

# Innovations en géologie de l'exploration

Michel Jébrak



**RESAN**

Relève de l'entrepreneuriat scientifique de  
l'Abitibi-Témiscamingue et du Nord-du-Québec



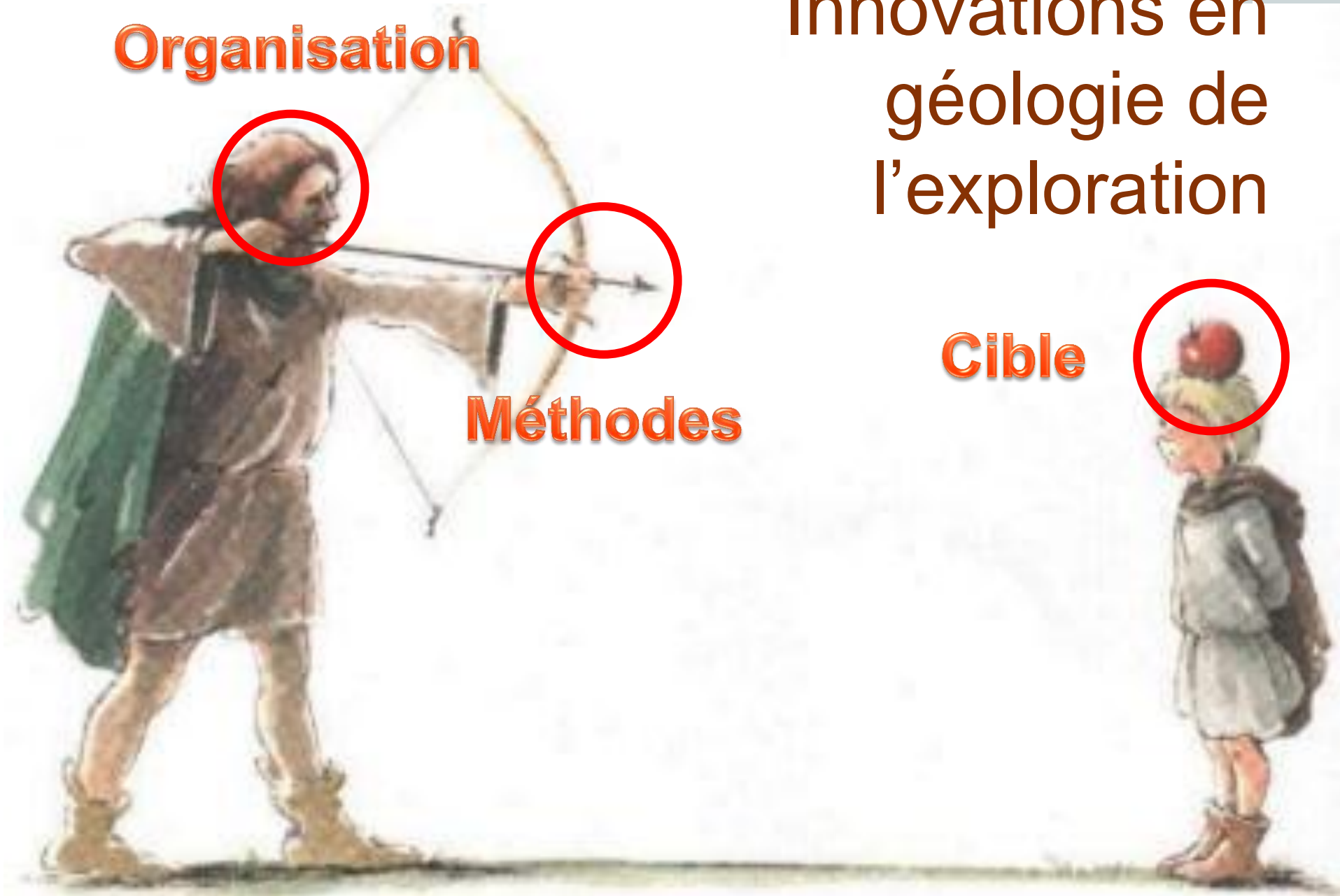
Chaire en  
entrepreneuriat  
minier UQAT-UQAM

**Organisation**

Innovations en  
géologie de  
l'exploration

**Méthodes**

**Cible**

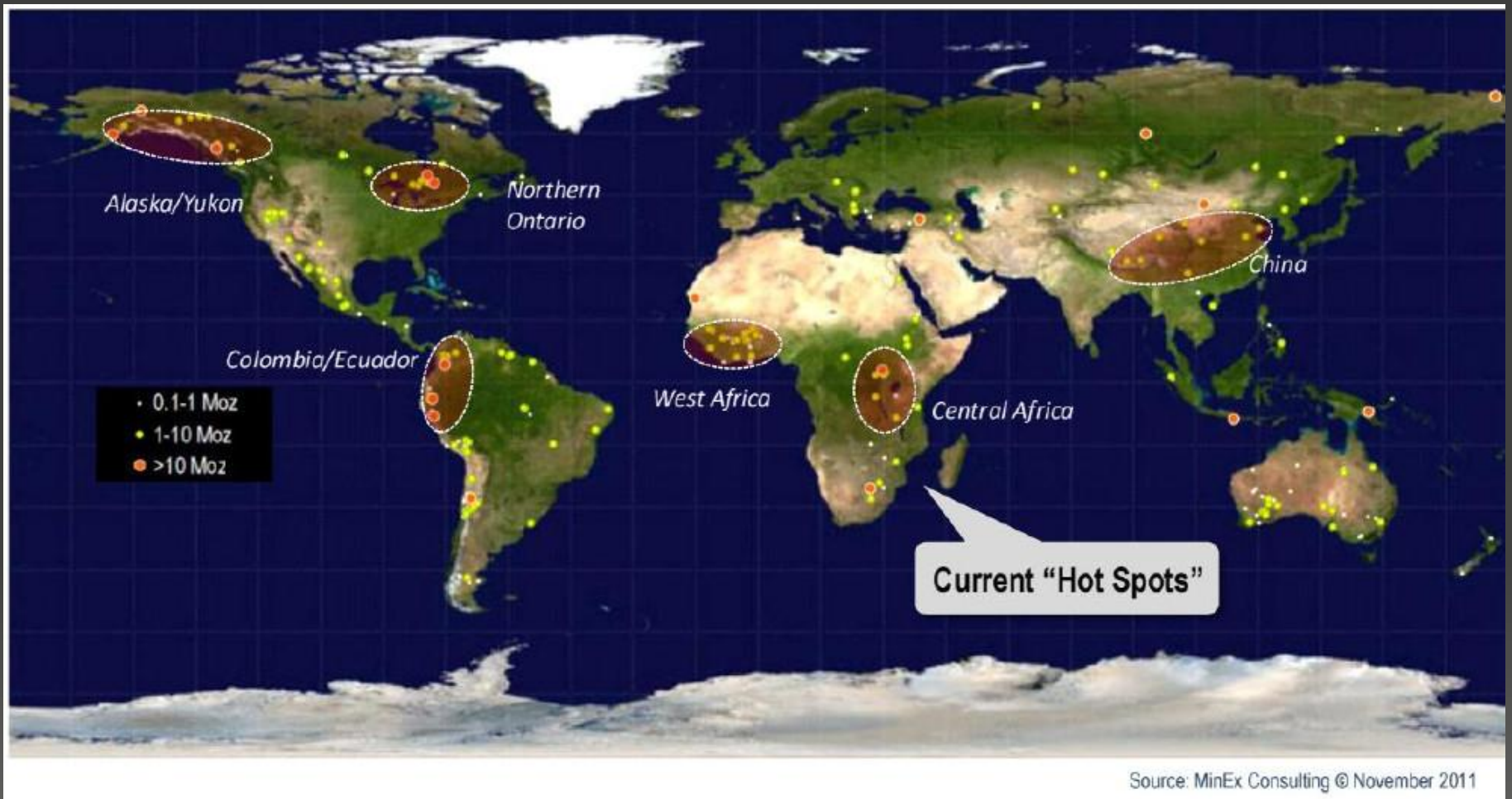


# Innovations en géologie de l'exploration

*New ideas in old terrains  
or  
old ideas in new terrains*

**Cible**

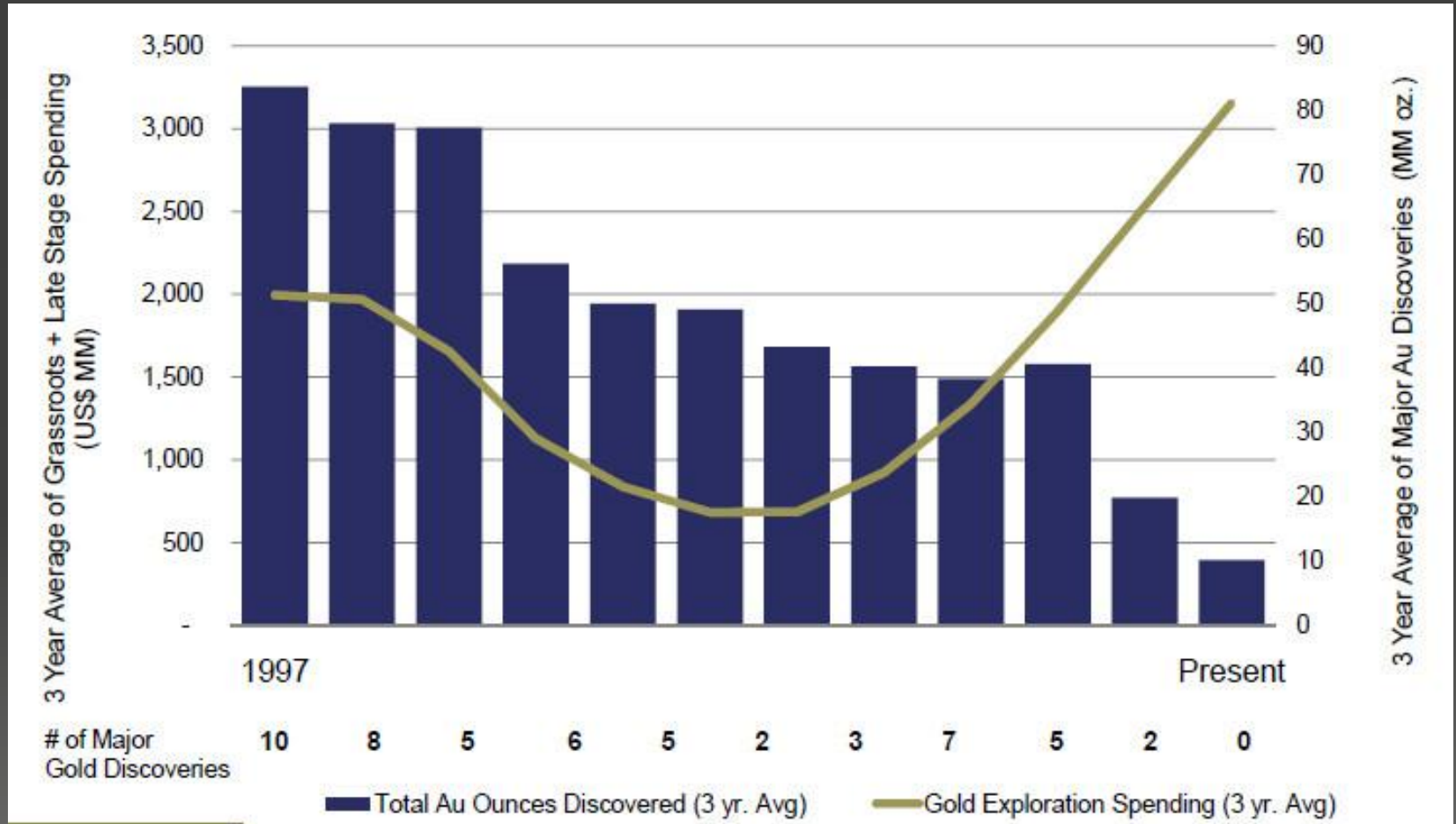




Schodde, 2011

# La baisse des découvertes

Kinross, 2008



3 Year Average of Major Au Discoveries (MM oz.)

# Cibles classiques

## Des cibles classiques

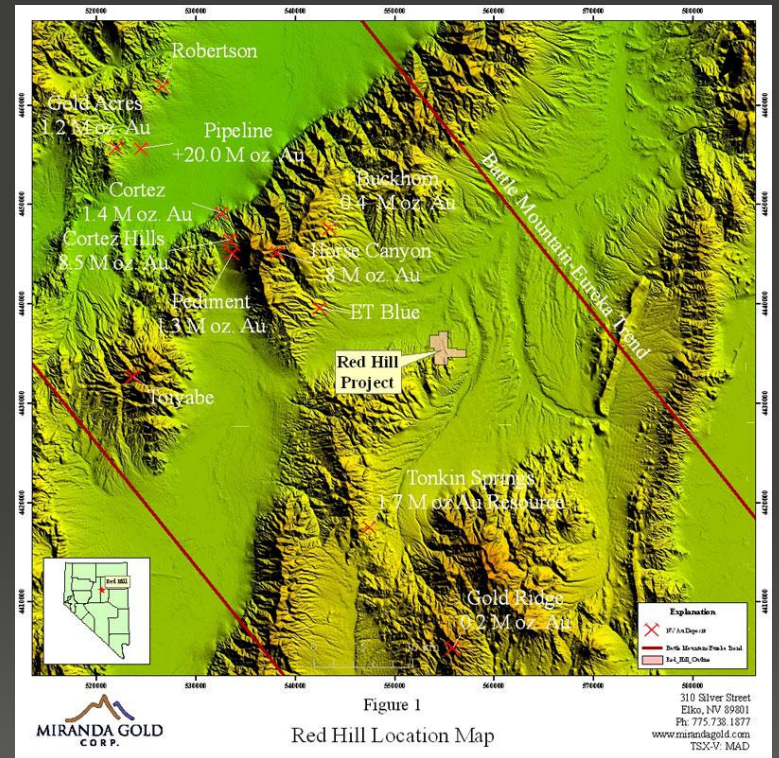
- Ceintures de roches vertes archéennes
- Porphyres et épithermaux
- Carlin

## Dans des ceintures moins matures

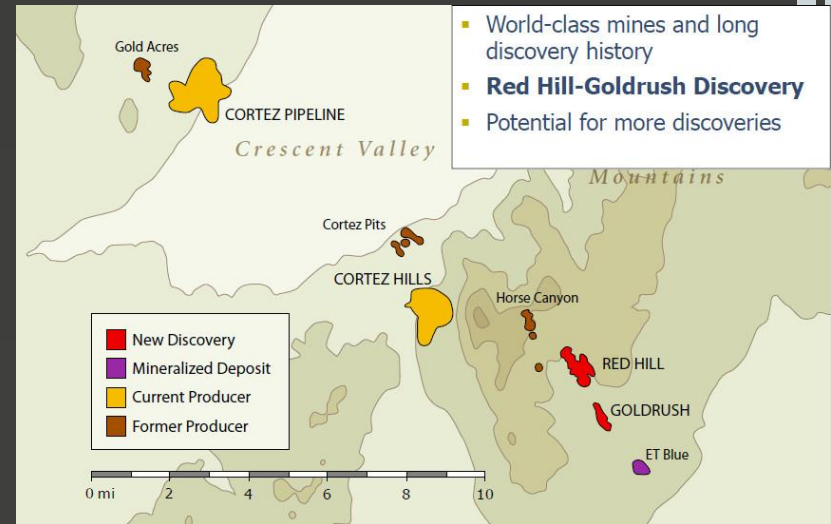
- Archéen... de Tanzanie, de Mauritanie...
- Porphyres... du Mésozoïque
- Extension des ceintures au Nava



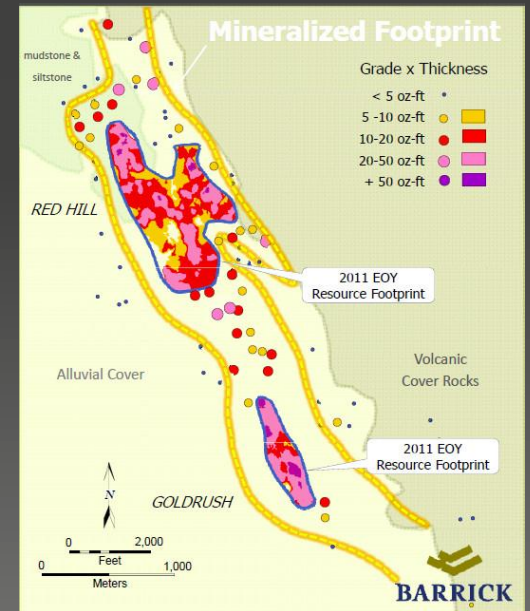
# Carlin



# Red Hill, Miranda, Barrick



Géochimie  
Hg  
Gravi





# 7 Moz

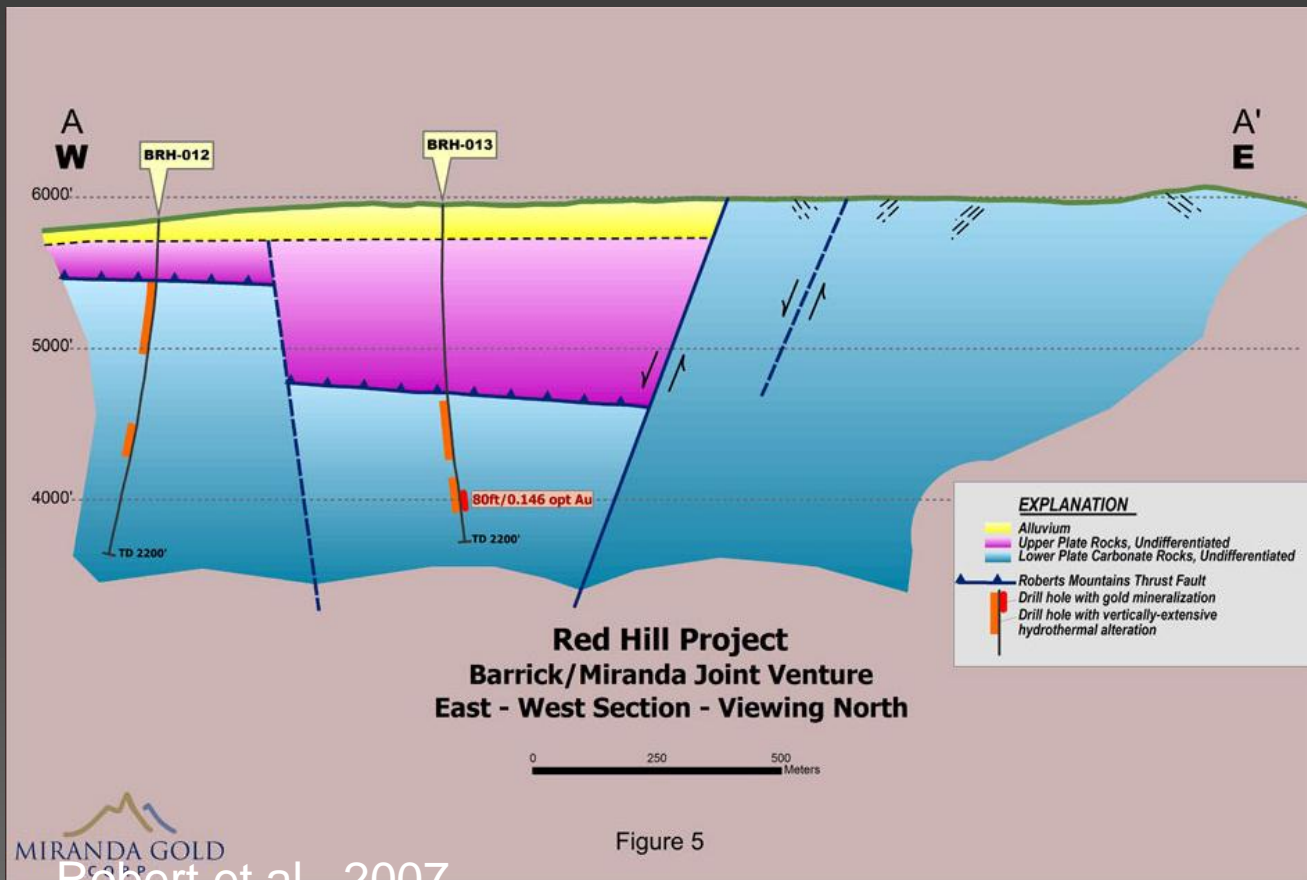
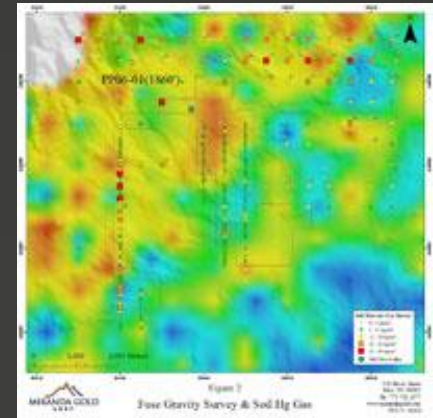


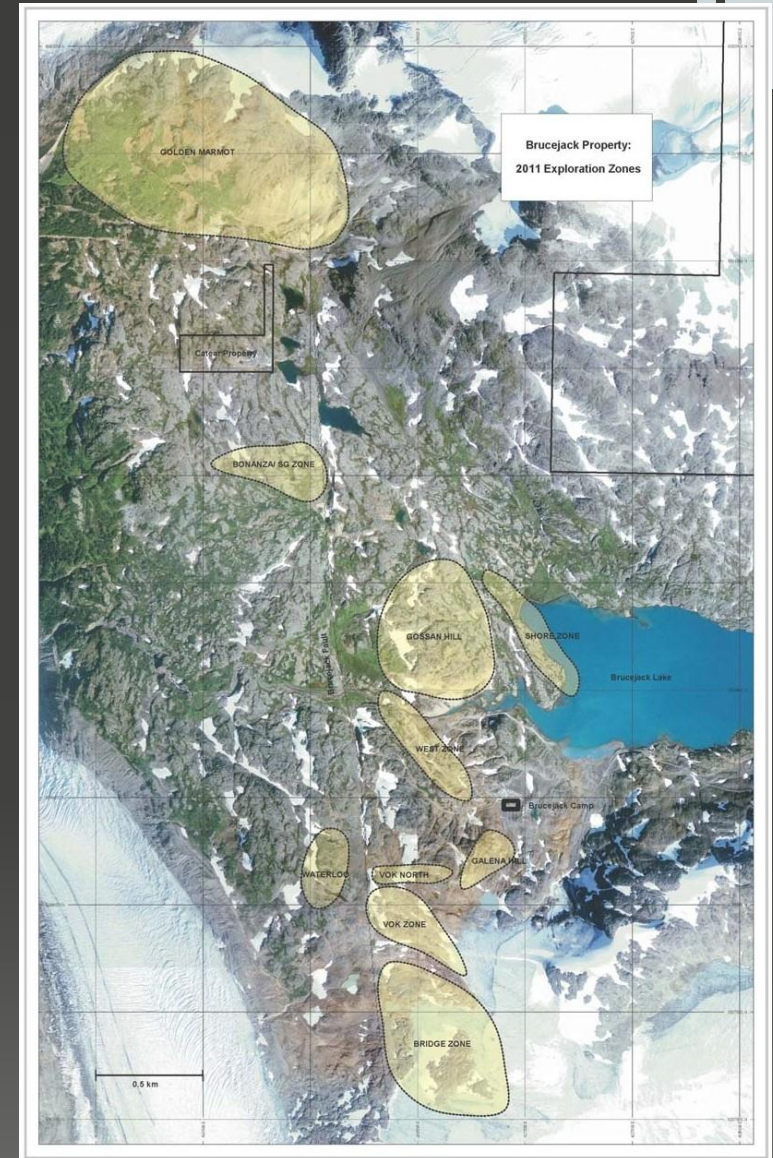
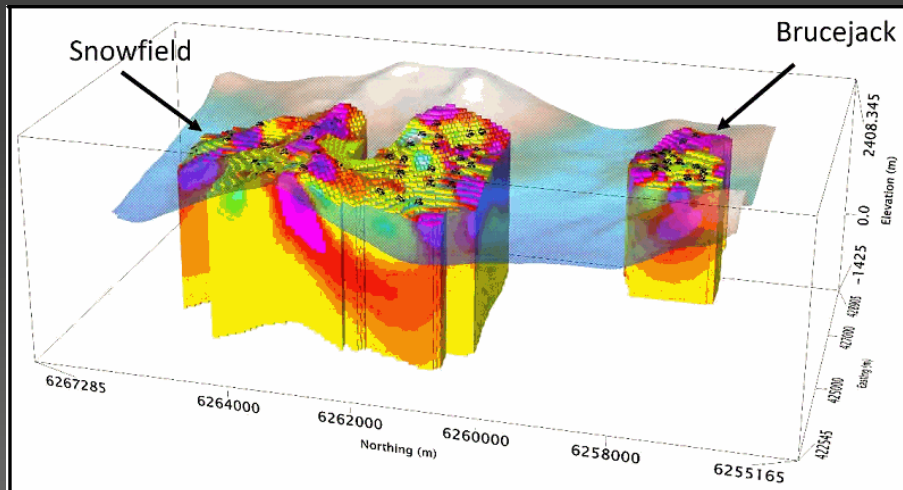
Figure 5

Robert et al., 2007



Épithermal - porphyres

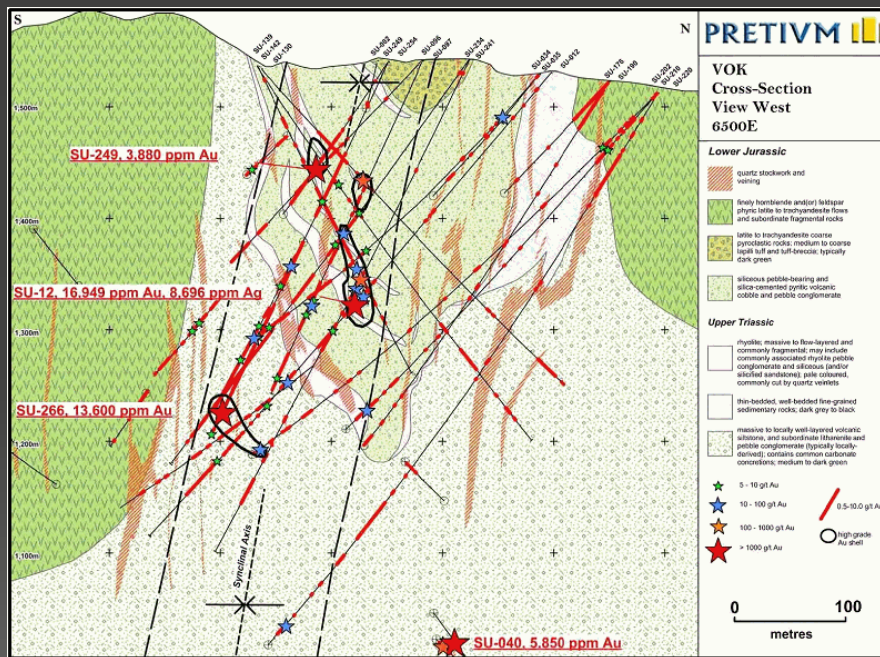
# Snowfield, Brucejack, BC Pretium, Silver Standard



3D avec levé MT de Quantec



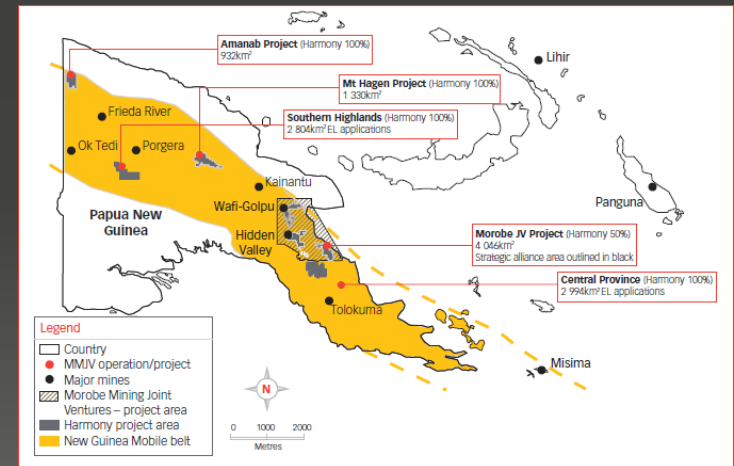
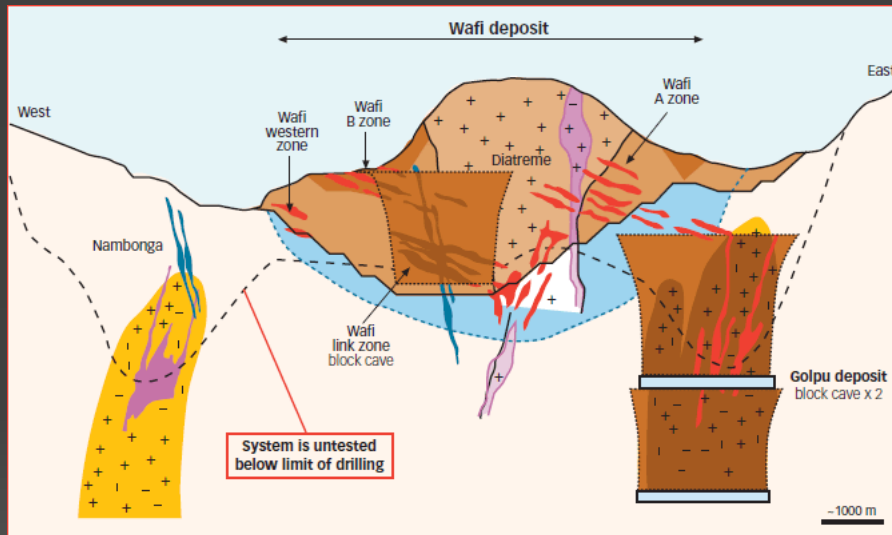
# Snowfield, Brucejack BC



**55,7 Moz**

# Wafi Golpu, PNG (Golpu Deep) Harmony, Newcrest

Géochimie



19,3 Moz

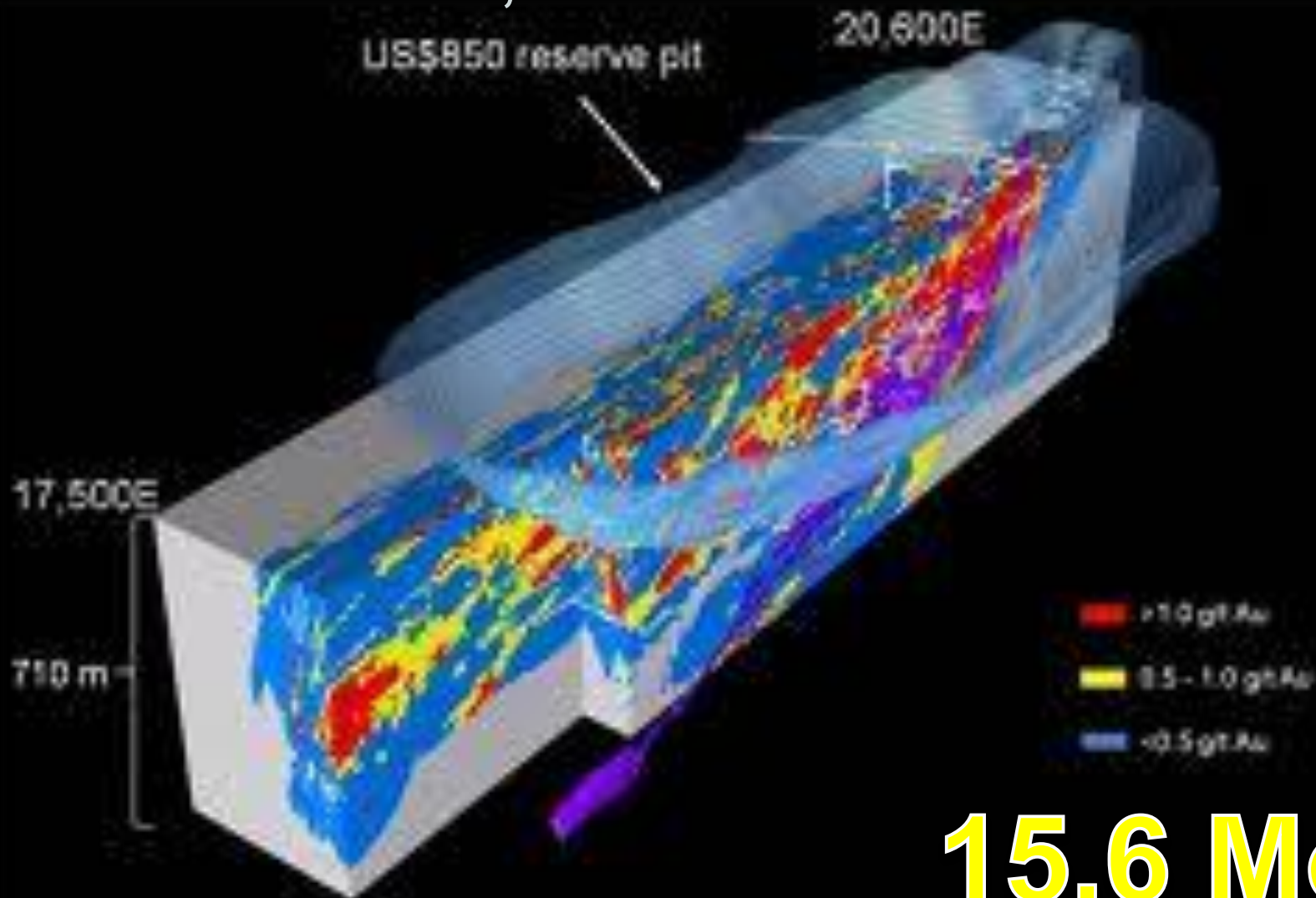
331 metres at 0.93% Cu and 0.51 g/t Au  
from 694 metres depth



# Zone de cisaillement $\pm$ BIF



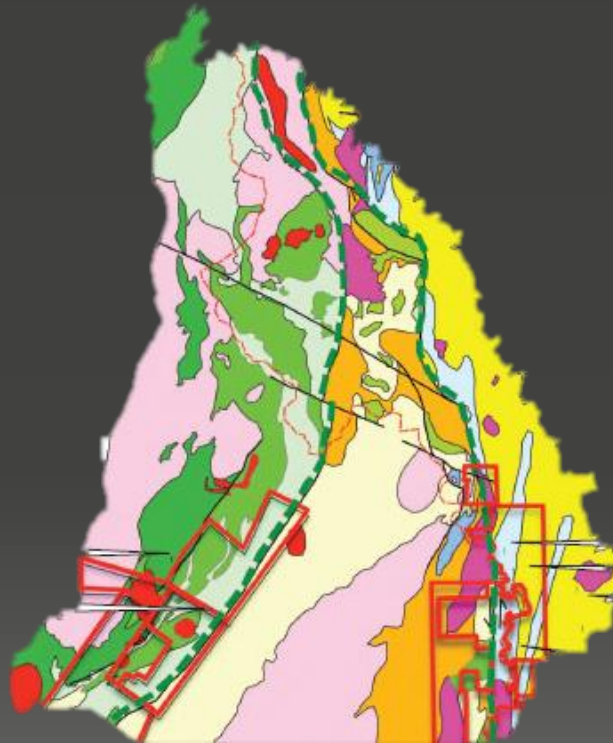
# Detour Lake, ONT



**15,6 Moz**

# Gunkouno, Mali, Randgold 2009

Aero EM  
Geochimie  
(30 ppb)

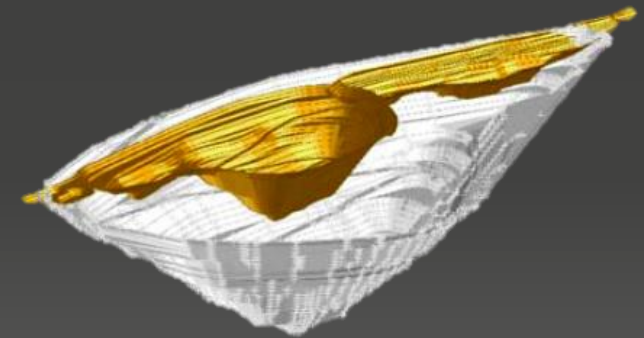
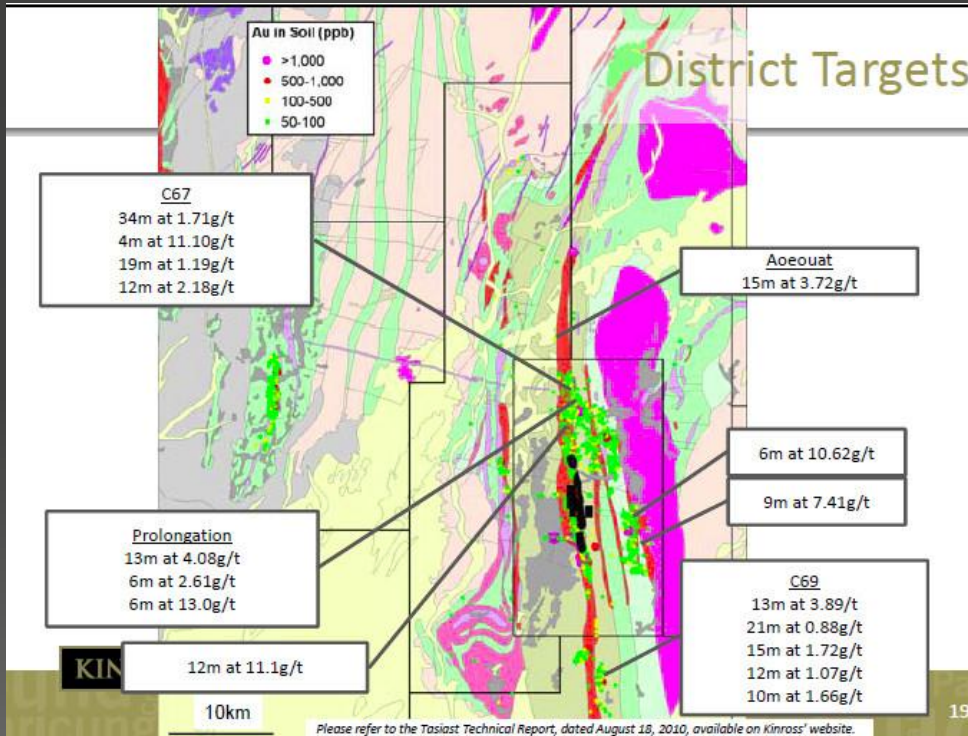


**5,5 Moz**



# Tasiast (extension) Mauritanie Kinross, 2006

Géochimie

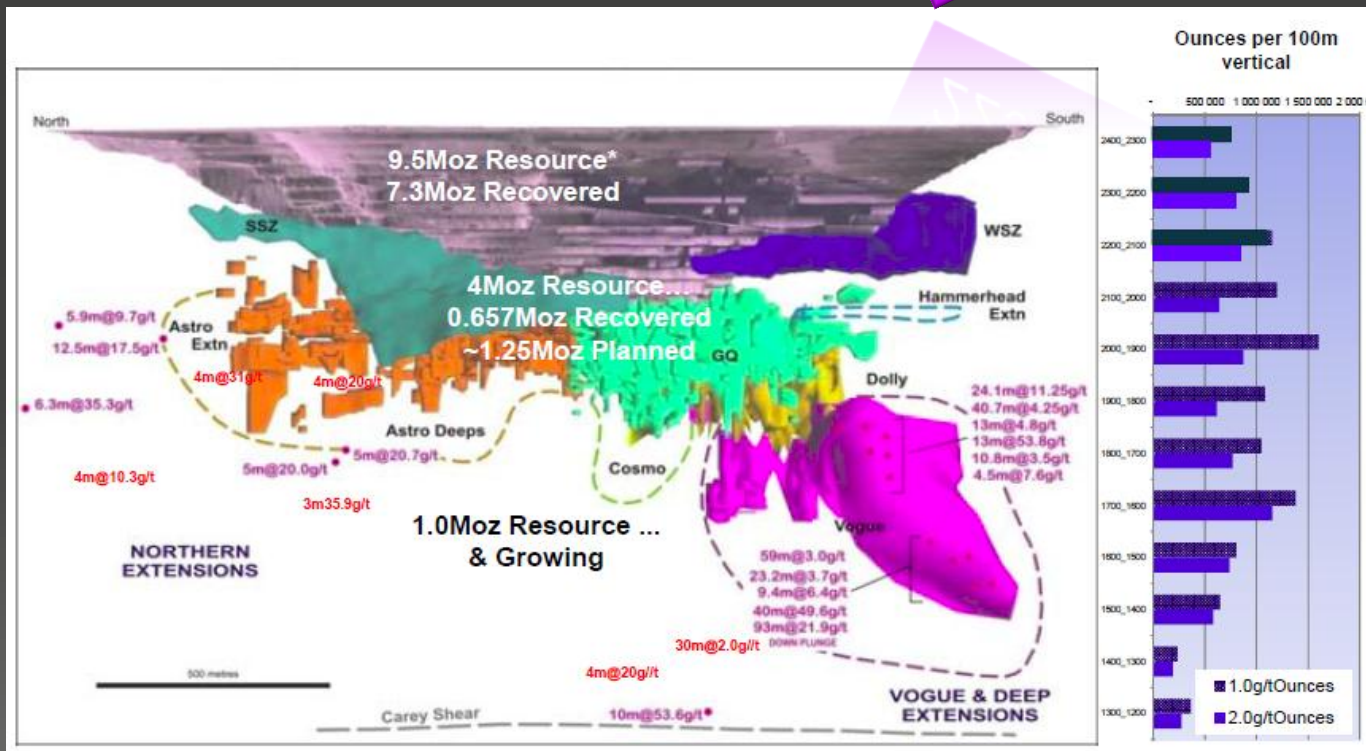


# 13 Moz

# Sunrise Dam/Vogue Anglo Gold, WA 2011

BLEG  
1988

229 m @ 5.1 g/t Au





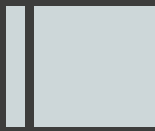
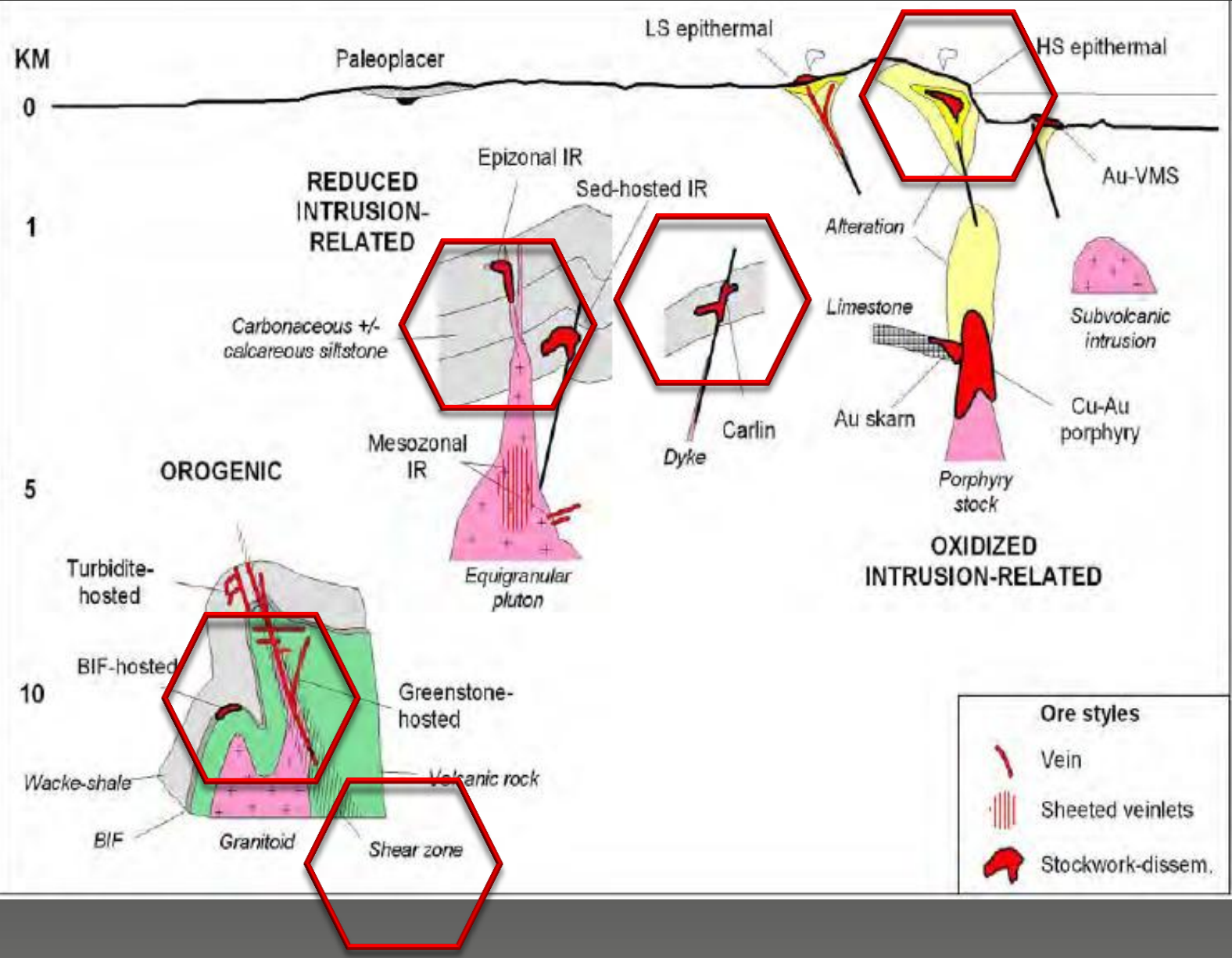
# Nouvelles cibles

## Des gisements profonds... en Australie

- Challenger
- Tropicana (5,4 Moz)

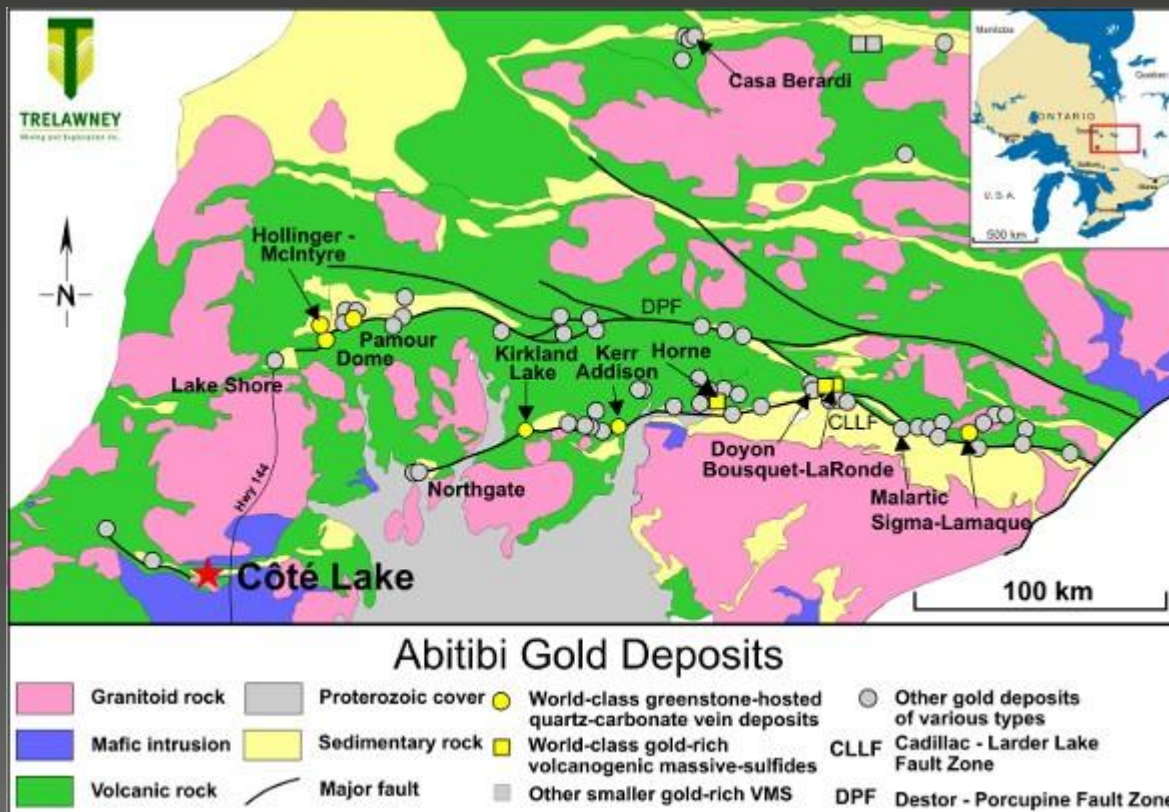
## Des gisements porphyriques... au Canada

- Malartic (12,7 Moz)
- Lac Coté (4,2 Moz)



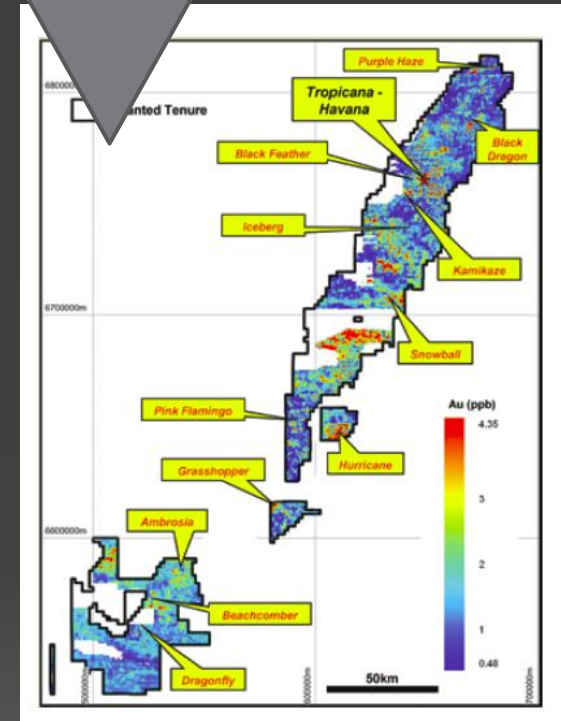
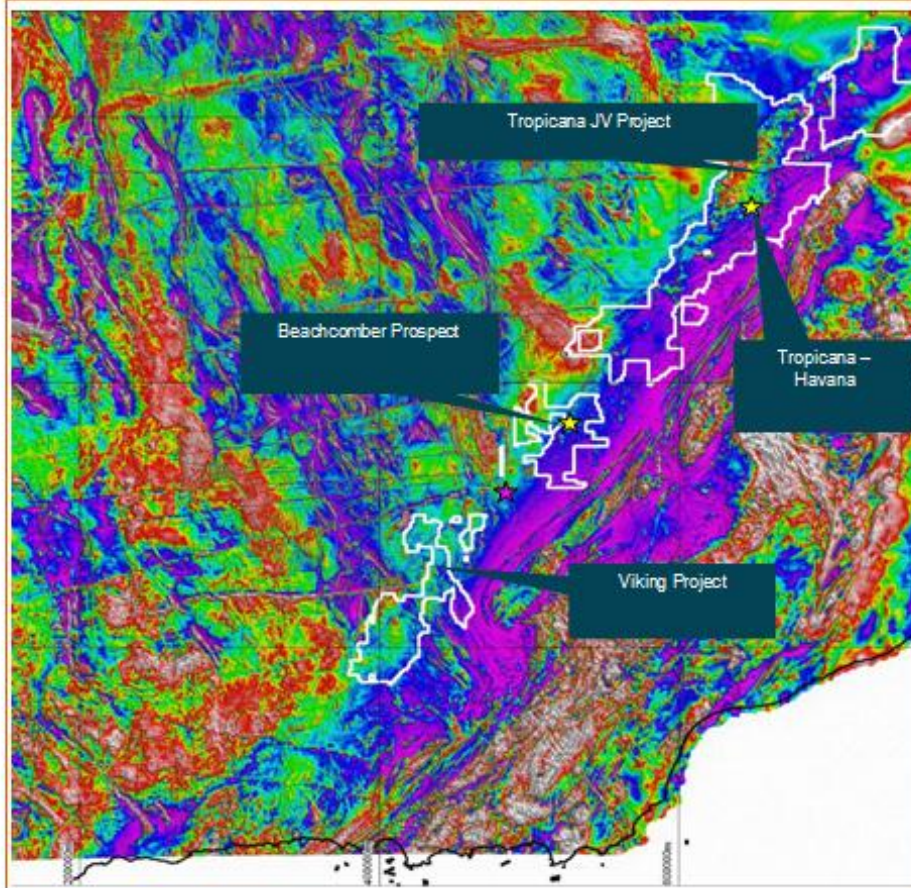
# Lac Coté, Trelawney Mining & Exploration, 2010

4,2 Moz



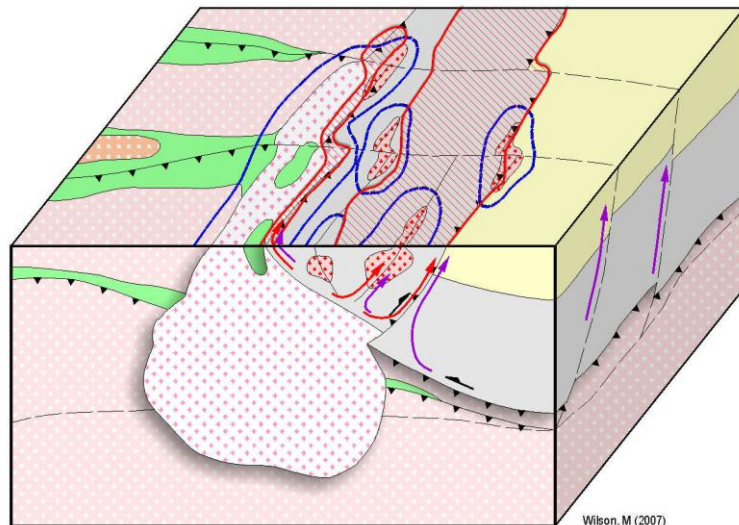
# Tropicana, WA AngloGold, 2005

Géochimie  
sol





# Tropicana



### Archaen Stratigraphy

- Internal Pluton (eg. High-Ca Granites)
- Greenstone Stratigraphy
- Basement and External TTG Granite
- Deep Gravity Low
- Magnetic Stratigraphy

### Proterozoic Stratigraphy

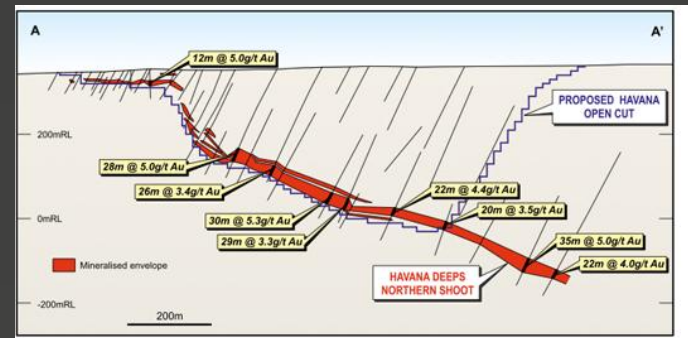
- Sediments
- High Grade Metamorphic Rocks
- Chamockite / Enderbite
- Suture Granite

- Thrust or Reverse Fault
- Magmatic Fluids
- Normal Fault
- Deep Basinal or Metamorphic Fluids
- Inferred Fault, Shear or Discontinuity



Southwest Australia

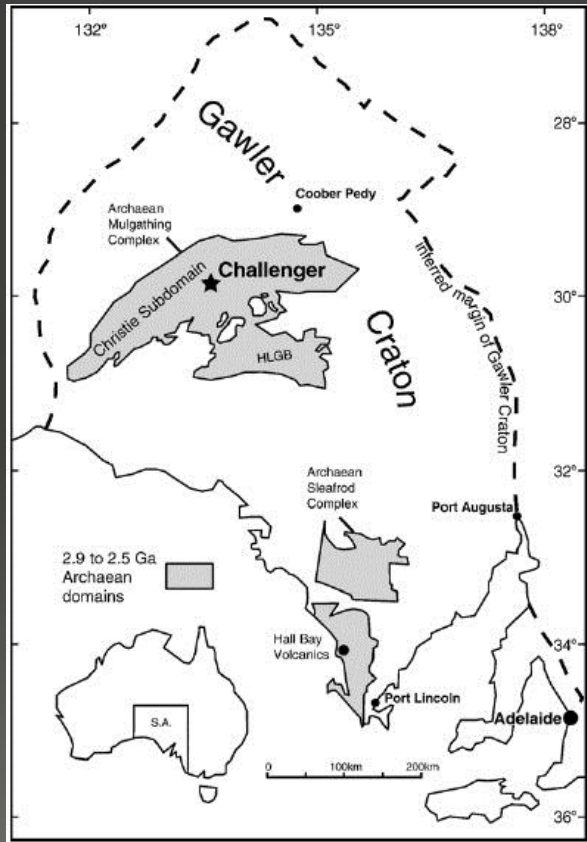
MODEL OF TROPICANA-STYLE HYDROTHERMAL SYSTEM



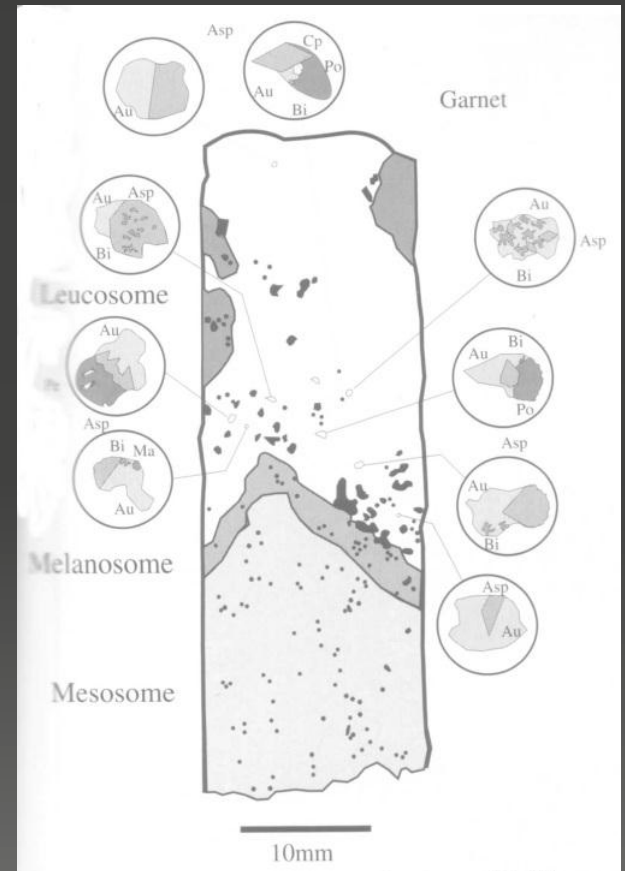
5,4 Moz



# Challenger, SA Dominion Mining 1995



Géochimie  
Calcrete  
180 ppb



# Challenger



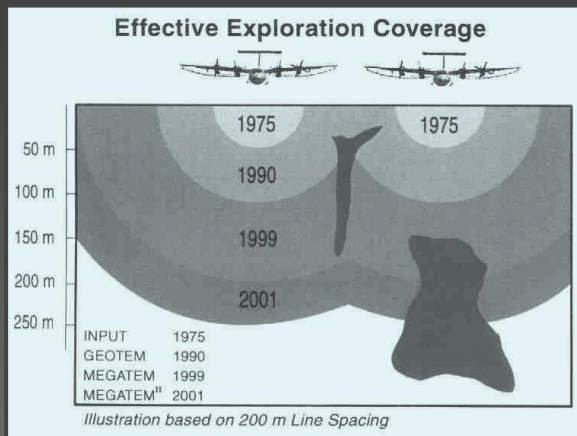
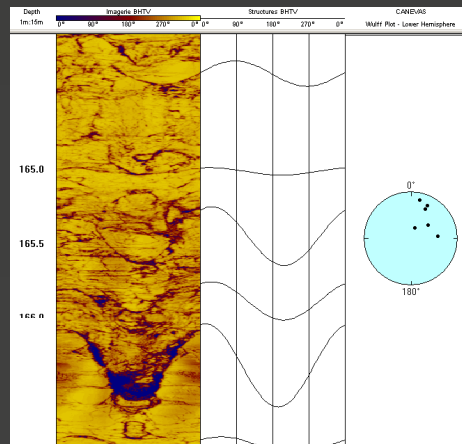
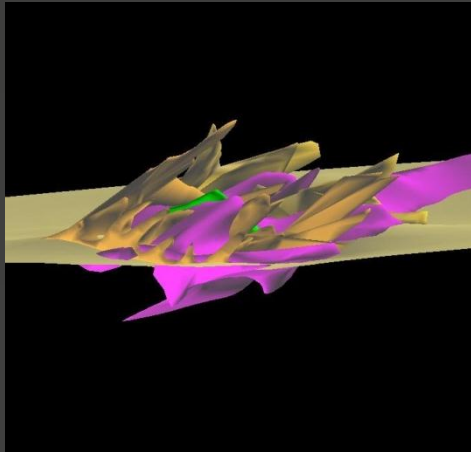
**1,7 Moz**

# Innovations en géologie de l'exploration



**Méthodes**

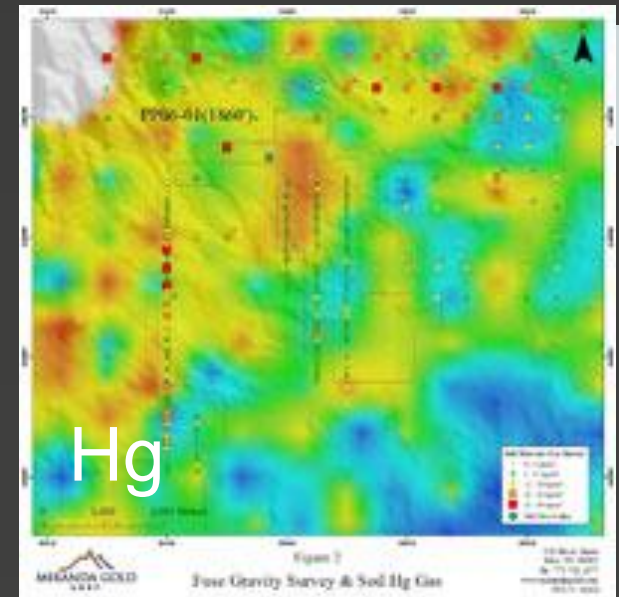
# Augmenter la sensibilité et la vitesse de détection des gisements





# Un exemple, les avancées en géochimie

- **Halos primaires**
  - Lithogéochimie
  - Seuils de détection
  - Pathfinder
- **Halos secondaires**
  - La recherche sous les couvertures déplacées
  - Modèle de dispersion des sulfures en cours d'oxydation: nouveaux medium (gaz, biogéochimie, extraction sélective)
  - Valorisation des données (metadata type ph)
  - Levé basse densité

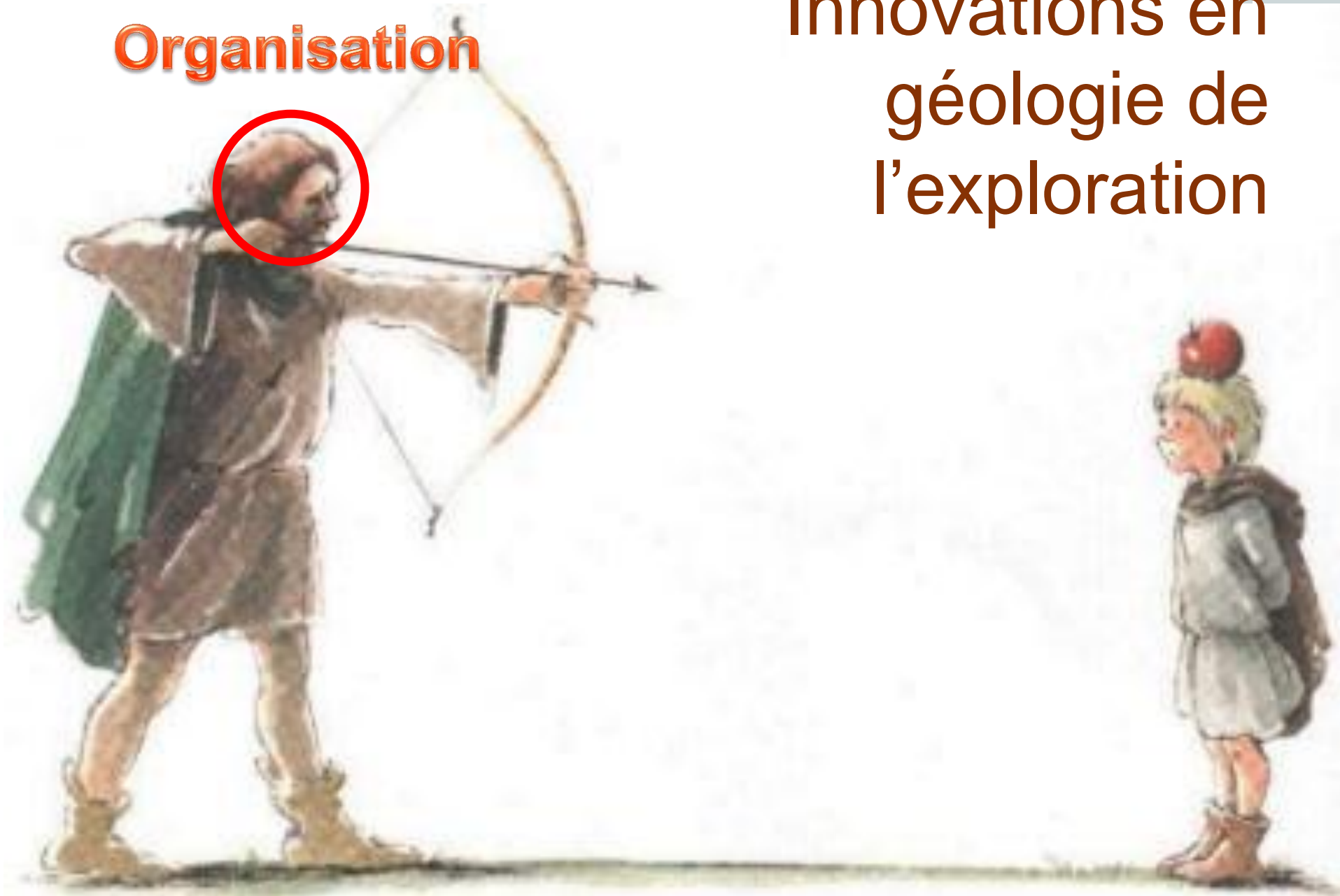


D'après Cohen et al., 2010

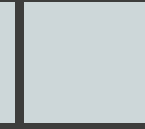


**Organisation**

Innovations en  
géologie de  
l'exploration



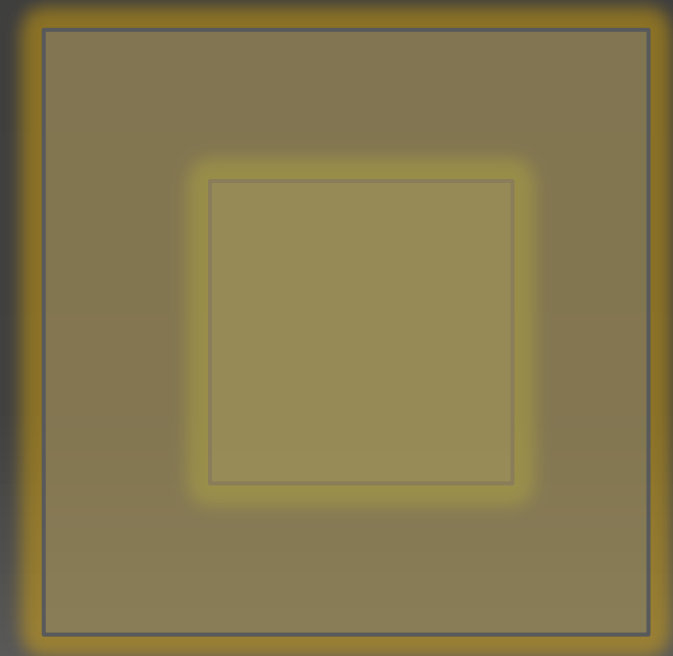
# ORGANISATION



entreprise

nation

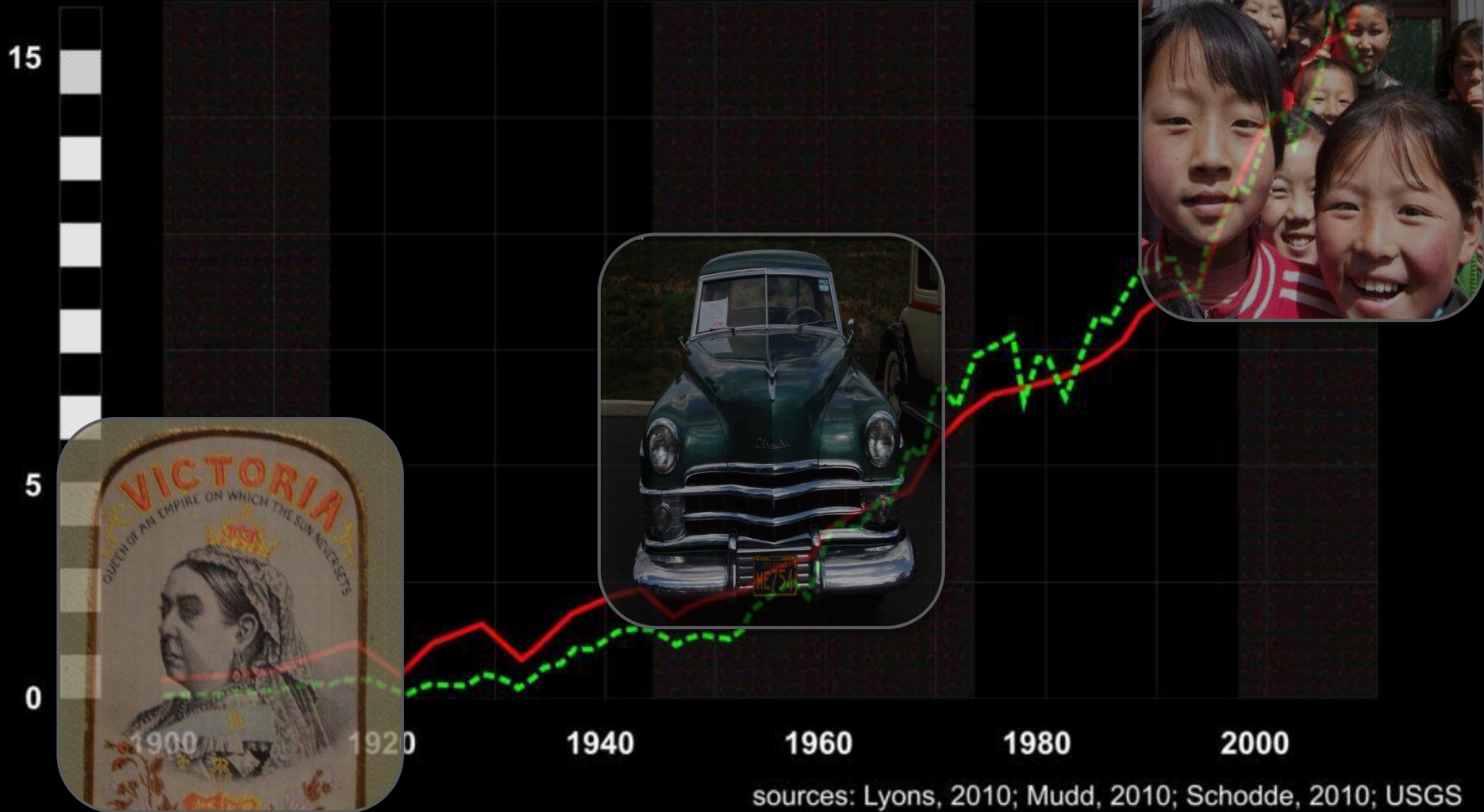
Communauté



# Organisation et supercycles

Cu production (Mt/y)

Ni production (100 kt/y)



1870-1914

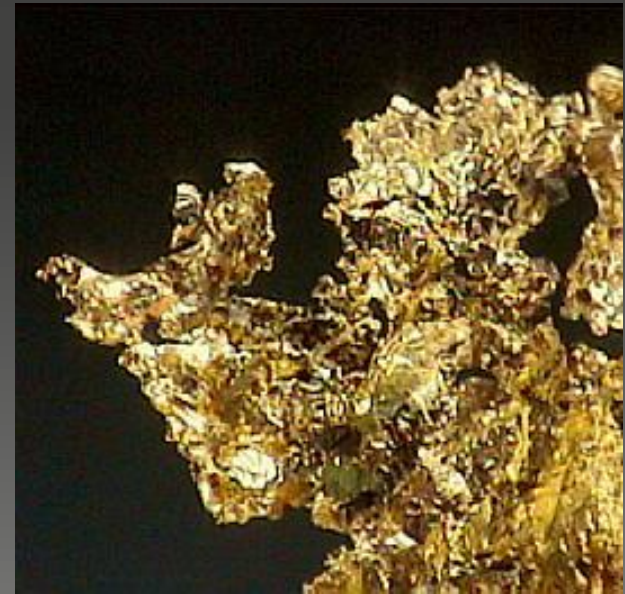
1945-1973

1995-

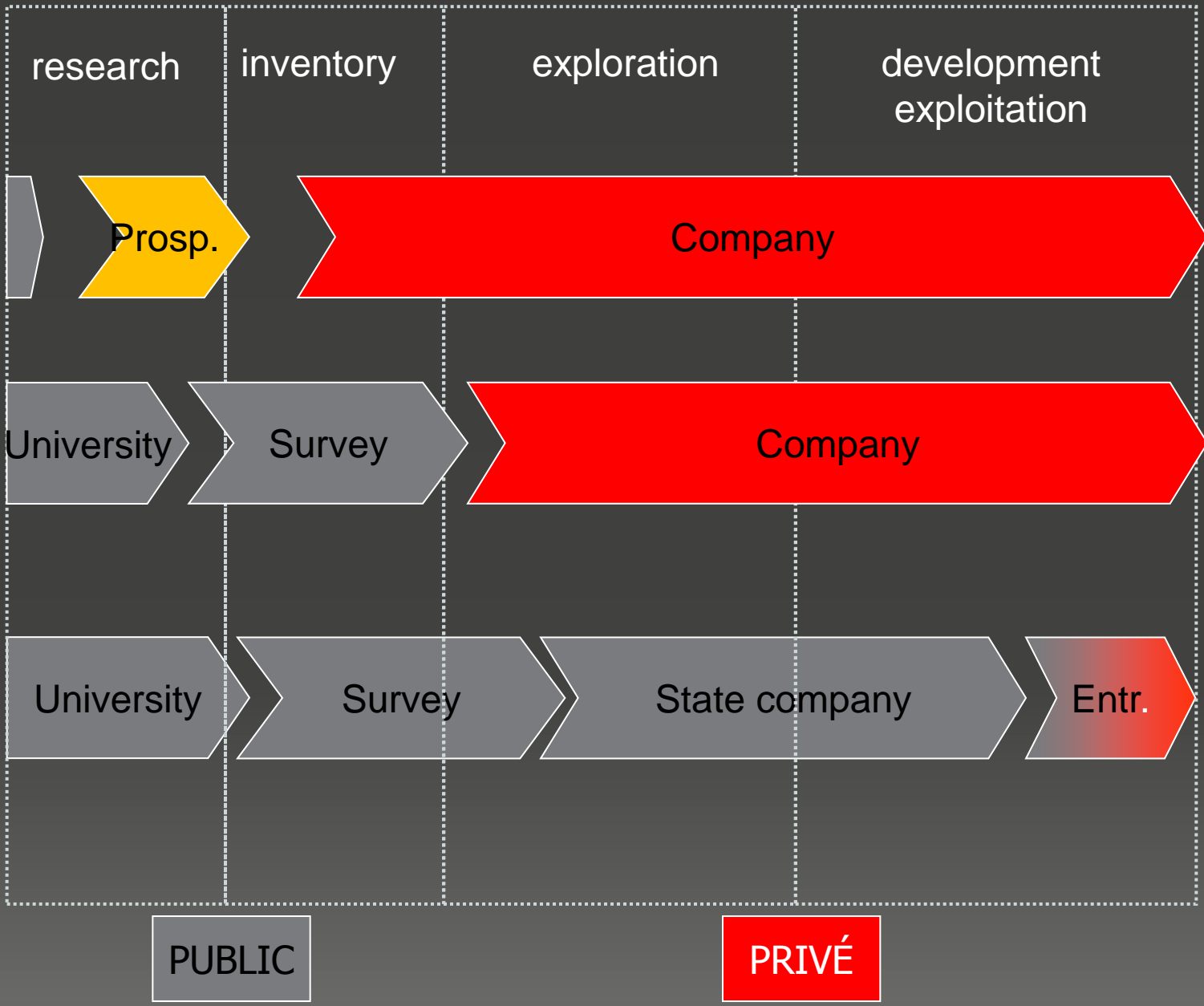
sources: Lyons, 2010; Mudd, 2010; Schodde, 2010; USGS

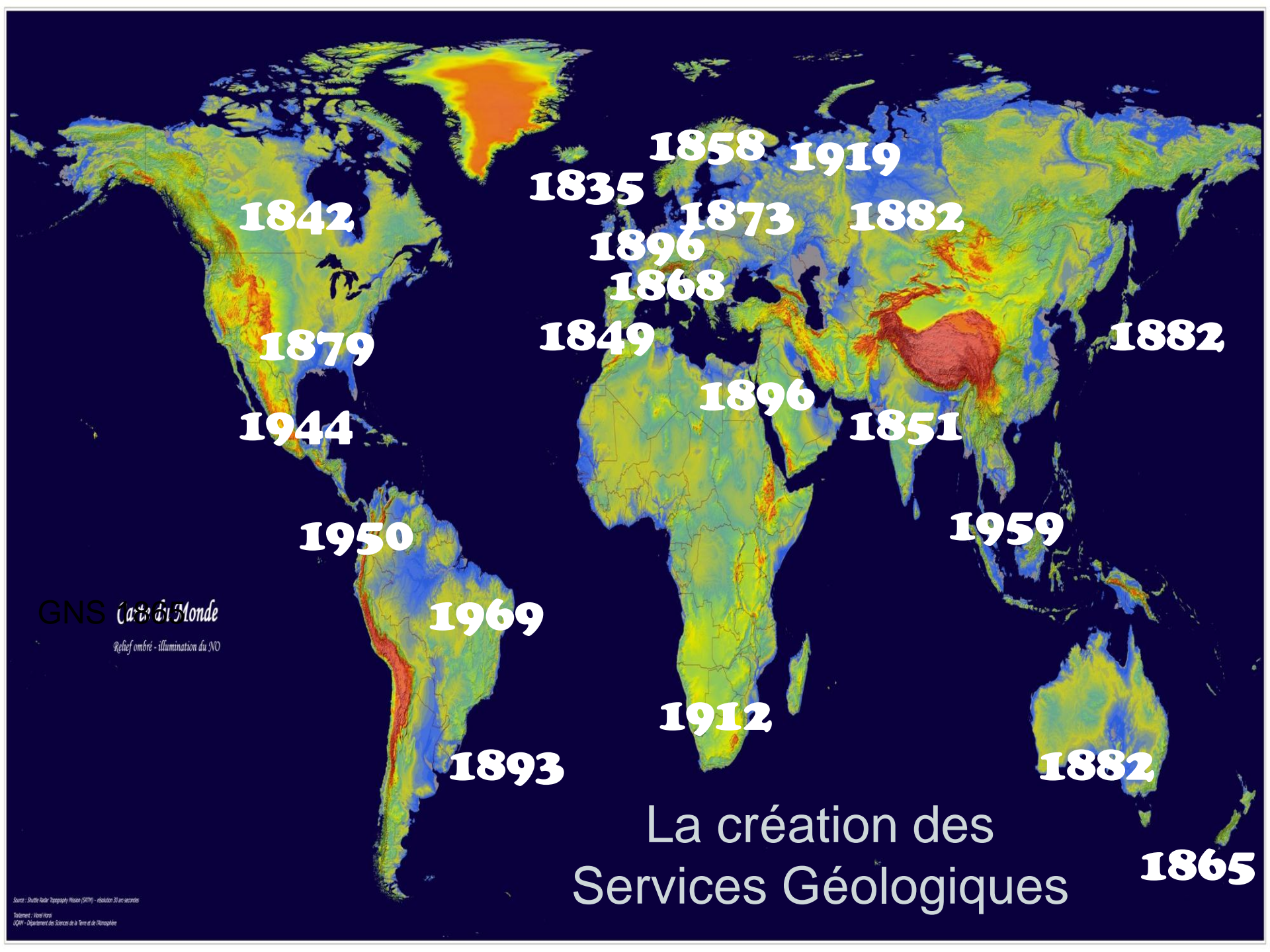
# Organisation de l'entreprise

- G1 Prospecteur individuelle, puis organisation fordienne
- G2 État et organisation pyramidale
- G3: Déconstruction par soustraitance









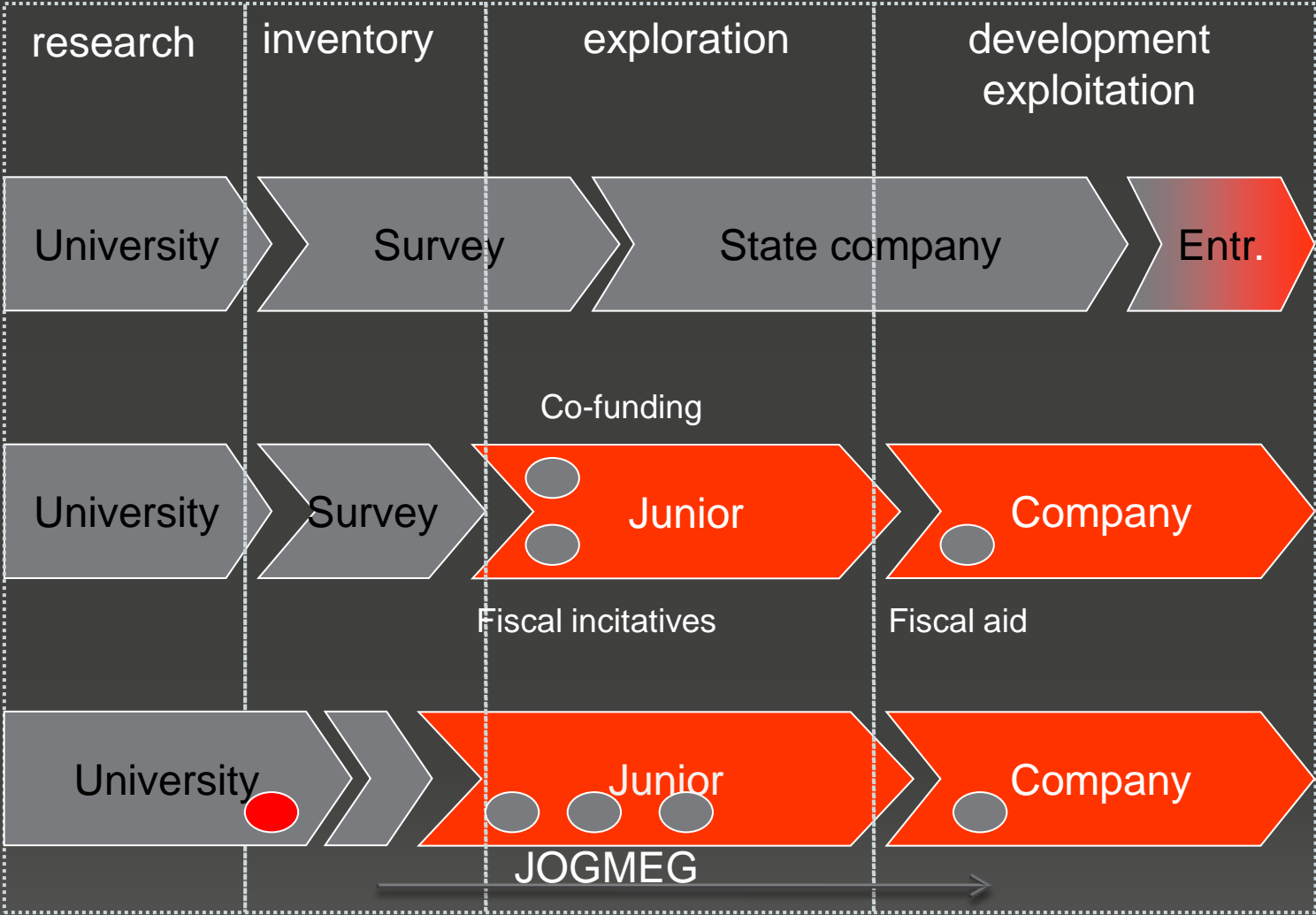
GNS *Carte du Monde*  
Relief ombré - illumination du NO

# La création des Services Géologiques

1865

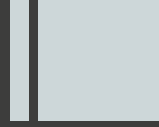
Source - Shuttle Radar Topography Mission (SRTM) - résolution 30 arc-secondes  
Traitement - Hervé Hous  
UQAM - Département des Sciences de la Terre et de l'Atmosphère

Ideé



PUBLIC

PRIVÉ



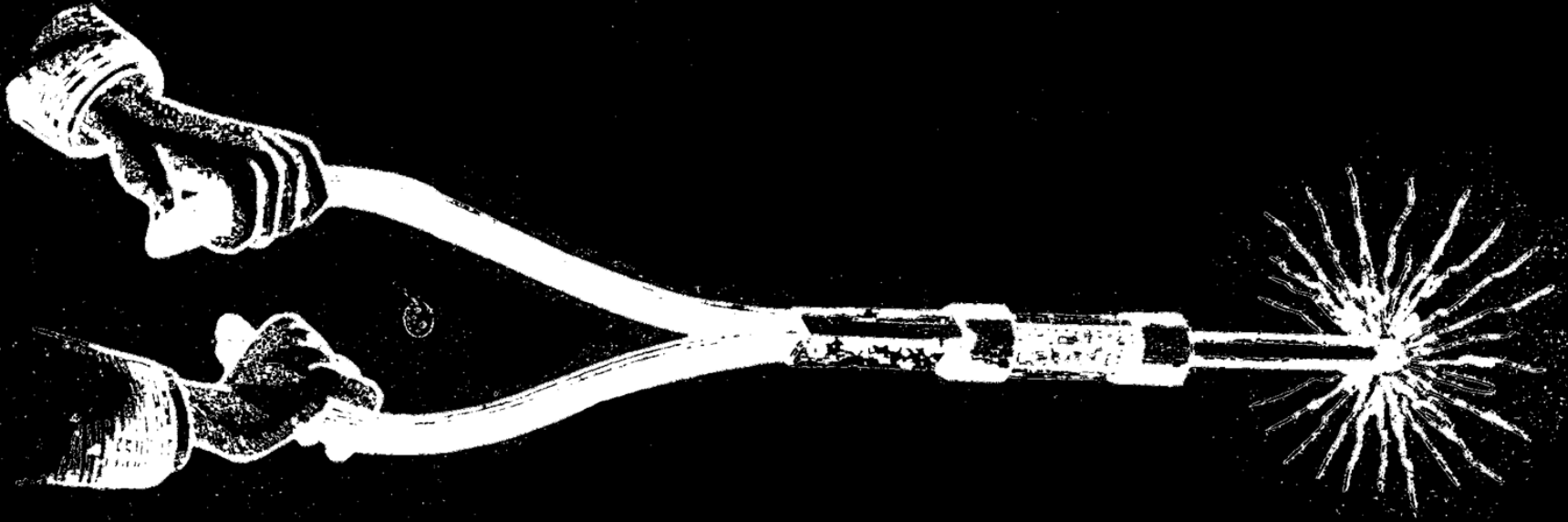
Mine

# Conclusions





**NO. 3, MAGNETIC MINERAL ROD. PRICE BY EXPRESS, \$18.00.**



Merci de votre attention !