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The Mercenary Geologist's Guide:

Speculating in Junior Resource Companies

Geology for the Lay Investor

Geology for the Lay Investor

- Geology Explained
- The Rock Cycle
- The Geologic Time Scale

- Primary Mineral Deposits Classification
- Secondary Mineral Deposits Classification
- Controls of Mineral Deposits

Geology for the Lay Investor

- The Economic Geologist
- Mineral Resources and Reserves
- Mineral Exploration and Development
- Concluding Remarks

What is Geology?

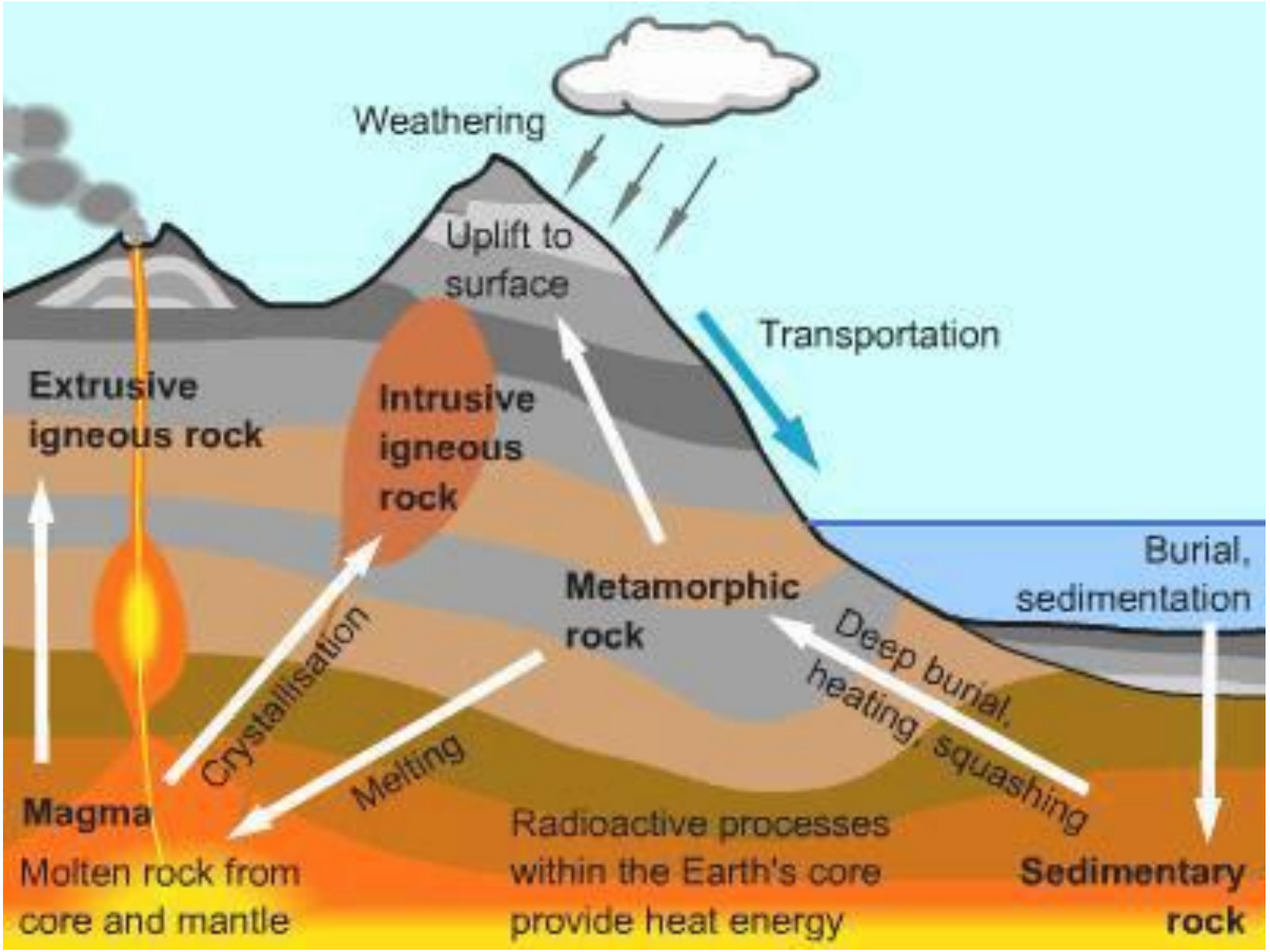
Science & Study of Earth's Physical Matter:

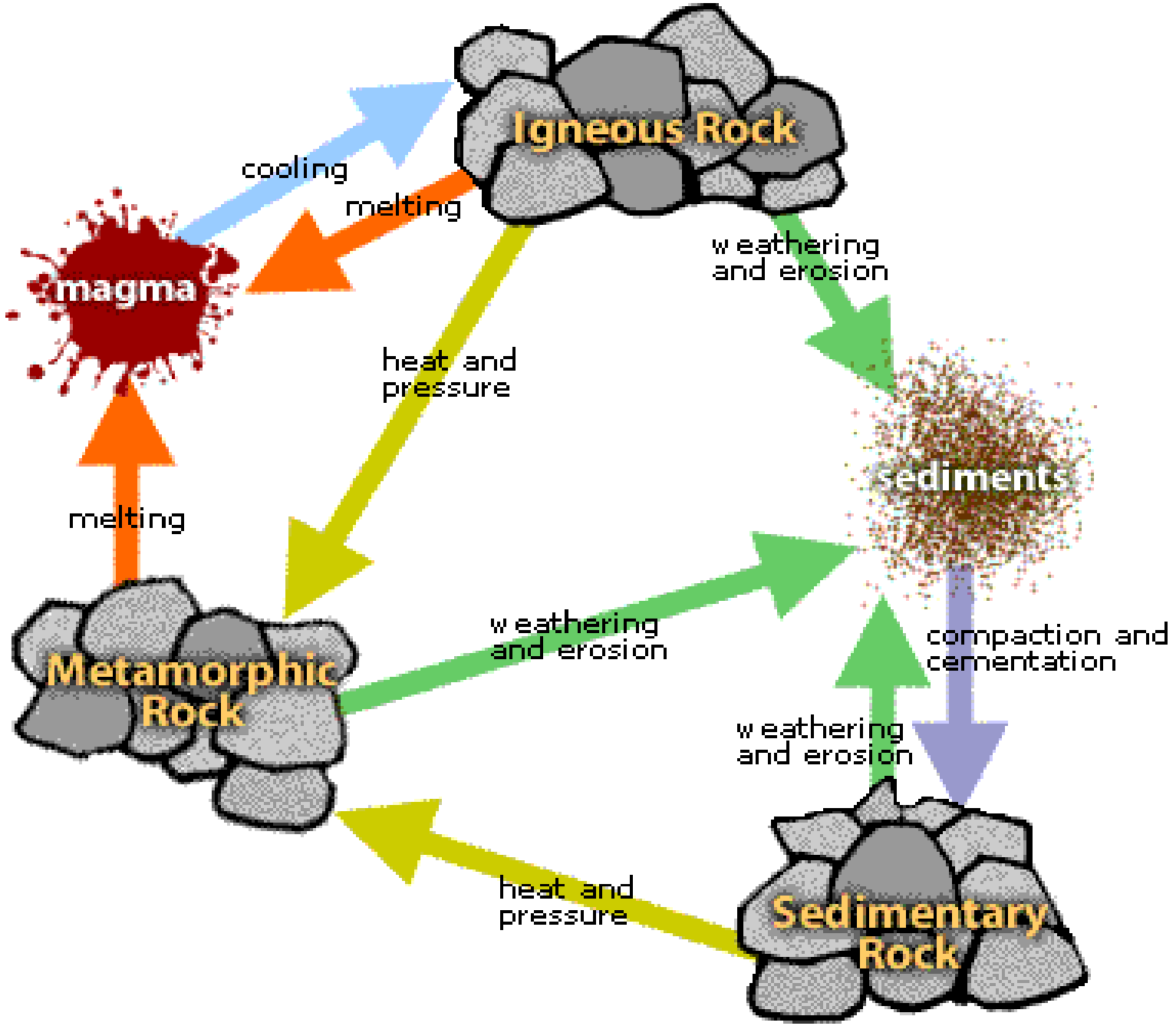
Rocks, Minerals, and Fluids

- Composition
- Structure
- Properties
- Processes
- History

Geology 101: The Rock Cycle

- Igneous Rocks
  - Intrusive Rocks Underground Magma
  - Volcanic Rocks Surface Magma
  - Hard with Large or Small Crystals
- Sedimentary Rocks
  - Mechanical Erosion and Deposition
  - Chemical Erosion and/or Deposition
  - Soft, Layers, Fossils
- Metamorphic Rocks
  - Heat and Pressure; No Melting
  - Hard, Banded, Crystals


Weathering
Uplift to surface
Transportation
Extrusive igneous rock
Intrusive igneous rock
Metamorphic rock
Burial, sedimentation
Crystallisation
Melting
Deep burial, heating, squashing
Magma
Molten rock from core and mantle
Radioactive processes within the Earth's core provide heat energy
Sedimentary rock


Igneous Rock
cooling
melting
magma
weathering
and erosion
heat and
pressure
sediments
melting
Metamorphic
Rock
weathering
and erosion
compaction and
cementation
weathering
and erosion
heat and
pressure
Sedimentary
Rock

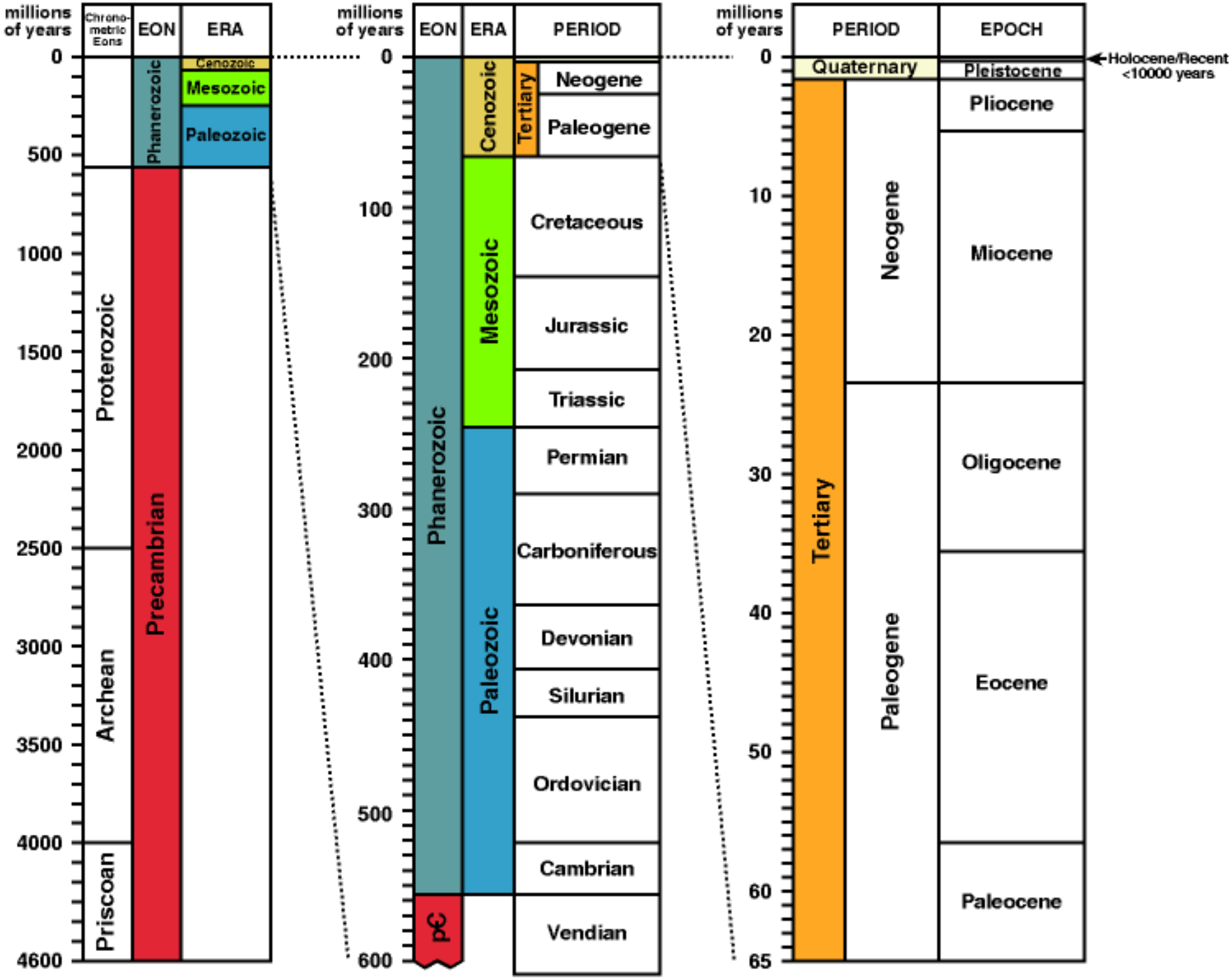
The Geologic Time Scale

- Age of the Earth 4.6 billion years
  - Radioactive Decay
  - Fossils 3.8 billion years
- Divisions: Eons, Eras, and Periods
- Based on Life Forms & Major Extinctions
- Principle of Uniformitarianism

EON	ERA	PERIOD	MILLIONS OF YEARS AGO
Phanerozoic	Cenozoic	Quaternary	1.6
		Tertiary	66
	Mesozoic	Cretaceous	138
		Jurassic	205
		Triassic	240
	Paleozoic	Permian	290
		Pennsylvanian	330
		Mississippian	360
		Devonian	410
		Silurian	435
		Ordovician	500
		Cambrian	570
Proterozoic	Late Proterozoic Middle Proterozoic Early Proterozoic		2500
Archean	Late Archean Middle Archean Early Archean		3800?
Pre-Archean			

Geologic Time Scale
Eras

- Cenozoic Mammals
- Mesozoic Trees, Dinosaurs, Birds, Mammals
- Paleozoic Marine, Land Plants & Animals
- Proterozoic (Late, Middle, Early)
  Primitive Aquatic Plants
- Archean (Late, Middle, Early)
  Primitive Life Forms
- Pre-Archean No Life Forms Known


millions of years
Chrono-metric Eons
EON
ERA
0
500
1000
1500
2000
2500
3000
3500
4000
4600
Phanerozoic
Precambrian
Cenozoic
Mesozoic
Paleozoic
Proterozoic
Archean
Priscoan
millions of years
EON
ERA
PERIOD
0
100
200
300
400
500
600
Phanerozoic
pЄ
Cenozoic
Mesozoic
Paleozoic
Tertiary
Neogene
Paleogene
Cretaceous
Jurassic
Triassic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
Vendian
millions of years
PERIOD
EPOCH
0
10
20
30
40
50
60
65
Quaternary
Tertiary
Neogene
Paleogene
Holocene/Recent <10000 years
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene

What is an “Ore Deposit”?

Ore Deposits, Park and McDiarmid, 1975

“Ores are rocks and minerals that can be recovered at a profit.”

Mineral Deposits Classification

- Metallic Minerals
- Nonmetallic Minerals and Rocks
- Energy Solids and Fluids
- Water

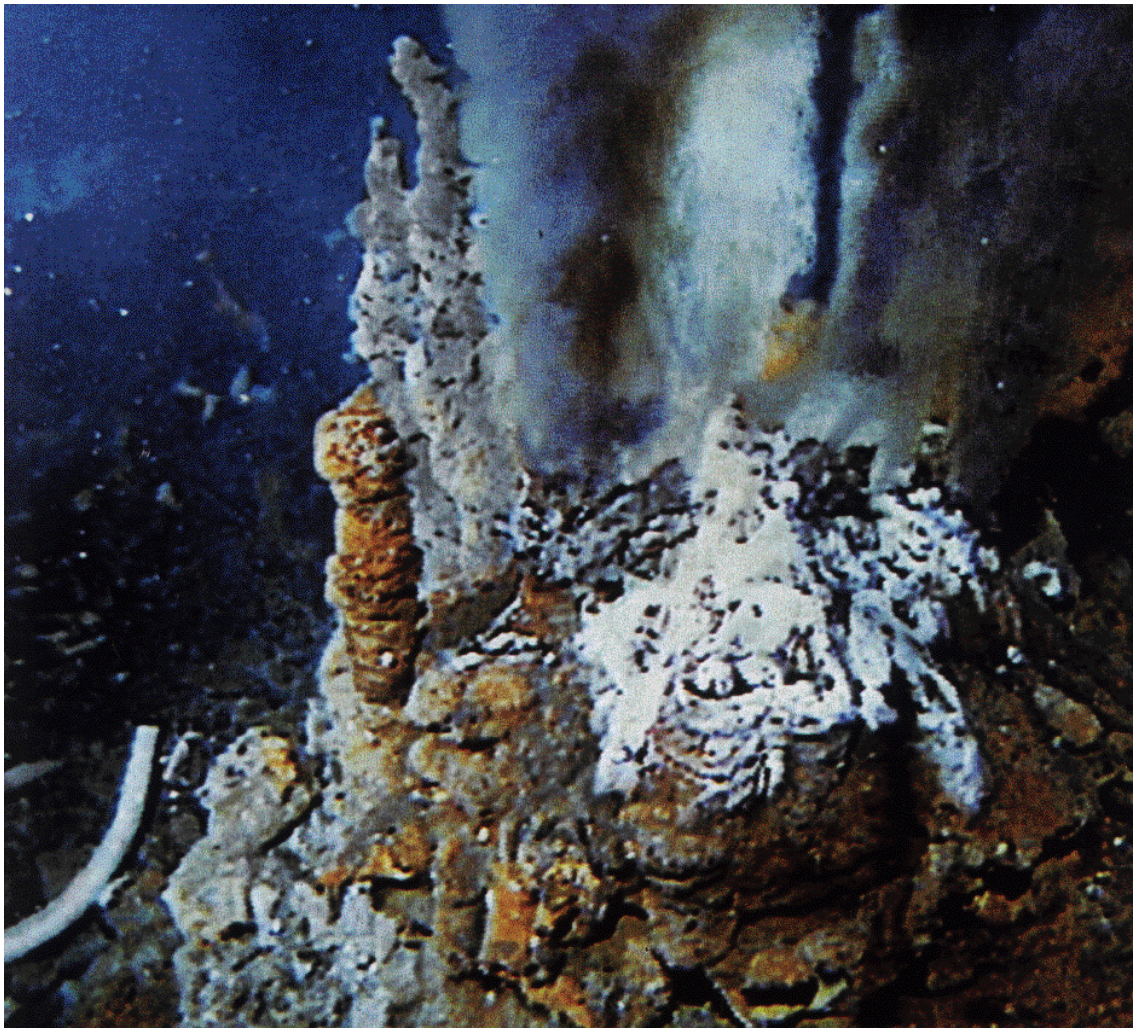
Mineral Deposits Classification (Primary)

- Magmatic Segregation Deposits
  - Ni-Cu-PGE-Chromite
- Metamorphic Deposits
  - Mesothermal Au, Garnet, Marble, Asbestos
- Hydrothermal Deposits
  - Porphyry-Skarn Cu-Mo-Au-Ag; Granite-Pegmatite Sn, REE, Rare Metals; Carlin Au; Carbonate Replacement Pb-Zn-Ag; Epithermal Au-Ag $\pm$ Base Metals

Porphyry Cu-Au-Mo Deposit
Open Pit Mine, North Central Utah

Epithermal Gold Deposit, Sonora

Volcanogenic Massive Sulfide



Mineral Deposits Classification (Primary)

- Sea Floor Deposits
  - Volcanic and Sediment-Hosted Massive Sulfide
- Basinal Brine Deposits
  - Mississippi Valley Pb-Zn-F
- Chemical Sedimentation
  - Phosphate; Evaporite; BIF; Mn Seds & Nodules

Controls of Primary Mineral Formation

- Geological Boundaries or Discontinuities
- Magmas
- Chemical and Physical Changes
- Hot Briny Waters (Hydrothermal)
  - Magmatic, Metamorphic, Basinal, Meteoric

Mineral Deposits Classification Secondary

- Oxidation-Reduction
  - Sandstone & Unconformity U_3O_8; Copperbelt
- Clastic Sedimentation
  - Placer Au, Ti, REE, Diamonds, Sn; Witwatersrand
- Weathering
  - Laterite Ni; Bauxite; Supergene Cu

Gas Hills, Wyoming Uranium Roll Front

Tofti Placer, Alaska 2009

Economic Geology

- What is “Economic Geology”?
  - Study of Geology Applied to Ore Deposits
- What is an “Ore Deposit”?
  - Rocks and Minerals Recovered *at a Profit*
- Who is an “Economic Geologist”?
  - Science, Communication, Business, Finance

De Re Metallica (1556)
Georgius Agricola

What Does an Economic Geologist Do?

- Field Geology
- Office Geology
- Reports and Presentations
- Financings and Business Development

Pre-Season Office Geology

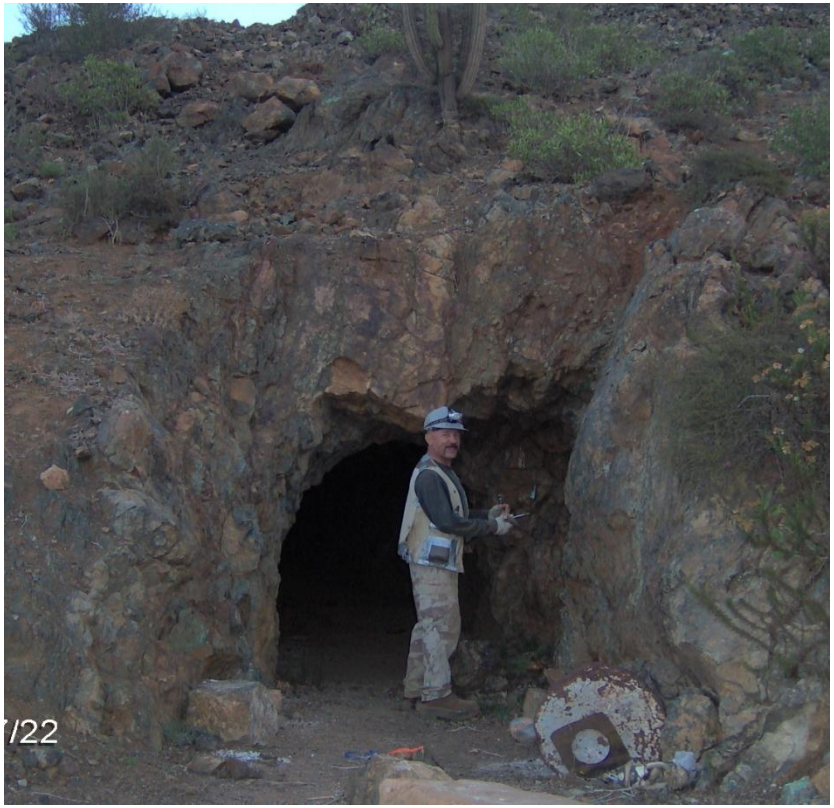
- Plan Exploration Programs
- Compile Data for Field Exploration
- Prepare Maps for Field Exploration
- Budget Exploration Programs
- Negotiate with Contractors

Field Season Geology

- Mapping and Prospecting
- Rock, Soil, and Stream Sampling
- Drilling Logistics and Management
- Core and Chip Logging
- Manage Field Crews and Contractors

Geological Mapping and Core Logging

El Vino Fino, Chile July 2007



Albert's Hump, B.C. Sept 2006

Prospecting

Temoris, Mexico
January 2007

Poison Canyon, N. M.
April 2008

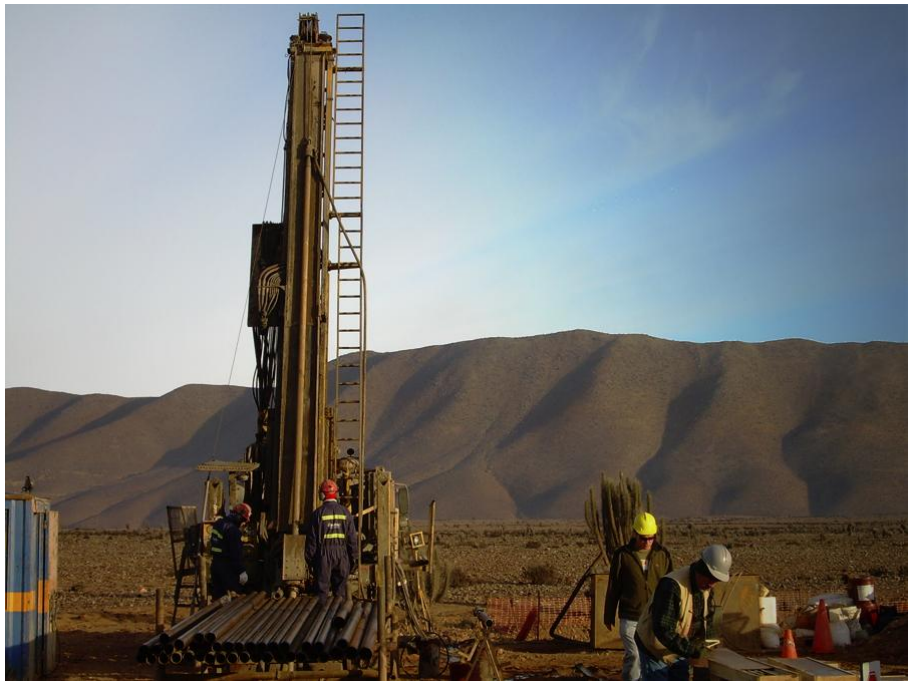
Rock Sampling

Albert's Hump, B.C.

September 2006

Drilling Logistics and Management

Las Posadas, Chile
July 2007



Big Springs, Nevada
October 2007

Post-Season Office Geology

- Compile Maps and Data
- Analyze, Integrate, and Interpret Data
- Write Reports & News Releases
- Presentations for Investors & Financings

Analyst Tour Northern Chile
January 2006

CIM Standards on Mineral Resources and Reserves (2000)

Mineral Resource :

- Concentration of Material
- Quantity and Quality
- Reasonable Prospect for Economic Extraction
- Geological Characteristics and Continuity
- Specific Evidence and Knowledge

Mineral Resources

Geological Confidence in the Resource Estimate

- Inferred
- Indicated
- Measured

Note: Confidence level of Inferred Resources are insufficient to assess technically or economically.

Mineral Reserves

- Economically Mineable Part of Resources
- Measured and/or Indicated Resources Only
- Preliminary Feasibility Study
- Economic Extraction at Time of Report
- Includes Dilution and Loss Allowances

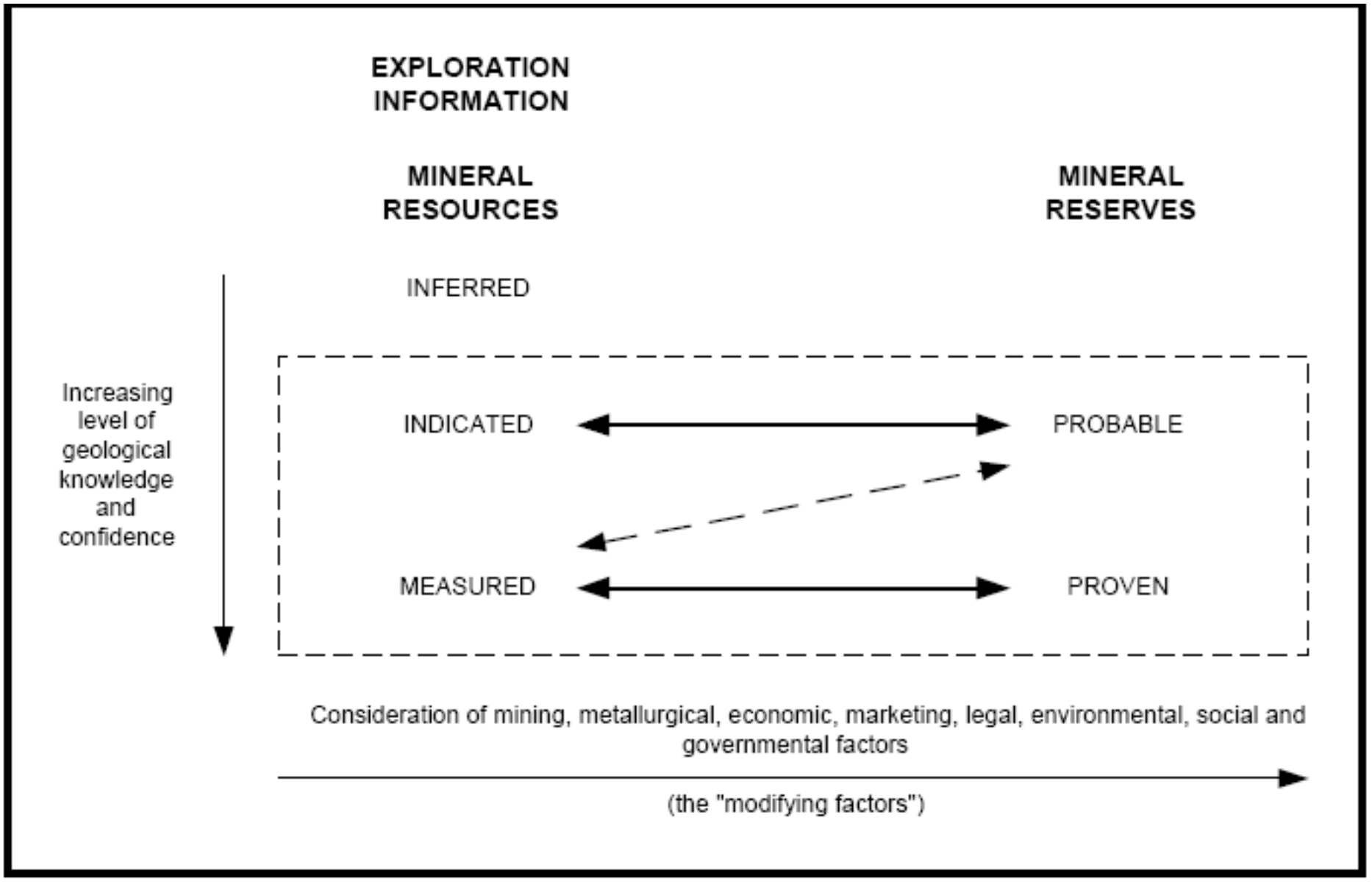
Mineral Reserves

Geological Confidence in the Reserve Estimate

- Probable
- Proven

- Economically Viable Project

- Mining, Processing, Metallurgical, Economic, Marketing, Legal, Socio-Economic, Environmental, and Government Factors


EXPLORATION INFORMATION
MINERAL RESOURCES
MINERAL RESERVES
INFERRED
Increasing level of geological knowledge and confidence
INDICATED
PROBABLE
MEASURED
PROVEN
Consideration of mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors
(the "modifying factors")

Mineral Resources vs Mineral Reserves

What is the Difference?

"At a Profit."

Evaluating a Company for Investment

Mineral Resource:

- Mineralized mass of rock
- Highly elevated content
- Particular mineral commodity
- Compared to Background Abundances

- Often Little or No Economic Input

Mineral Exploration

- Grassroots Reconnaissance
- Prospect Evaluation
- Drill Targeting
- Phase I - II Drilling
- Phase III Drilling, Inferred Resource

Advanced Exploration & Development

- Phase IV-V Drilling, Metallurgy, M&I Resource
- Pre-Feasibility Economics M&I Resource, Permitting
- Feasibility Economics Proven & Probable Reserve
- Financing and Development

- Mining

Every Good Geologist Knows
That
Grade is King!

Mining the Stock Market

Mark Twain: Comstock Lode 1865

Virginia City, Nevada

"A mine is a hole in the ground with a liar standing beside it."

A Mine is a Hole in the Ground…

Why I Do What I Do…

28 # King Salmon

11 # Lake Trout

Why I Really Do What I Do…

In-Fisherman 2008

Master Angler Award 5# Brook Trout

The Real Reason I Do What I Do…

- See the World
- Explore
- Develop
- Create Wealth
- Make the Earth a Better Place to Live

Monday Morning Musings from Mickey the Mercenary Geologist

www.MercenaryGeologist.com