# predictive mineral discovery
## COOPERATIVE RESEARCH CENTRE

## A1: Characteristics of Mineralised Faults

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### Integrating the A1 and F4 databases through Habitat Modeling
### Using the Example of Archaean Gold Deposits in the Yilgarn Craton and Elsewhere

### What is 'Habitat Modeling'?

- A *Habitat Model* is a statistical model that accounts for most of the variation in the distribution of a species (here a mineral deposit type)
- Gold deposit groups are defined by analysis of Archaean gold data
- The model uses as many factors as possible to define the factors and weightings that control gold distribution
- The result is a strong predictive capability

### Gold Deposit Groups and Endowment

Some groups of gold deposits, as constructed through these analyses by different software packages (using patn, PAUP, snob, SOM software), are characterised by distinct levels of gold endowment.

In some instances, the reason is quite clear (eg. poorly known deposits have less gold)



SOM cluster analysis of Archaean Au data
(analysis by S. Fraser and B. Dickson, CSIRO)

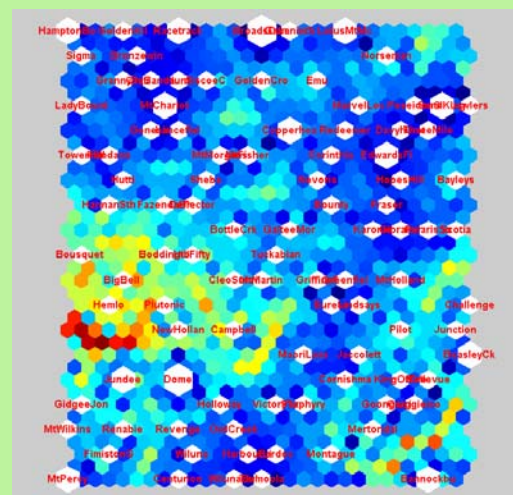| SOM Group | Group 1 Unknowns | Group 2 High mm grade (1) | Group 3 bif-hosted | Group 4 High mm grade (2) | Group 5 Low mm grade |
|---|---|---|---|---|---|
| SUM kg Au | 41202 | 565274 | 437291 | 1146500 | 4178729 |
| n | 8 | 28 | 17 | 6 | 53 |
| Average kg Au | 5150 | 20188 | 25723 | 191083 | 78844 |
| SD | 5394 | 35658 | 29126 | 250335 | 227300 |

In the example of SOM groupings, 5 well-defined groups appear geologically reasonable but a particular group (Group 4) of high-metamorphic grade deposits has remarkable endowment. Note that Kalgoorlie (Fimiston) is within the low metamorphic grade group (Group 5), and affects the average of this group.
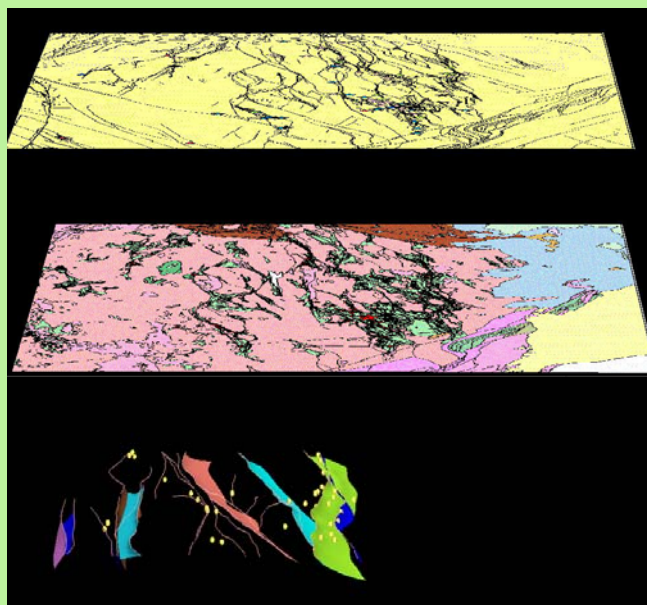
Why are these better endowed?
The main criteria that differentiate the well-endowed group (Group 4) in the above example are:
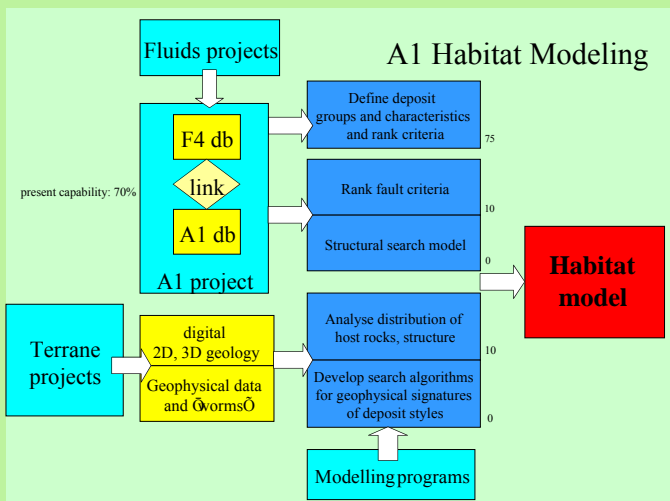• hosted by granite or porphyry
• abundant tourmaline

The question then becomes: Is there a genetic link to syn-mineralisation granites?



Perspective view of Yilgarn faults with deposits coded by Group (top); Geology with deposits coded by endowment (middle) and 3-D Faults and deposits (bottom). Geology from Geoscience Australia.

### A1 Habitat Modeling



Fluids projects
F4 db
link
A1 db
A1 project
present capability: 70%
Terrane projects
digital 2D, 3D geology
Geophysical data and ÒwormsÓ
Define deposit groups and characteristics and rank criteria  75
Rank fault criteria  10
Structural search model  0
Analyse distribution of host rocks, structure  10
Develop search algorithms for geophysical signatures of deposit styles  0
Modelling programs
Habitat model

### The Future

Habitat mapping of gold deposits in Yilgarn Craton and analogous terrains elsewhere
  • this requires more complete fault and deposit databases
  • semi-automated analysis of multiple factors from geology and geophysics

Application to other terranes and deposits types

Linking A1 and F4 databases
  • web-enabling of resultant database; SOM analysis of faults; ranking criteria

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