Style

Waroonga, Redeemer – compressional inversion structures controlled with Emu shear
- NE trending reverse oblique slip fault zone with overlapping pattern (strike-slip and reverse); dilation and compressional bends and jogs and fault nucleation and termination;
- Second order fault splays, structural junction and triple junction of NE trending structures and NNW trending accommodation structures.

Vivian, Fairylands – compressional inversion structures
- NNW faults and shears formed as a pre-buckle thrust faults with overlapping faults (strike-slip and reverse) associated with accommodation SW and NE structures activated in transtensional regime;

New Holland - Genesis– transtensional inversion structures
- NNW flexural zones and shears and their overlapping areas in strike slip oblique-reverse kinematics (coarse arenitic lithology);
- Flat laying reverse oblique slip faults (insignificant displacement) formed in a interaction zone between Waroonga and Emu shear zones.

Great Eastern – compressional inversion structures
- W-E tension faults developed in anticline hinge with strike slip components associated with N-S extension;
- Interference of extension faults developed in extensional field of compressional tectonic regime.

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Stage 1: Pervasive hydrothermal alteration → post-D2, pre-D3
- Pervasive, early hydrothermal alteration overprinting regional metamorphic mineral assemblage;
- Hydrostatic pressure < lithostatic pressure; no brittle fracture of coarse grained units.

Stage 2: Hydrothermal alteration associated with Au / sulphide mineralisation → syn-D3 and
- Hydrostatic pressure exceeds lithostatic pressure; brittle fracture occurred in sandstone packages;
- Formation of gold bearing quartz veins;
- Fine-grained sandstone and siltstone behave in ductile manner.

Stage 3: Minor, late stage hydrothermal alteration → syn-D3 (late)
- Late stage fluid movement / pulse along brittle-ductile fractures and shear zones.
Fluid Source, Path and Depositional Trap

**Fluid sources (Δ34S and metal zonation):**
- magmatic fluid;
- metamorphic fluid;
- mixed source.

**Stable isotope S34**

**Fluid path (Δ34S and metal zonation):**
- regional 340º structures;
- permeable lithology of Scotty Creek Formation;
- combination of both.

**Depositional trap:**
- structure opening – suction pump formed in basin inversion phase causing sudden pressure and temp drop;
- redox property of coarse grained lithology.

**Post mineralisation:**
- metamorphic modification;
- exhumation and preservation.
“Qui audit, adipiscitur” - fortune favours the brave who dare to enquire —

Genetic Models - Crustal Environment - Associations

What were precursor deposits? Where were precursor deposits?

- VMS, IRGS, porphyry, epithermal ?
- Metamorphosed up to amphibolite facies; - mineralisation pre-date metamorphism??
- Geometry is structurally controlled - overprinted and transposed;
- Structurally up-graded – and chemically/mechanically re-mobilised.

Groves et al., 1998; Lang et al., 2000

Vladimir David, SMEDG Technical talks July, 2016
Gold mining future?

Family gold panning in Madagascar, Mining Journal June, 2016