Polymetallic gold, silver and base metal mineralisation at Paupong, NSW: A new intrusion-related system

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Paupong Gold Project

- South-eastern Lachlan Orogen

- Polymetallic gold-silver-copper intrusion-related system
  - With associated Pb-Zn-Bi-Te

- Under-explored area of NSW

- Stream sediment sampling in 1970’s
  - One sample (in hindsight) identified Paupong system but was not followed up
Paupong Gold Project

- Ordovician sediments (Adaminaby Group)
- Silurian intrusives (Kosciuszko and Berridale Batholiths)
- Regional gold, copper, tin and tungsten deposits
- Characteristic IRG metallogenesis
Paupong Intrusive Suite

- Linear trend of granites and granodiorites intruded parallel to thrust faults
  - Non-magnetic

- More deformed than neighbouring Kosciuszko and Berridale Batholiths
  - Pervasive fracturing, weakly sheared, weak pyrite mineralisation, localised stockwork or sheeted veining anomalous polymetallic mineralisation

- Middle Creek granodiorite dated at 430.9 ± 2.1 Ma (Waltenberg et al. in prep)
  - Berridale Batholith: 435.1 ± 4.4 Ma
  - Blind Gabbro: 414.6 ± 4.1 Ma - 380.5 ± 5.1 Ma

- Interpreted buried intrusions from detailed aeromag
Paupong Intrusive Suite

- Deformed, anomalously mineralised porphyritic granite with pervasive sheeted veining
- Weak but anomalous Au, Ag, Bi, Cu and Pb
Mineralisation

- Structurally controlled vein-hosted mineralisation in turbidites and sandstones

- Minor historical workings at Litchfield Reef, Beloka Reef and Don’s Hill
  - Unknown production
  - Litchfield Reef: reported average grade = 15 g/t Au

- Modern exploration has defined **8 x 4 km footprint of vein-hosted Au (+Ag+Cu+Pb+Zn+Bi) mineralisation**
  - Matches granite geochemistry
Polymetallic System

- Polymetallic mineralisation in quartz veins
  - Rock chips and narrow massive sulphide drilling intersections

- Up to 14 g/t Au and 451 g/t Ag
  - 3.8% Cu
  - 4.1% Pb
  - 1.0% Zn
  - 1.4% Bi
  - Localised anomalous Te (up to 78 g/t)
  - Broadly elevated As (>7.5% in some rock chips)

- Zoning on local and regional scale
Metal zoning - Kidman

- Kidman area shows strong polymetallic mineralisation in large quartz vein system
  - 1.5 km mapped strike length
  - Structural influence with fault intersection?

- Windy Hill also shows polymetallic mineralisation in veins adjacent outcropping diatreme breccia

- No detailed exploration yet at Don’s Hill/Quarry, Lone Ranger or Bluey’s
Kidman drilling results (2015-2016)

Veins are:
- structurally controlled
- show multiple deformation phases
- mineralisation has been strained and deformed
- locally strongly anomalous in Bi and Te (up to 7,380 ppm Bi and 30 ppm Te)

Drilling at Kidman gave significant intercepts:
- **7.5m @ 1.25 g/t Au, 3.1 g/t Ag, 0.23 % Cu**
- **2m @ 1.05 g/t Au**
- **4.4m @ 1.0 g/t Au, 1.8 g/t Ag, 0.13 % Cu**
- **0.8m @ 1.43 g/t Au, 1.5 g/t Ag, 0.12 % Cu**
Windy Hill drilling results 2016-2017

- strong As+Ag+Bi +Cu+Pb + Zn anomalism

- Intercepts include:
  - 0.8m @ 184 g/t Ag, 4.1% Pb, 1% Zn, 478 g/t Bi
  - 0.3m @ 83.6 g/t Ag, 0.17% Pb, 3.8% Cu, 0.3% Bi, 0.4 g/t Au
  - 0.4m @ 1.16 g/t Au, 8.9 g/t Ag

- magnetic highs are magnetite-pyrrhotite alteration, above buried intrusions?
Windy Hill drilling results 2016-2017

- Mapped **gossanous breccia** at surface with associated quartz stockwork, sheeted quartz and individual quartz veins.

- Open spaced matrix (quartz+pyrite) between breccia clasts in outcrop at surface.

- Coincident with subtle magnetic ‘donut’.

- Diorite matrix to breccia at depth (114m downhole).
Diatreme Breccia

- Drilling intersected strongly altered, **pyrite-rich diorite** as matrix to breccia
  - 235m intersection

- Alteration = **albite-muscovite-sericite-pyrite**
- Breccia clasts completely altered and recrystallised

- **Diorite contains 10-20% pyrite**, however no gold or base metals

- Undeformed; unrelated to Paupong Intrusive Suite??
  - U-Pb zircon or rutile geochronology planned
IRG comparison – trace elements

- Windy Hill Diorite different to Paupong Intrusive Suite
  - Sn, Pb, Ba Cs, Rb

- Paupong Intrusive Suite depleted in Cs and Rb and enriched in Pb relative to other IRG systems

- PIS broadly similar to Dargues Reef (LFB) and Scheelite Dome in the Tintina Belt, Yukon

- Paupong and Dargues Reef (Lachlan Orogen) distinct from Timbarra (New England Orogen)
IRG comparison – Oxidation vs Fractionation

- IRG systems also differentiated by degree of oxidation and fractionation, as well as temperature (e.g. Blevin, 2008)
- Leads to province, district and deposit-scale metal zonation
- Gold can be a proximal and distal component

After Blevin (2008)
Comparison with other IRG systems

- I-type granites (e.g. Paupong Intrusive Suite) tend to be oxidised
  - Sn enrichment in PIS?

- Paupong intrusives may show similarities with Mt Leyshon

- Paupong shows strong Ca depletion (albitisation);
  - Ca migrated distally?

- All metalliferous elements are present at a provincial to district scale
Conclusions

- **Complex intrusive history;**
  - Kosi + Berridale Batholiths
  - Paupong Intrusive Suite
  - Windy Hill Diorite?
  - Blind Gabbro

- Aeromagnetic data suggests presence of **additional non-outcropping intrusions**

- Surface sampling and drilling show strong association between **gold, silver, arsenic, bismuth, tellurium**, also with **copper and lead**

- Vein chemistry reflects **metal associations** in Paupong Intrusive Suite

- Additional targets based on geochemistry and geophysics

- **Similarities with other IRG systems, but also strong differences**
  - e.g. oxidised system, but Sn enrichment in intrusives
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