Demand and supply

“It all starts with the rocks”
Finding a needle in a haystack...
Value of discoveries (Australia)

Exploration spend

Until recently, exploration created value for Australia

Over the last 27 years $1.68 of value was created per $1 spent on exploration

Recent poor performance is due to a combination of structural and cyclical factors

Cyclical: Blow-out in costs during the boom. Lack of drilling in the bust

Structural: Progressive move to exploring under deeper cover. Higher social & environmental compliance costs

Source: MinEx Consulting © June 2017

MinEx Consulting
Strategic advice on mineral economics & exploration
Decline in discovery?

• High cost of drilling in boom
• Lack of drilling in bust
• Higher social and environmental costs

• Move to exploration under deeper cover


Copper to the World Conference, Adelaide
Geoscience contributions to the minerals value chain
Stuck to my books

#BestCareerAdvice #Ever
Geology and metallogeny of the Gawler Craton

A. J. Reid

INTRODUCTION

The Gawler Craton, South Australia, preserves rock units formed over the interval ca. 3.15-1.45 Ga in a wide range of geological environments and has both resources and high potential for a variety of mineralisation styles. The Gawler Craton is best known for iron and copper-gold (IOCG) deposits, as exemplified by the Olympic Dam and Prominent Hill deposits. However, gold and for a lesser extent base metal deposits within the craton are economically significant to the state of South Australia.

The western Kangaroo Playa, sedimentary cover that overlies large expanses of the Gawler Craton contributed to the difficulty of mineral exploration in this tenure. Yet, field mapping, geophysical surveys and geological and geochronological investigations have begun to reveal the mineral potential. Lithostratigraphic architecture and evidence of the crust-mantle interaction that occurred within the Gawler Craton (for example, Parker, 1992; Dally, Forsman and Twidale, 1996; Drinkwater, 1997; Reid, Reid and Jep gedzik, 2007; Telford and Heineman, 2013). The purpose of this contribution is to briefly review the regional geology and principal meta-plutonic episodes of the Gawler Craton.

GEOLOGICAL OVERVIEW

The oldest crystalline basement in the Gawler Craton, ca. 3.16 Ga granite-granites (Figure 1: Fraser et al., 2013a) exposed in the north-eastern Eyre Peninsula and inferred to exist at depth across large parts of the Gawler Craton (Fraser et al., 2010b). Massauan basement is overlain by bimodal to transitional Paleoproterozoic rocks of the Mungking and Stansfield Complexes (Figure 2), which comprise ca. 2.5-2.4 Ga mafic-ultramafic sequences, ultramafic to mafic volcanic and associated intrusive rocks (Dally and Forsman, 1995; Reid et al., 2011a). Bimodal volcanics and metasedimentary rocks of the Dwyka Supergroup are interpreted to have formed in an oceanic tectonic setting. Sedimentary rocks of the Dwyka Supergroup are interpreted to have formed in a continental setting and subsequently subducted and subducted into the subduction zone of the Gawler Craton, which has similarities to continental-margin, subduction-related magnetic anomaly features (Foster et al., 2009).

The most volumetrically significant phase of magmatism in the Gawler Craton is the ca. 2.58-2.49 Ga Mawson Range Volcanics - Hindmarsh Volcanics (Figure 3). These volcanic rocks are composed of mafic-ultramafic, and intermediate to felsic rocks, and are divided into lower and Upper units. The Lower Gavler Range Volcanics are composed of mafic-ultramafic and felsic rocks, and the Upper Gavler Range Volcanics are composed of felsic rocks.

AUSTRALIAN GEOPHYSICS
WE'RE ALL VERY EXCITED BY YOUR RESEARCH, BUT WE DON'T HAVE TIME TO READ THE PAPER, SO WE'D LIKE YOU TO SUMMARISE YOUR FINDINGS WITH ONE OF THESE EMOJIS.
The more things change...

...and the shoulders of giants
... the Government should ... confine its efforts mainly to the practical aspects of the work.

Minute scientific investigation is almost impossible in a country of so vast an extent as this.

Geological Survey of South Australia
GEological
Sketch Map
of
South Australia
Exclusive of
The Northern Territory

Upon which the boundaries of the chief formations have been delineated so far as such have been ascertained from records in the Survey Office and by personal inspection. To accompany the Annual Report for 1883.

Henry F. J. Brown
Government Geologist
31st December 1883.
MAP SHOWING
GEOLGY IN THE REGION
NORTHWARD FROM TARCOOLA

LEGEND
POTENTIALLY METALLIFEROUS ROCKS

LOWER PRECAMBRIAN
Quartz, felspar, pyrophyllite, and gneiss of surface. Early preprint.
Under these, but close to or within younger formations. Presenting residual to efflorescence.

Under these, but close to or within younger formations. Presenting residual to efflorescence.

IRON METALLIFEROUS

JURASSIC
Boulders and gravel with rounded quartz, pebbles, and, near the base, angular and cobble-like quartz. Boulders of well-rounded Jurassic age.

CRETACEOUS
Boulders and gravel with rounded quartz, pebbles, and, near the base, angular and cobble-like quartz. Boulders of well-rounded Cretaceous age.

RECENT
Boulders and gravel with rounded quartz, pebbles, and, near the base, angular and cobble-like quartz. Boulders of well-rounded Recent age.

WELLS AND BORE HOLES

SCALE

R. Frankland, Jnr.
Deputy Government Geologist
2·2·1934

Tarcoola

1934
Mapping is never finished – it is a snapshot in time of current understanding...
OMG! I want that on my tablet!

SMH! You can look at any drill core you want, for free?!
Forward looking statements

Competent person?
Geoscience contributions to the minerals value chain
UNCOVER Approach

Lithospheric architecture: MT, seismic, potential fields
Crustal evolution: basement geology interp.; crust forming events; metallogeny

Distal footprints: basement, cover geochem; spectral mineralogy
Cover: Thickness, age, type, geochemical response

Mineral potential
Composition

Exploration methodologies
Magnetotellurics, AusLAMP
Seismic receiver function etc.

Isotope data – crustal expression of lithospheric architecture

Stephan Thiel, Kate Robertson, Stacey Curtis et al.
CRUSTAL EVOLUTION

Mapping – outcrop and interpretations of basement geology through cover

Metamorphic analysis

Geochemical characterization of magmatic suites

Event history and structure of South Australia

Rian Dutch, Mark Pawley, Tania Wilson, Mario Werner, Stacey Curtis, Tom Wise et al.
K-feldspar abundance from Hylogger data.

- ARC Linkage Project: "Source to Spectrum": UniSA, Adelaide, Monash University
- Alteration facies mapping
- Mineralogical and chemical footprints of mineral systems of South Australia.

John Keeling, Claire Wade, Adrian Fabris, Alan Mauger, Georgiina Gordon et al.
• Surface landform, regolith mapping
• Geochemical surveys – baseline studies

Anna Petts, Carmen Krapf et al.
# 3D Drilling for Discovery & Definition of Mineral Deposits

## Area of Research

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