

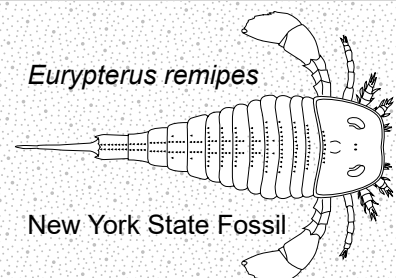
# Reference Tables for EARTH & SPACE SCIENCES

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### **2024 EDITION**

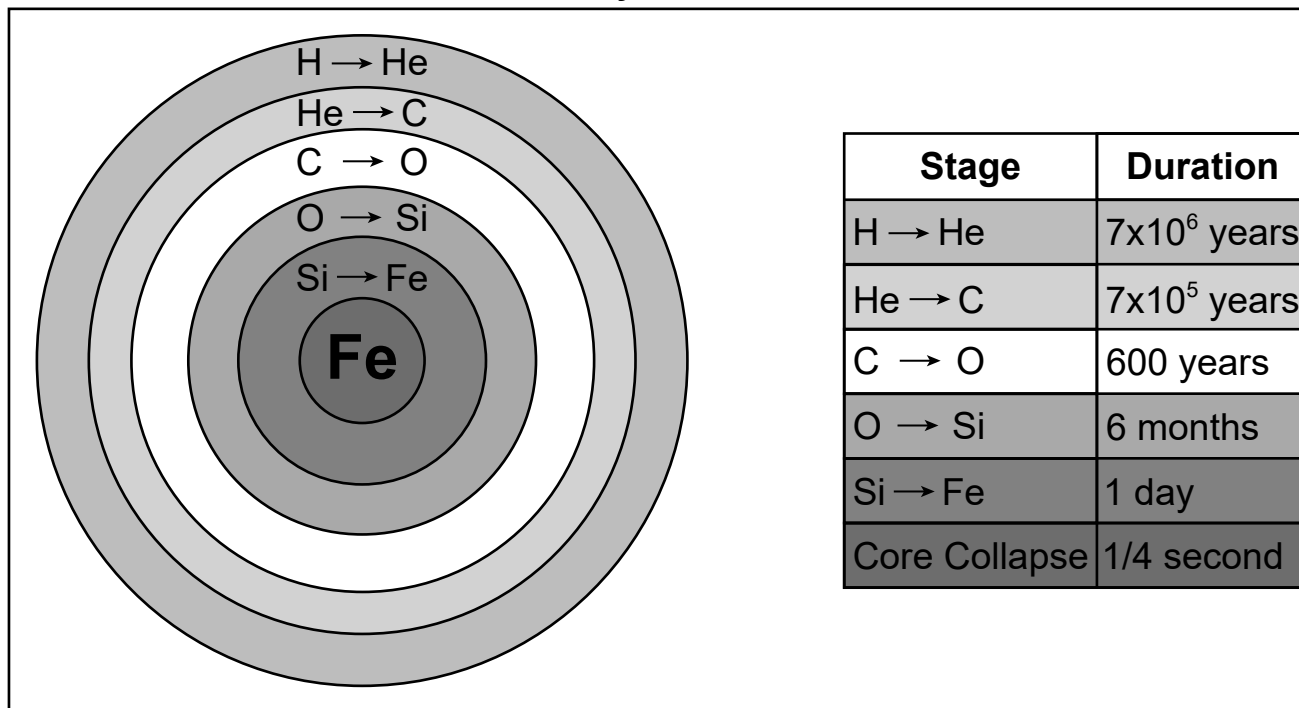
This edition of the Earth and Space Sciences Reference Tables should be used in the classroom beginning in the 2024–25 school year. The first examination for which these tables will be used is the June 2025 Regents Examination in Earth and Space Sciences.



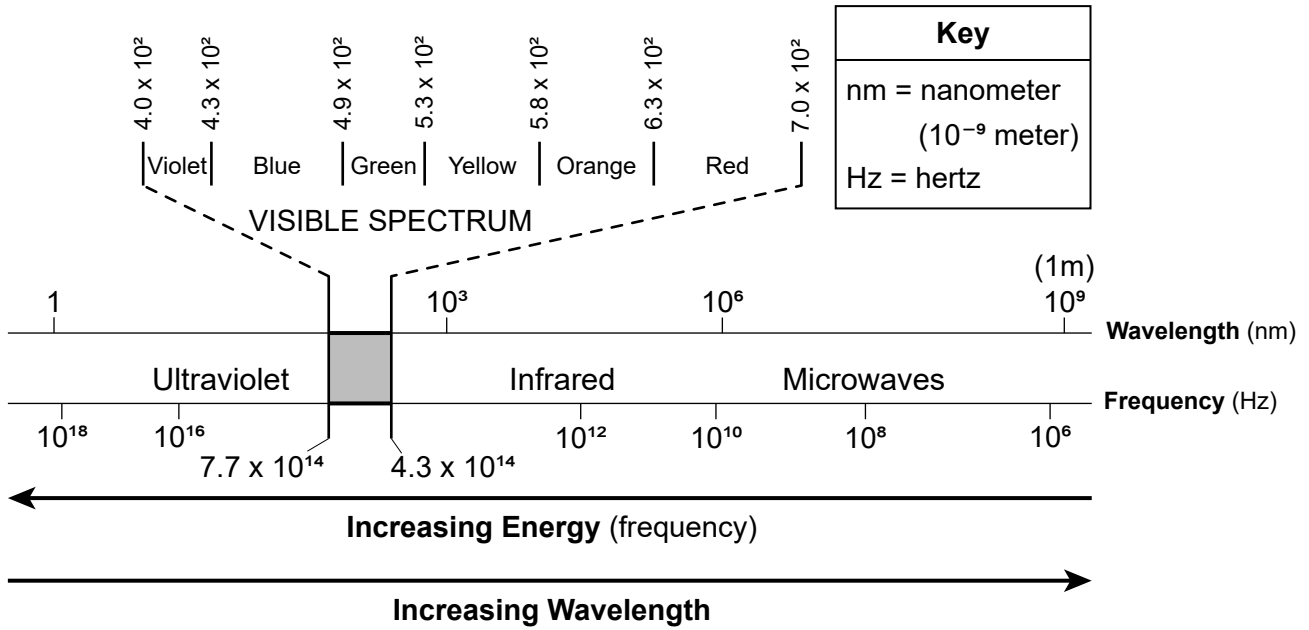
## Solar System Objects Data Table

Celestial Object	Mean Distance from Sun (million km)	Period of Revolution (d=Earth days) (y=Earth years)	Period of Rotation at Equator	Eccentricity of Orbit	Equatorial Diameter (km)	Axial Tilt (°)
SUN	---	---	27 d	---	1,392,000	7.25
MERCURY	57.9	88 d	59 d	0.206	4879	0.03
VENUS	108.2	224.7 d	243 d	0.007	12,104	177.4
EARTH	149.6	365.26 d	23 h 56 min 4 s	0.017	12,756	23.49
EARTH'S MOON	149.6 (0.385 from Earth)	27.3 d	27.3 d	0.055	3476	6.68
MARS	228.0	1.9 y	24 h 37 min 23 s	0.094	6792	25.19
CERES	414.0	4.6 y	9 h 6 min	0.076	~939	4.00
PALLAS	414.0	4.6 y	7 h 40 min	0.230	~546	84.00
JUPITER	778.5	11.9 y	9 h 50 min 30 s	0.048	142,984	3.13
SATURN	1432.0	29.5 y	10 h 14 min	0.054	120,536	26.73
URANUS	2867.0	83.7 y	17 h 14 min	0.047	51,118	97.77
NEPTUNE	4515.0	163.7 y	16 h	0.009	49,528	28.32
PLUTO	5906.4	248.0 y	6 d 9 h	0.250	2376	122.5
ERIS	10,000	557.2 y	1 d 1 h 58 min	0.436	2400	78.30

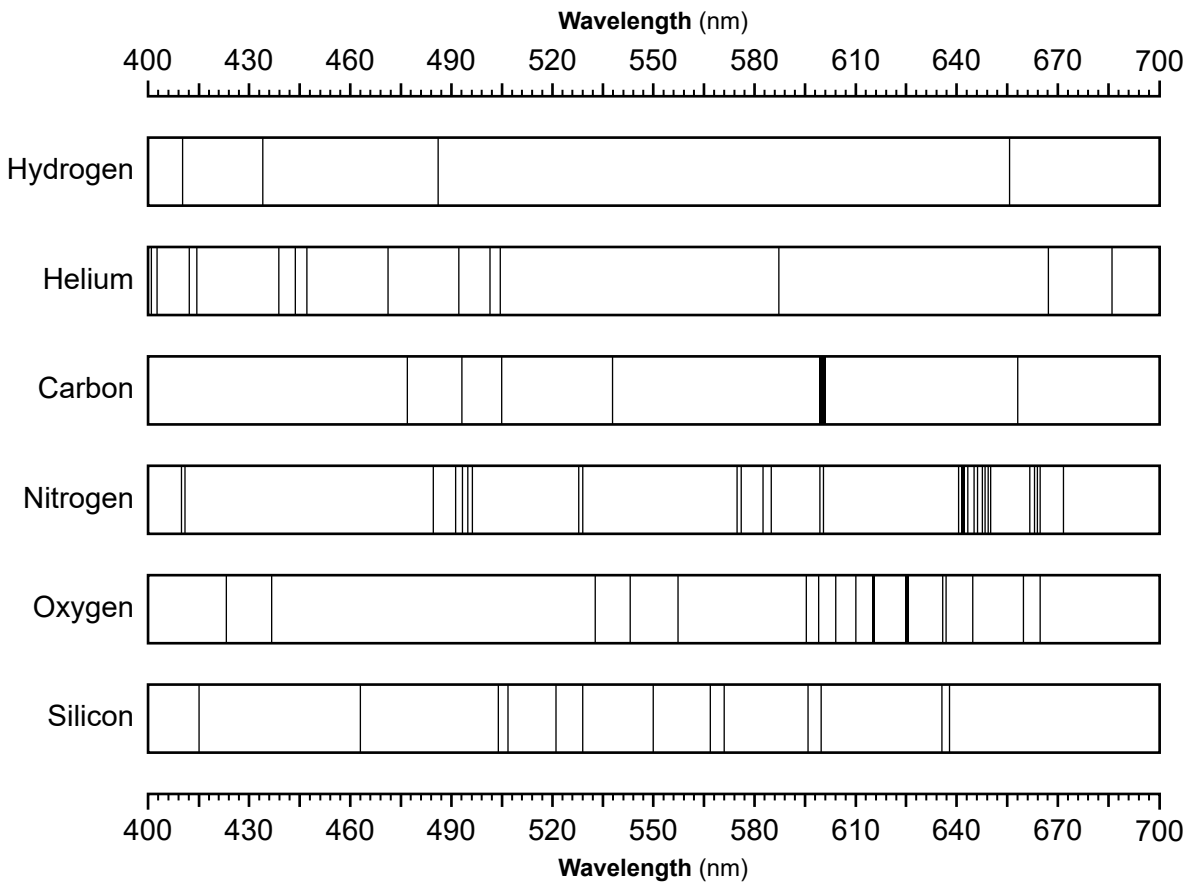
## Generalized Nucleosynthesis in a Massive Star



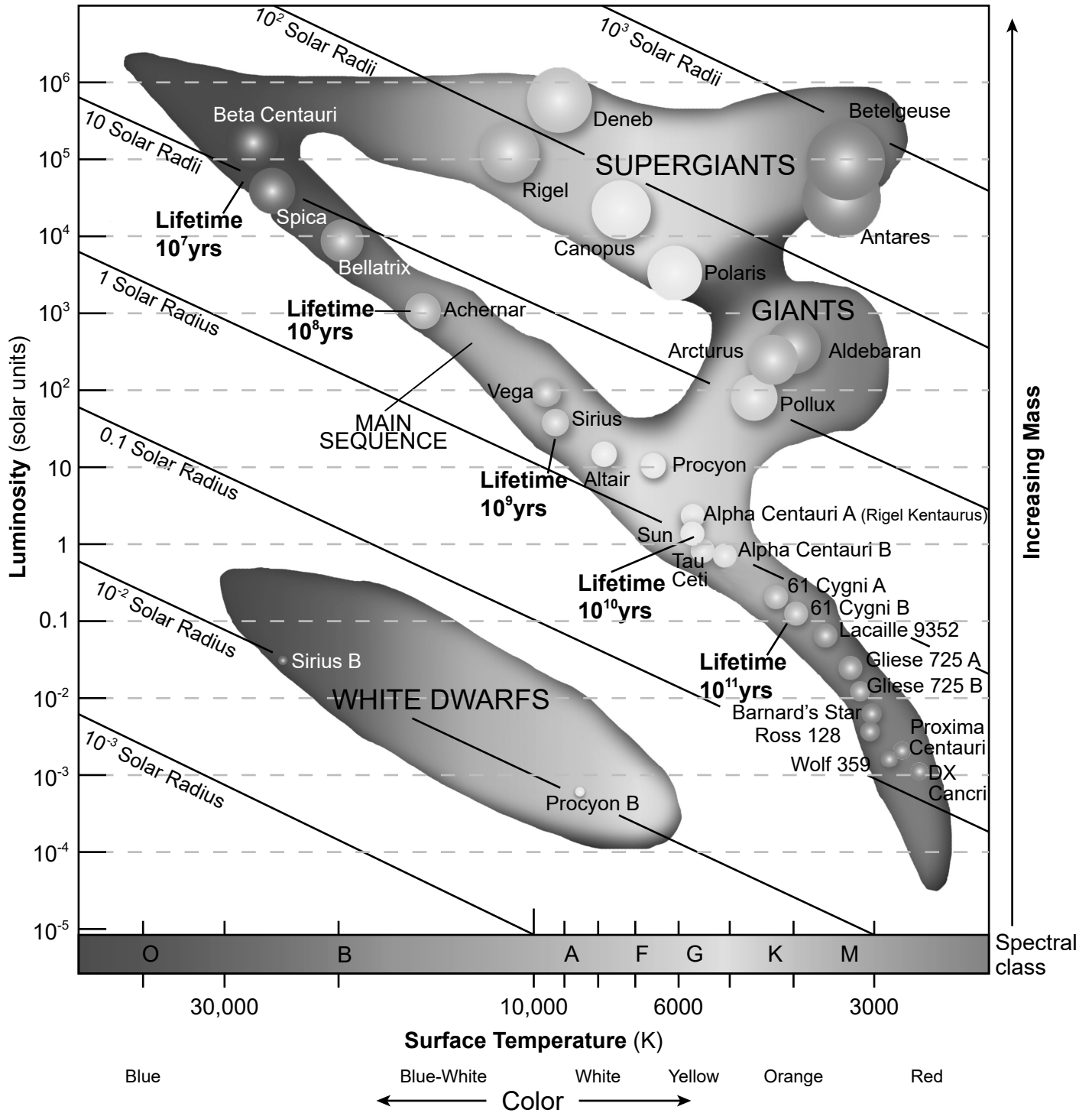
### Portion of Electromagnetic Spectrum Related to Earth and Space Sciences



### Emission Spectra of Some Elements from Stars

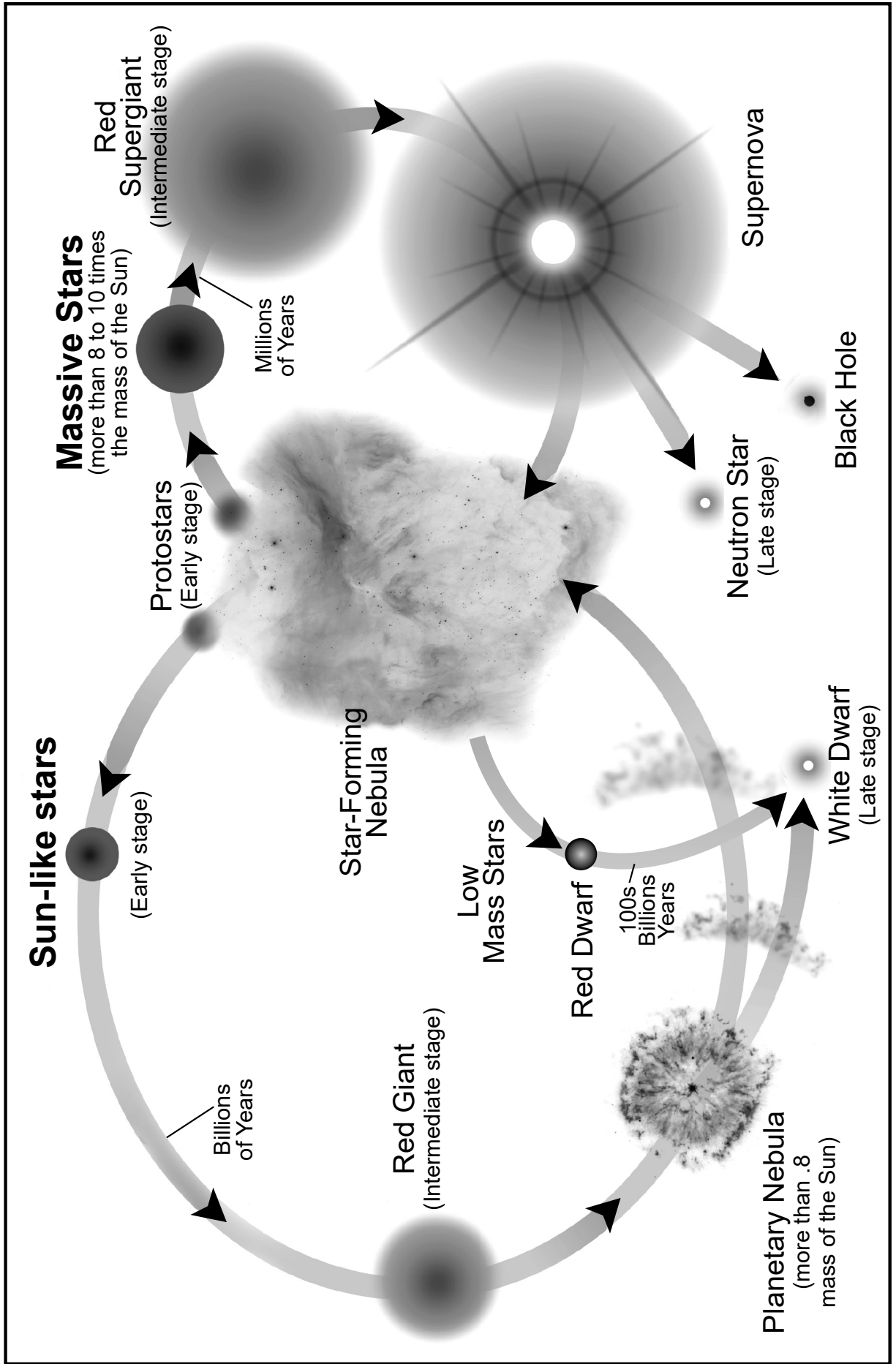


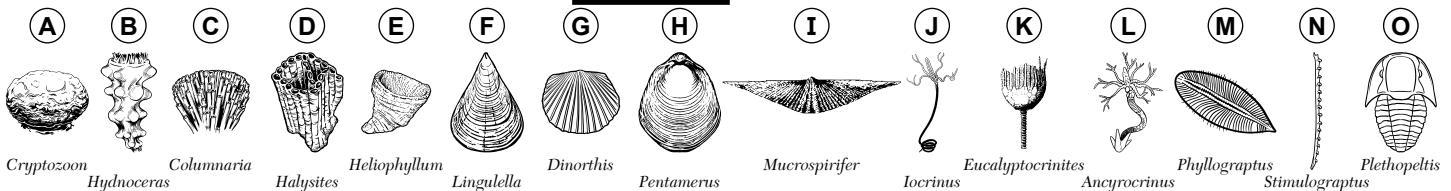
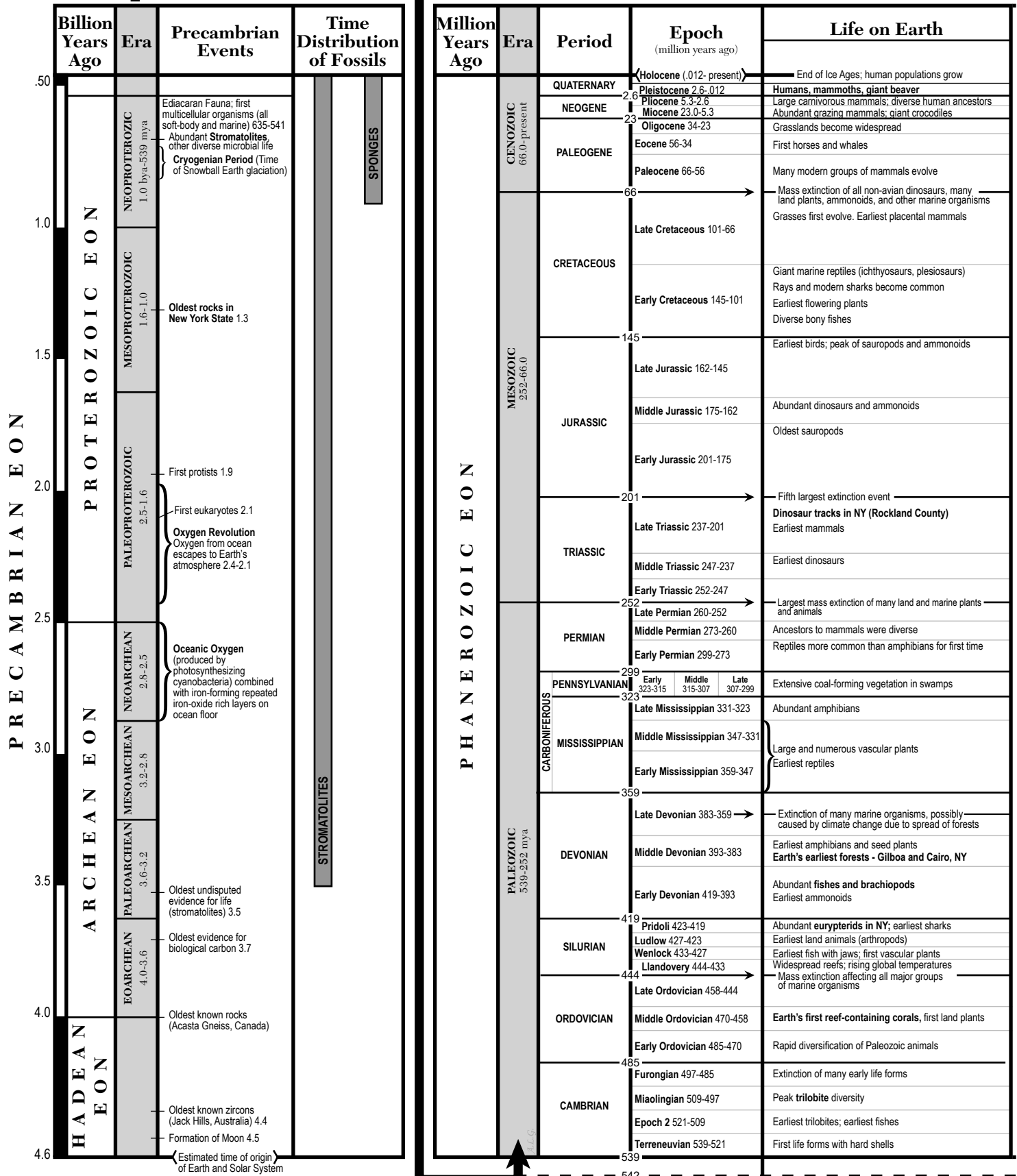
# H-R Diagram



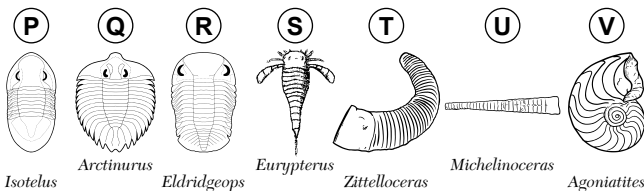
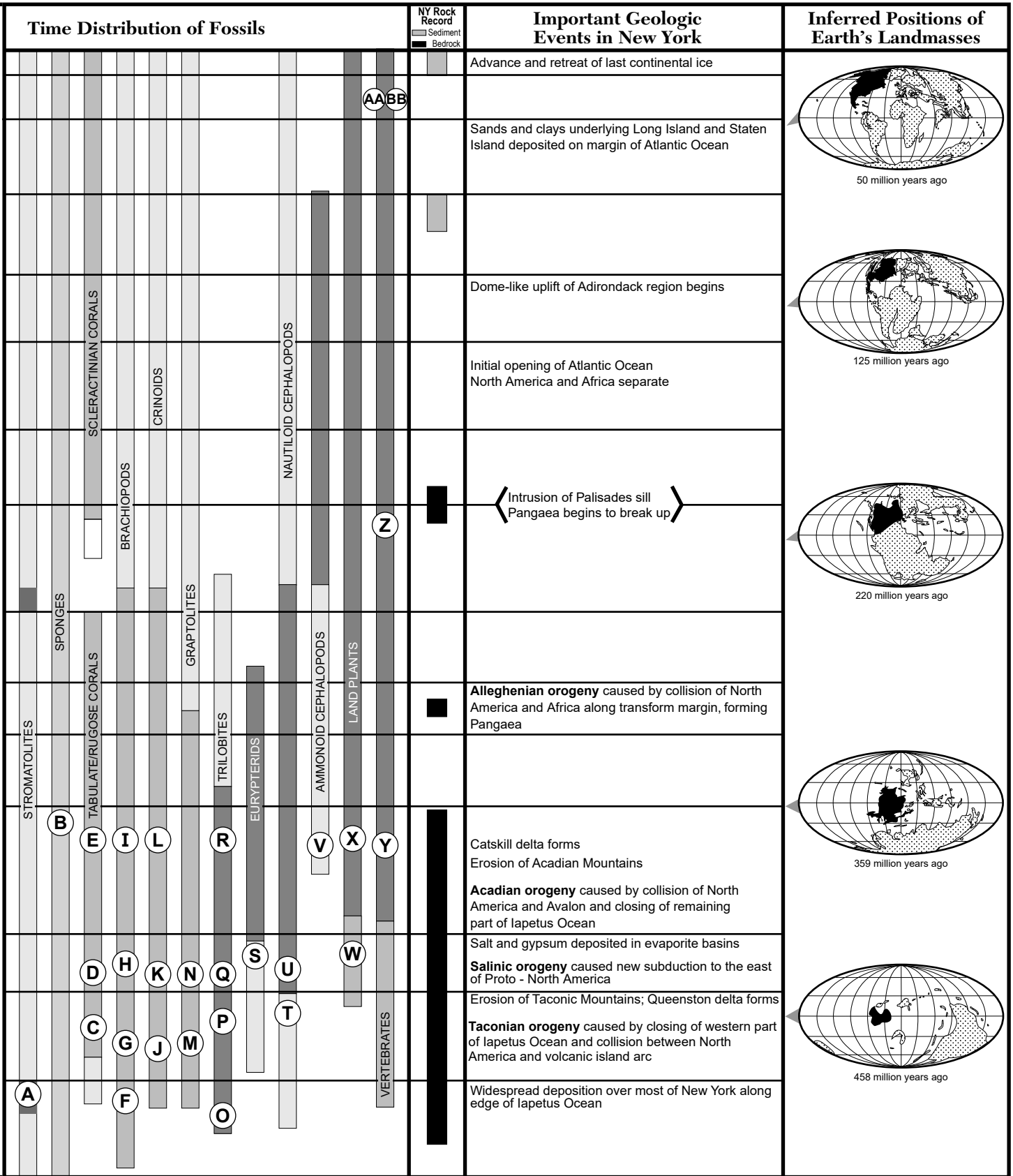


# Life Cycles of Stars Model

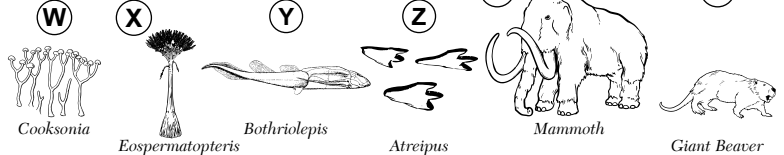




OF NEW YORK STATE

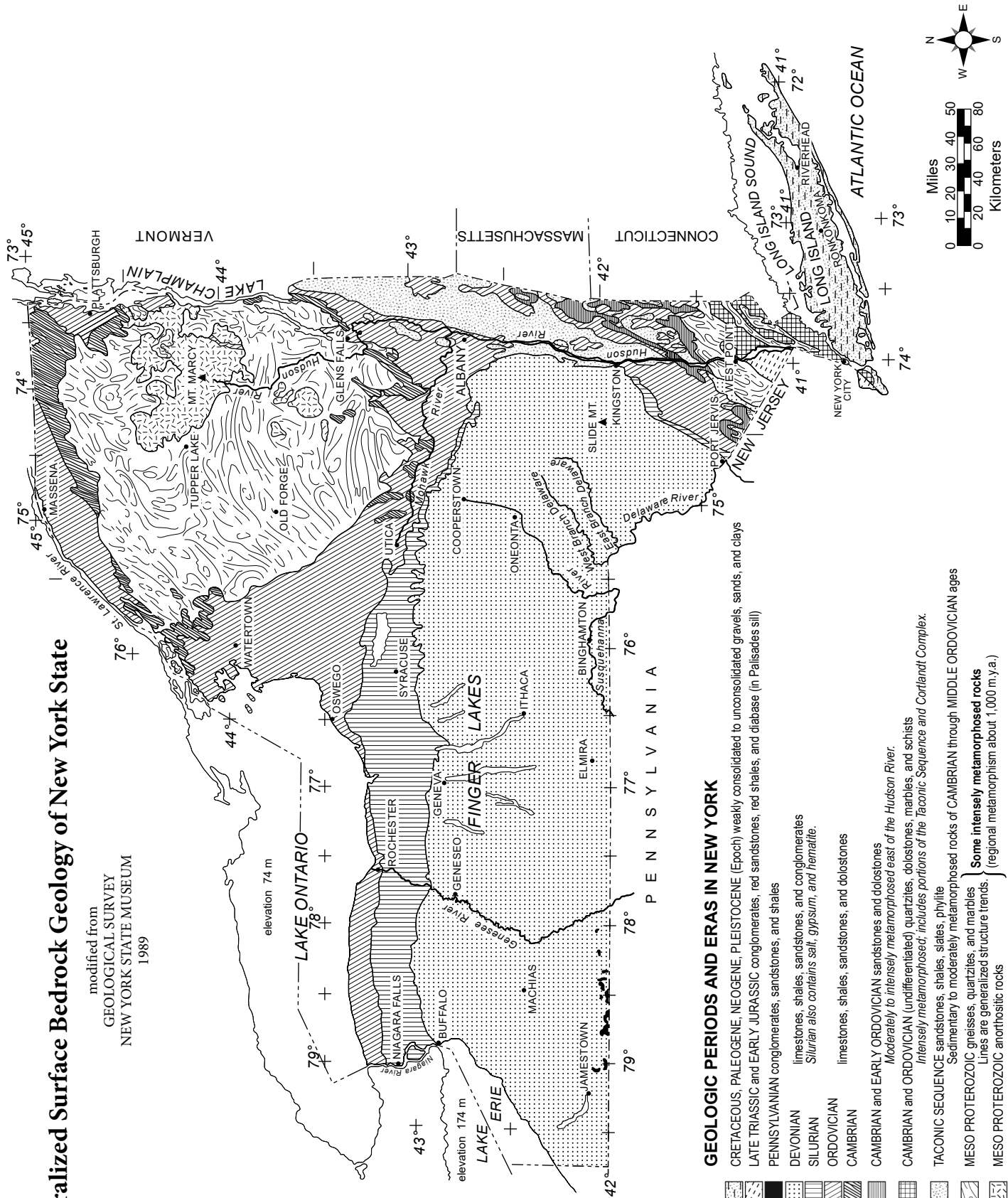


First opening of Iapetus Ocean. **Grenville orogeny:** Metamorphism of exposed bedrock - Adirondacks and Hudson Highlands.



# Generalized Surface Bedrock Geology of New York State

modified from  
 GEOLOGICAL SURVEY  
 NEW YORK STATE MUSEUM  
 1989

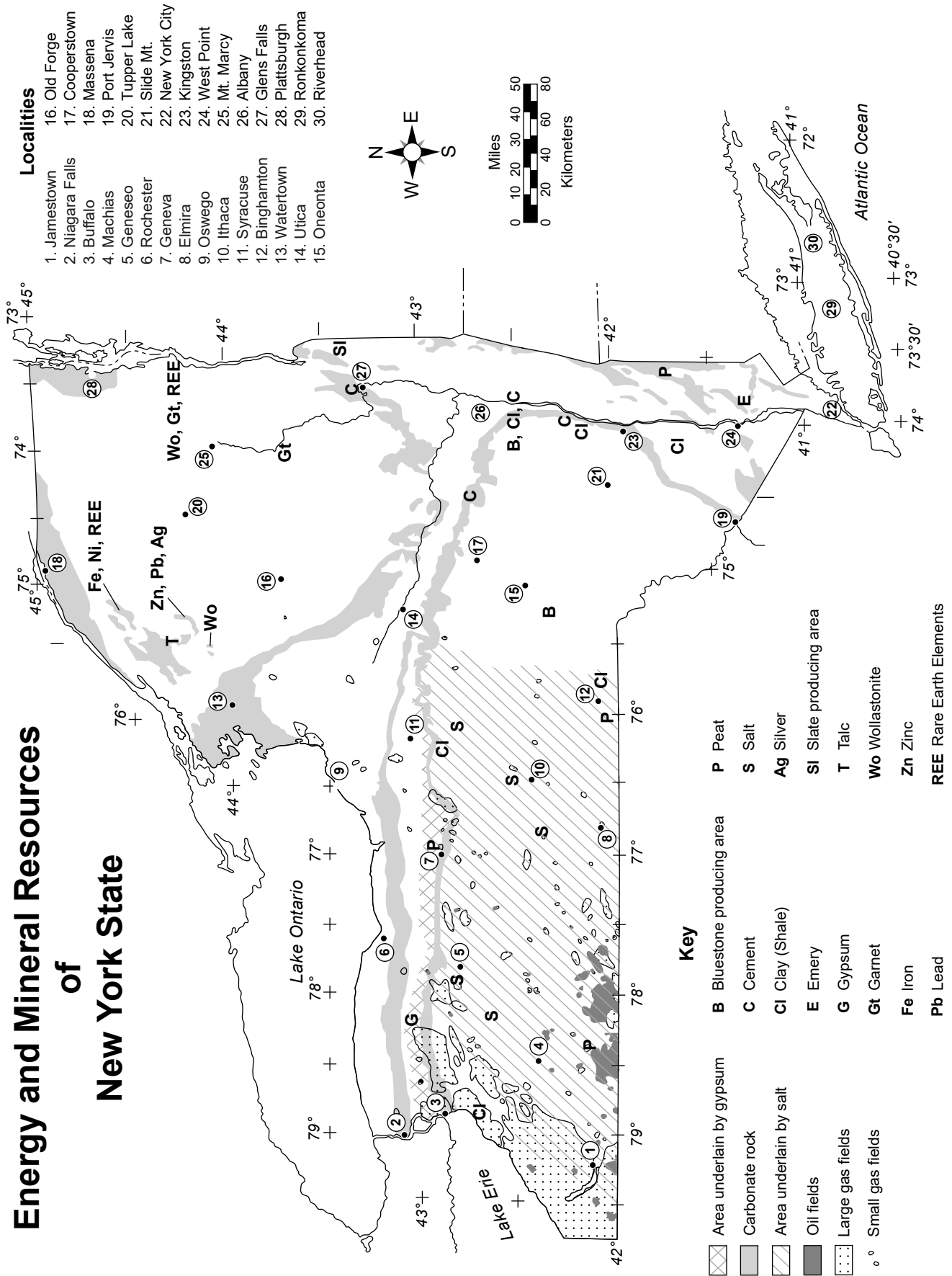


## GEOLOGIC PERIODS AND ERAS IN NEW YORK

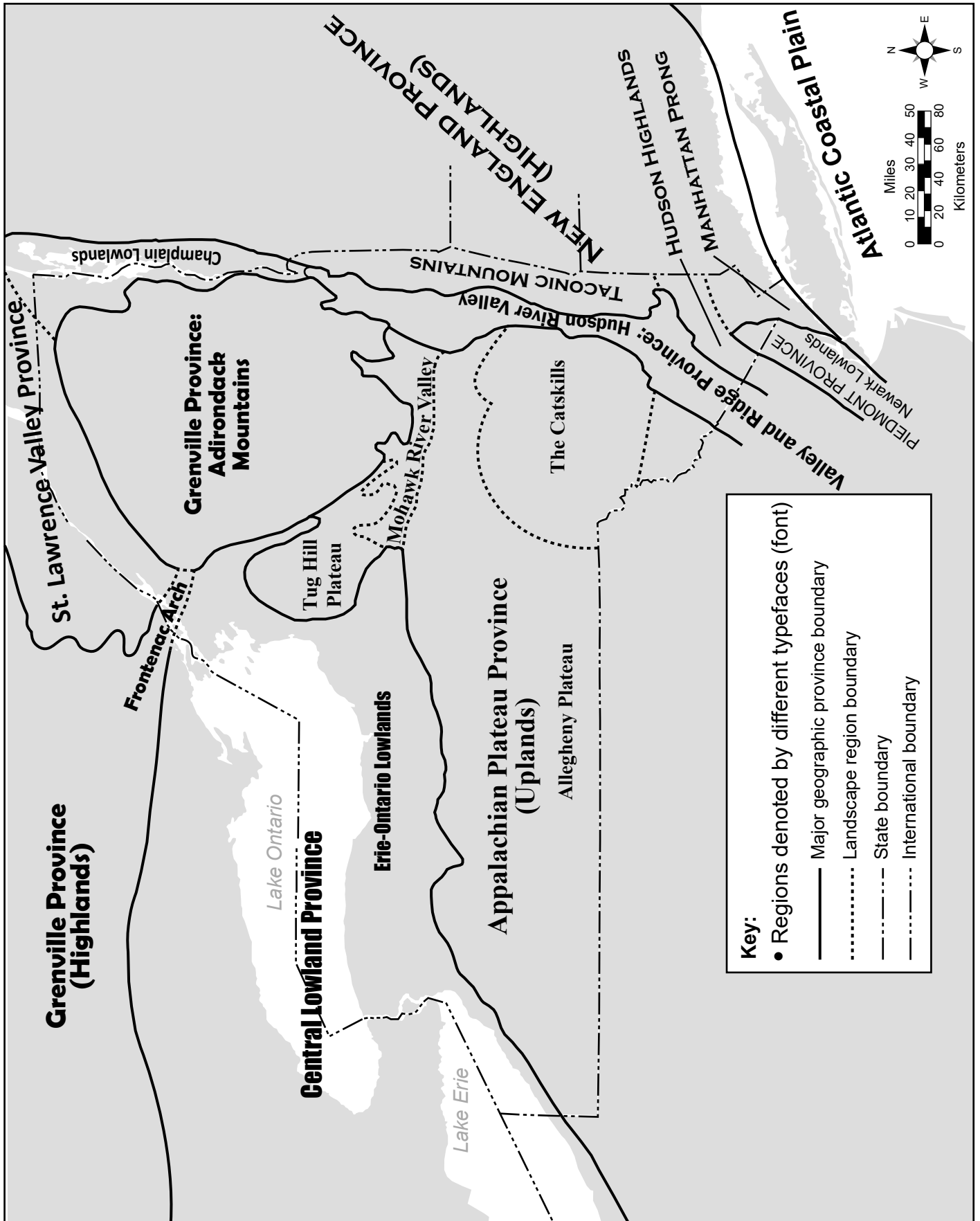
- CRETACEOUS, PALEOGENE, NEOGENE, PLEISTOCENE (Epoch) weakly consolidated to unconsolidated gravels, sands, and clays
- LATE TRIASSIC and EARLY JURASSIC conglomerates, red sandstones, red shales, and diabase (in Palisades sill)
- PENNSYLVANIAN conglomerates, sandstones, and shales
- DEVONIAN limestones, shales, sandstones, and conglomerates
- SILURIAN Silurian also contains salt, gypsum, and hematite.
- ORDOVICIAN limestones, shales, sandstones, and dolostones
- CAMBRIAN
- CAMBRIAN and EARLY ORDOVICIAN sandstones and dolostones  
*Moderately to intensely metamorphosed east of the Hudson River.*
- CAMBRIAN and ORDOVICIAN (undifferentiated) quartzites, dolostones, marbles, and schists  
*Intensely metamorphosed; includes portions of the Taconic Sequence and Cortlandt Complex.*
- TACONIC SEQUENCE sandstones, shales, slates, phyllite  
*Sedimentary to moderately metamorphosed rocks of CAMBRIAN through MIDDLE ORDOVICIAN ages*
- MESO PROTEROZOIC gneisses, quartzites, and marbles  
*Lines are generalized structure trends*
- MESO PROTEROZOIC anorthositic rocks  
*Some intensely metamorphosed rocks (regional metamorphism about 1,000 m.y.a.)*

<p><b>Dominantly sedimentary origin</b></p>	
<p><b>Dominantly metamorphosed rocks</b></p>	

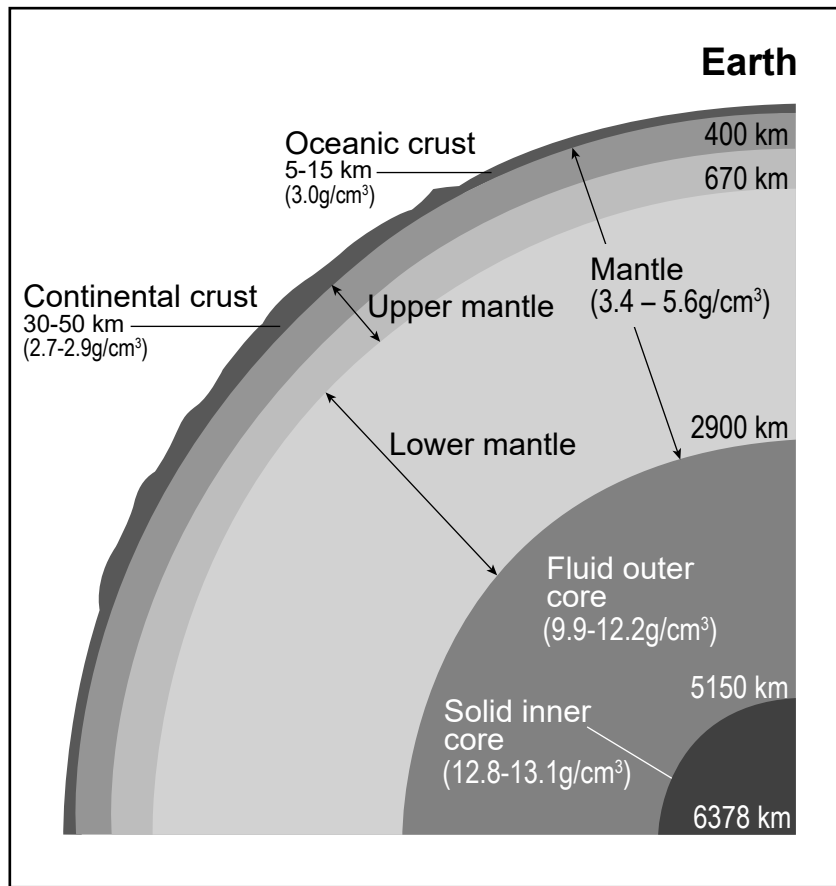
# Energy and Mineral Resources of New York State



# GEOGRAPHIC PROVINCE AND LANDSCAPE REGIONS OF NEW YORK STATE

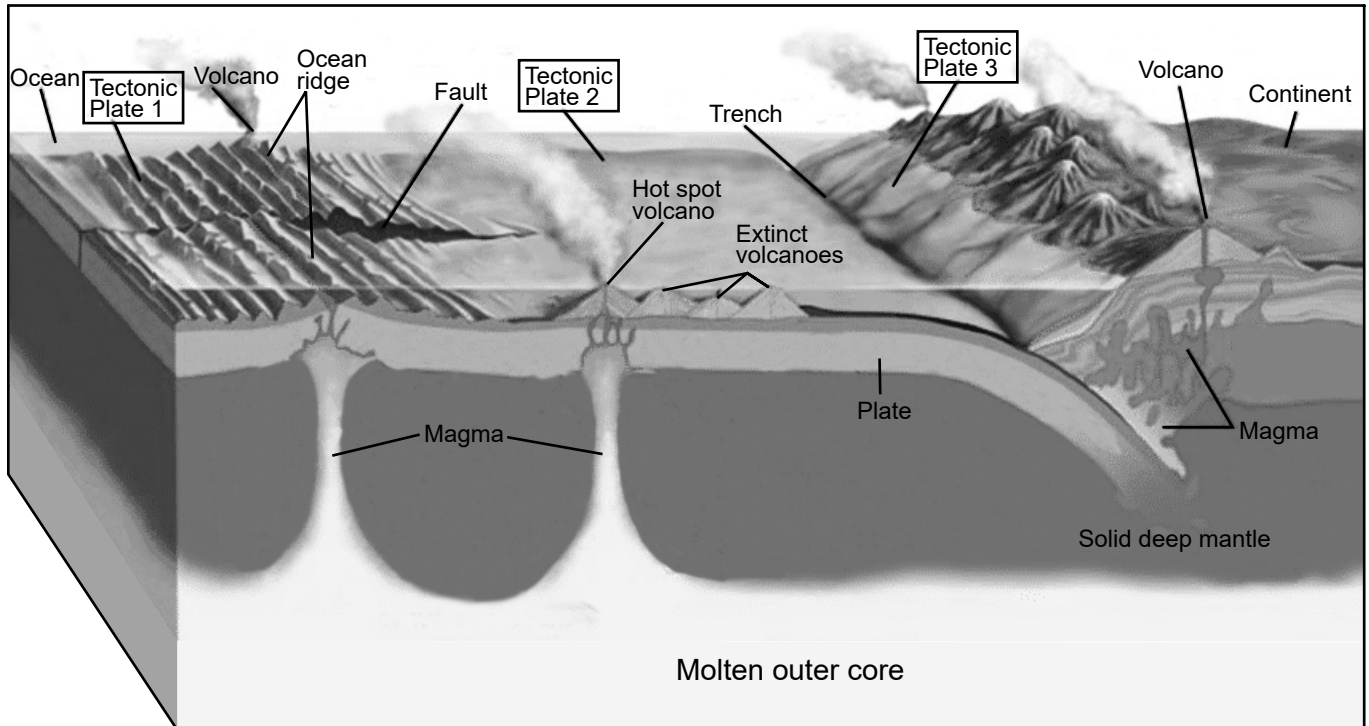


### Model of Earth's Interior Structure



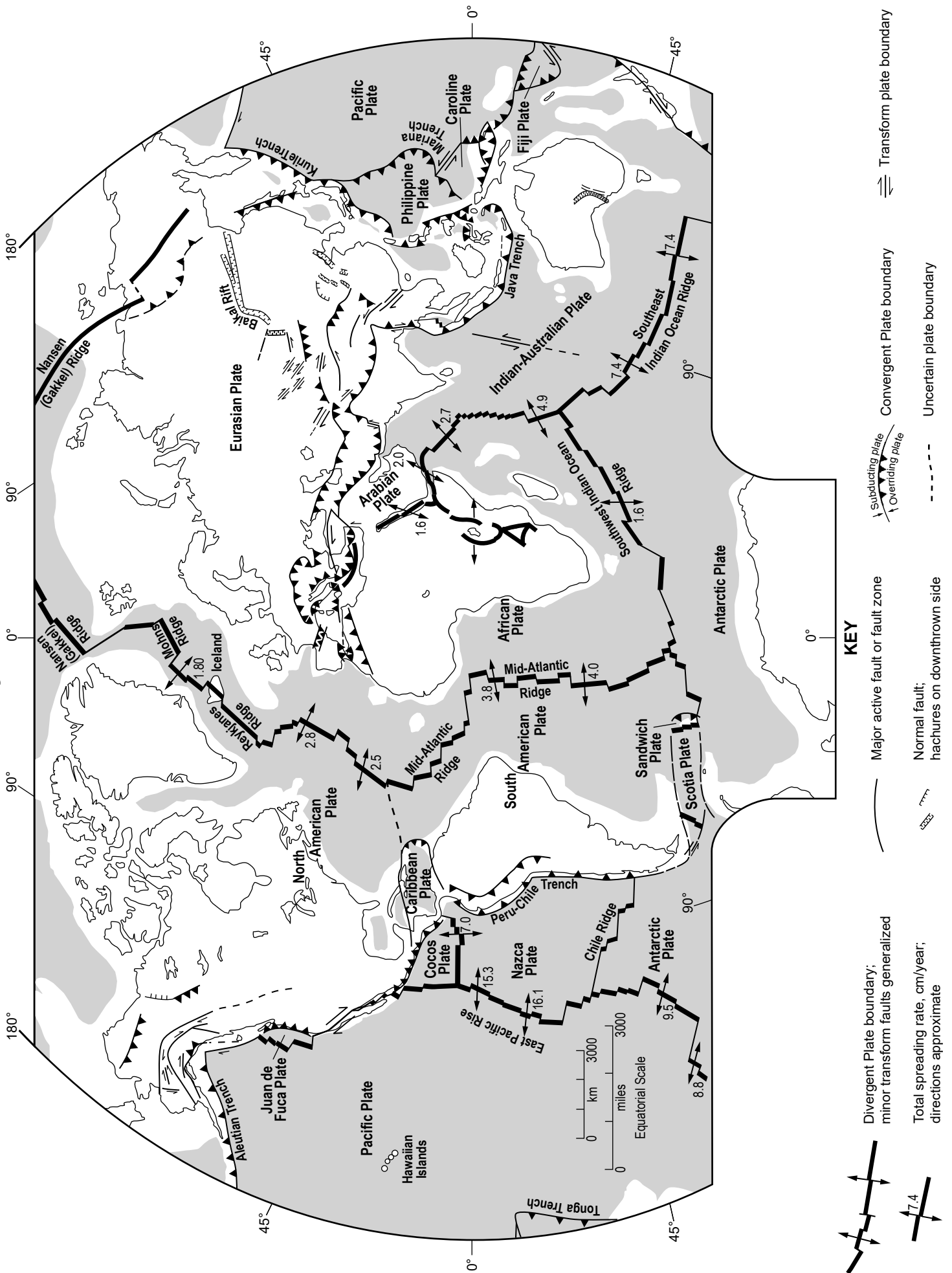
(Not drawn to scale)

### Cross Section Model of Earth's Surface and Interior



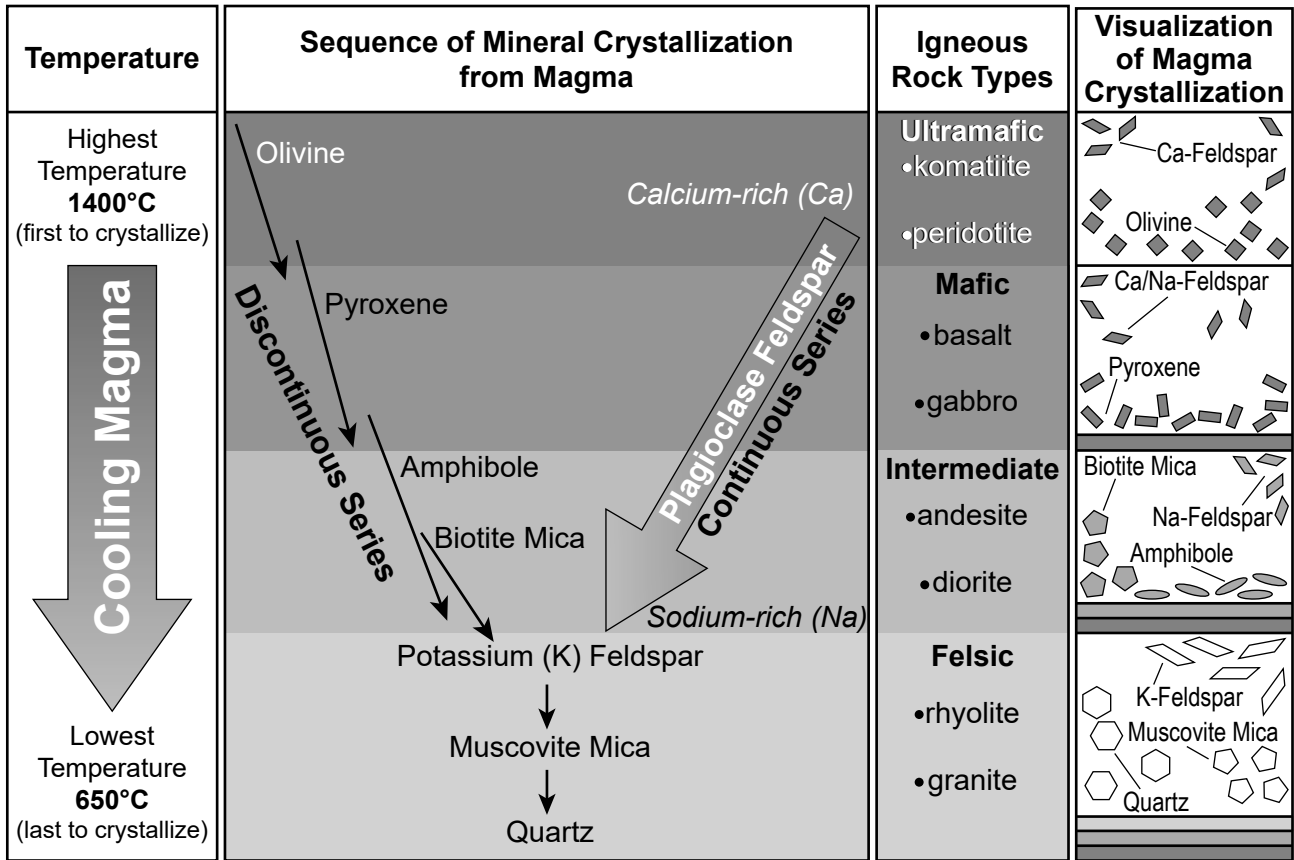
(Not drawn to scale)

# Global Tectonic Activity of the Last One Million Years

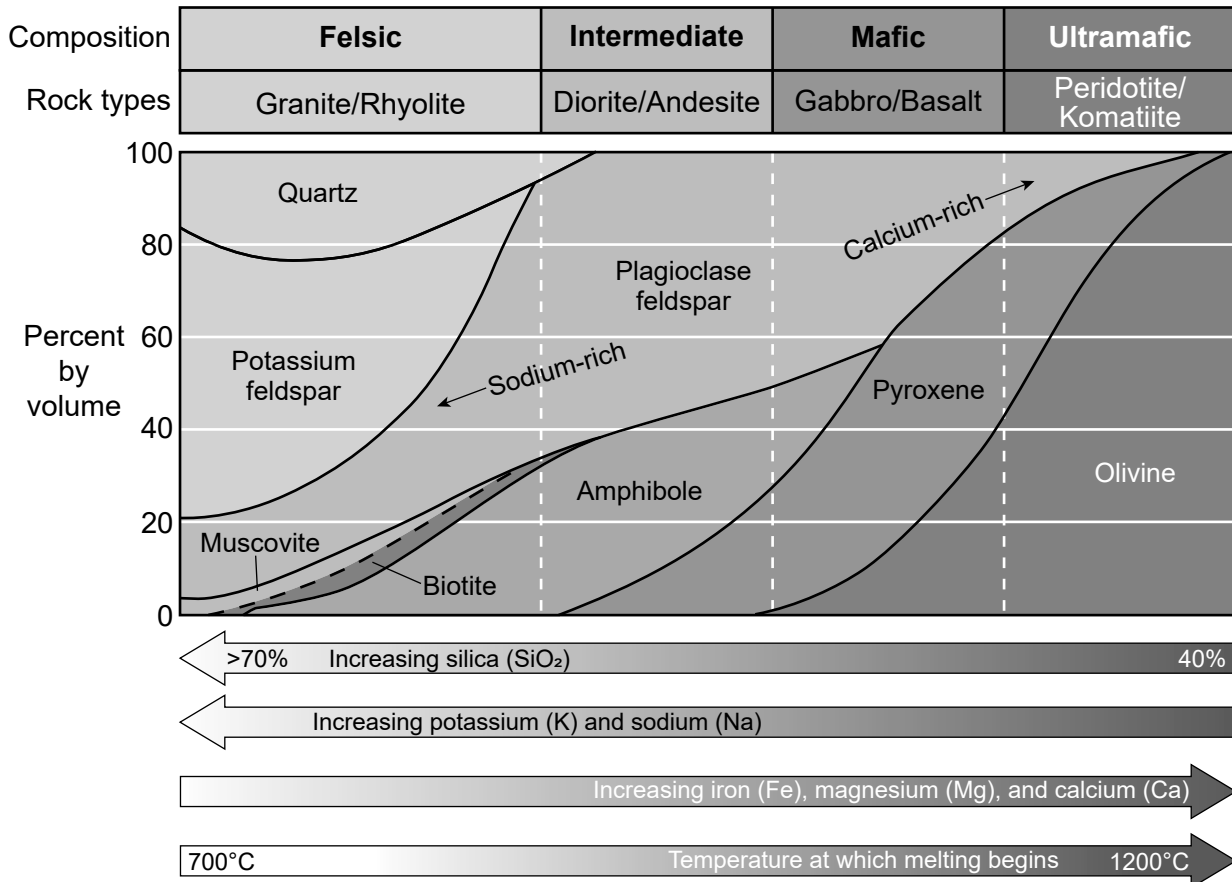




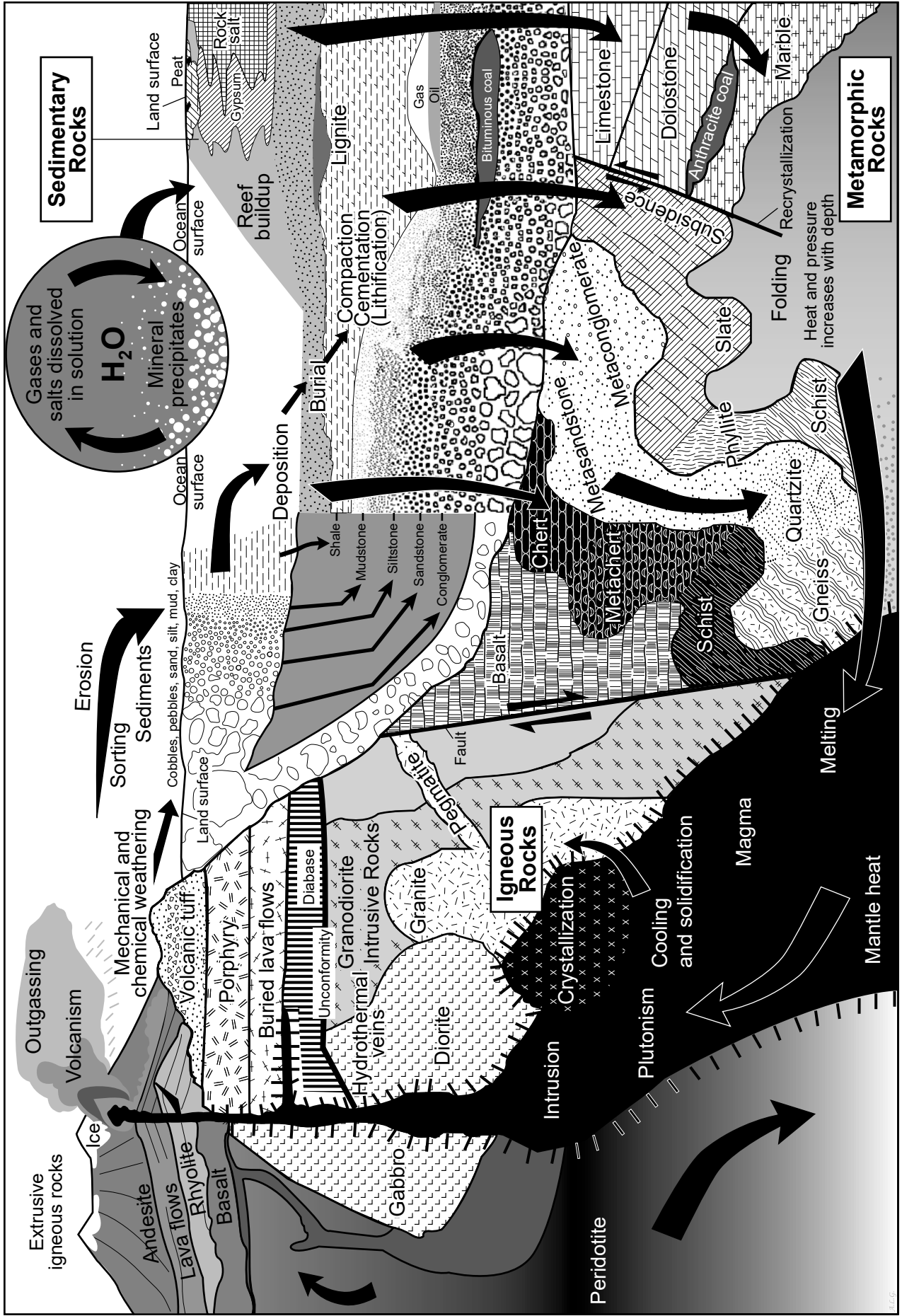
### Model of Bowen's Reaction Series



### Mineral Composition of Igneous Rocks



# Rock Cycle Infographic



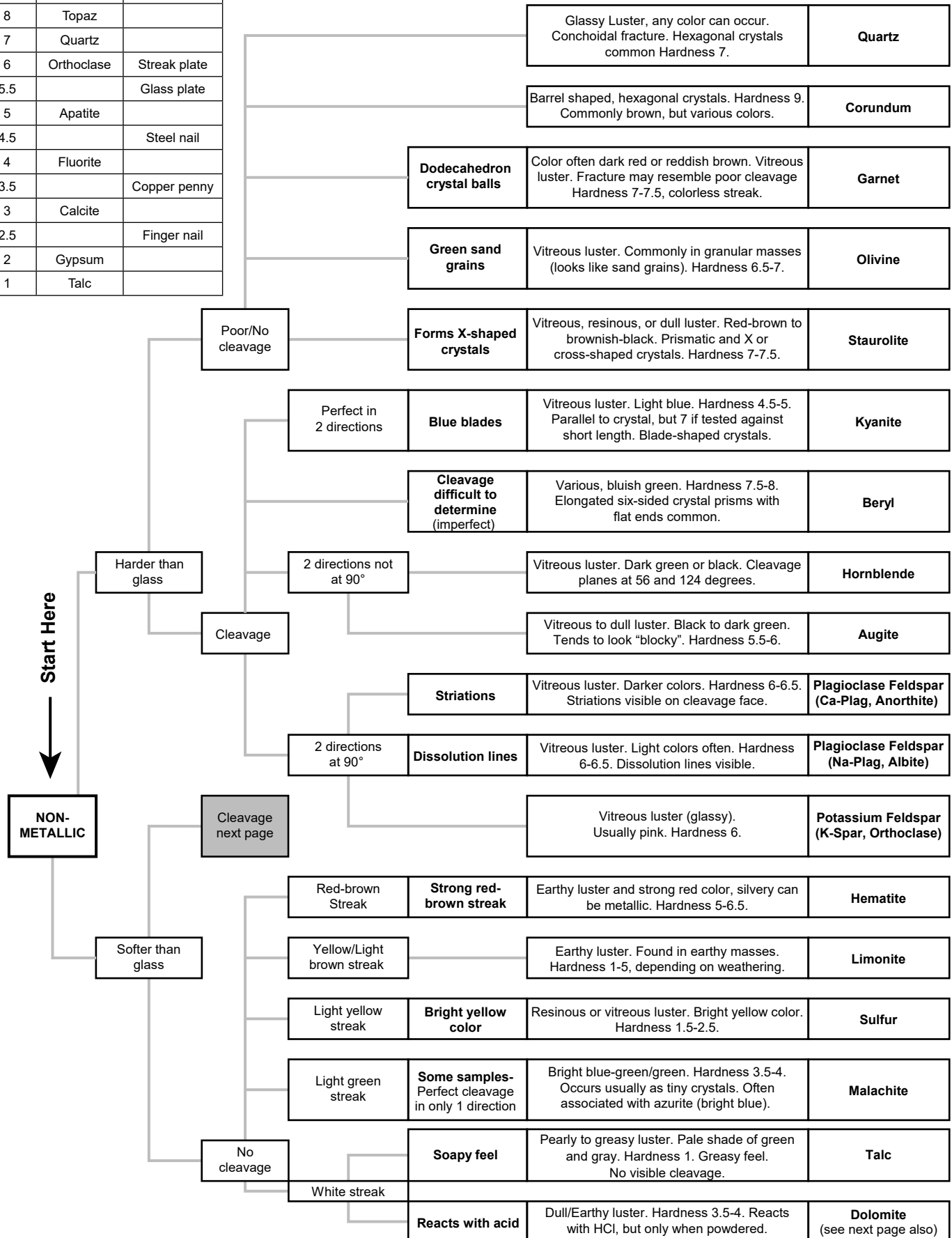
## Geologically Important Radioactive Elements Used for Radiometric Dating

Parent Isotope	Daughter Decay Product	Half-life (years)	Useful Dating Range (years)	Datable Materials
Samarium-147	Neodymium-143	106 billion	10 million - 4.6 billion	Garnets, micas
Rubidium-87	Strontium-87	48.8 billion	10 million - 4.6 billion	Potassium-bearing minerals (mica, feldspar, hornblende), whole igneous or metamorphic rock
Uranium-238	Lead-206	4.5 billion	10 million - 4.6 billion	Uranium-bearing minerals (zircon, apatite, uraninite)
Uranium-235	Lead-207	713 million	10 million - 4.6 billion	Uranium-bearing minerals (zircon, apatite, uraninite)
Potassium-40	Argon-40	1.3 billion	100,000 - 4.6 billion	Potassium-bearing minerals (mica, feldspar, hornblende), igneous or volcanic rock (tuff and/or lava flows)
Carbon-14	Nitrogen-14	5730	100 - 70,000	Organic materials, glacial ice containing carbon dioxide, groundwater, and ocean water

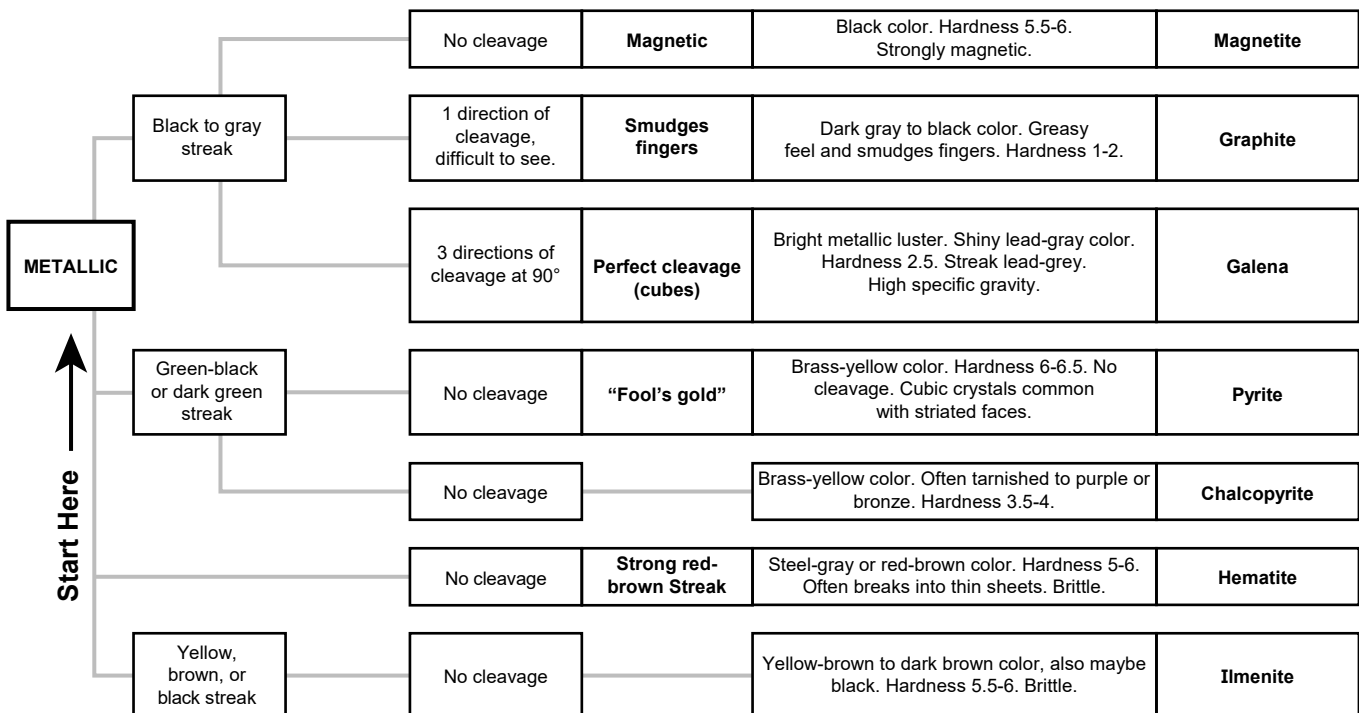
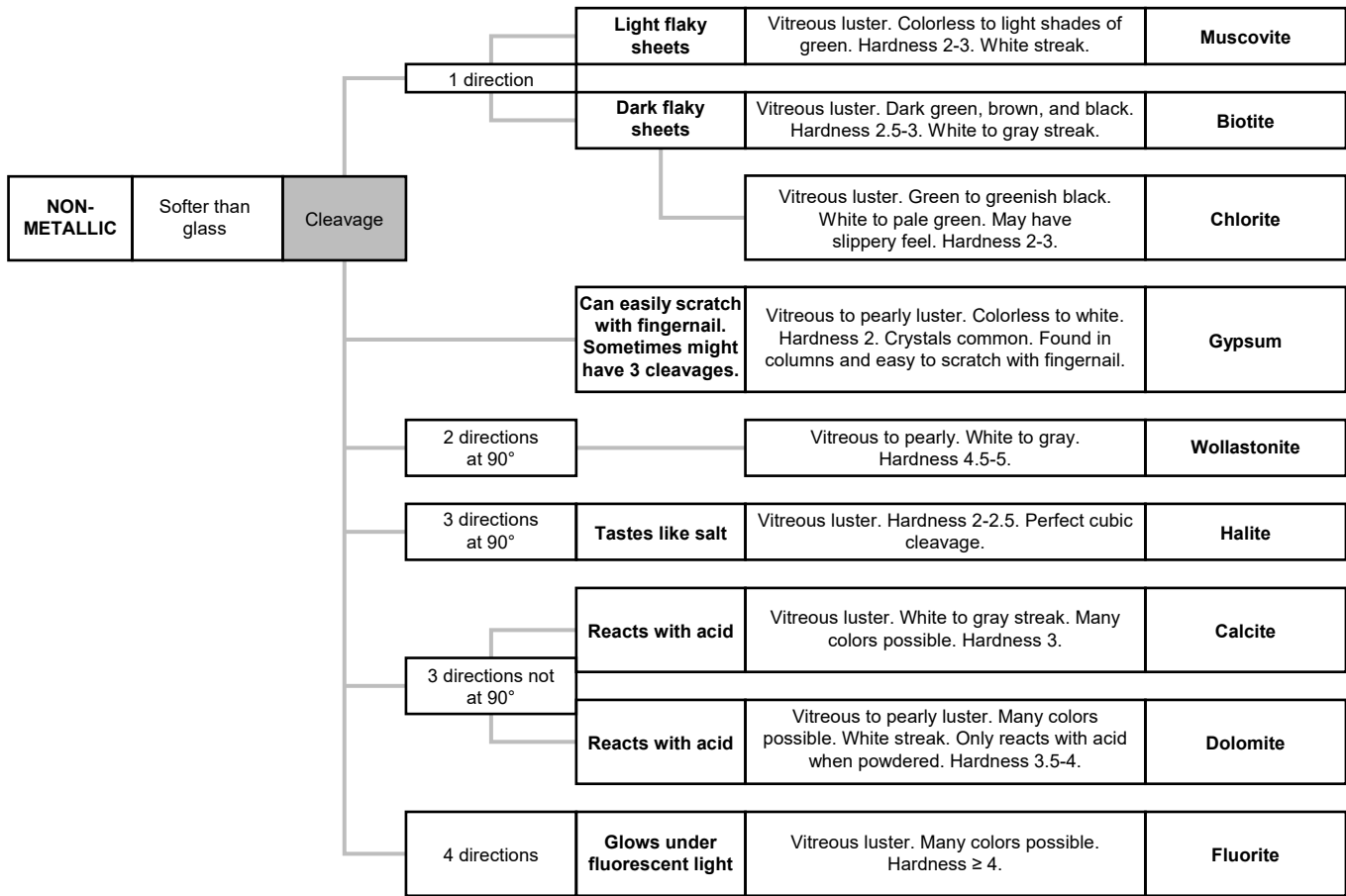
## Mohs Hardness Scale

Hardness	Mineral Name	Tools
10	Diamond	
9	Corundum	
8	Topaz	
7	Quartz	
6	Orthoclase	Streak plate
5.5		Glass plate
5	Apatite	
4.5		Steel nail
4	Fluorite	
3.5		Copper penny
3	Calcite	
2.5		Finger nail
2	Gypsum	
1	Talc	

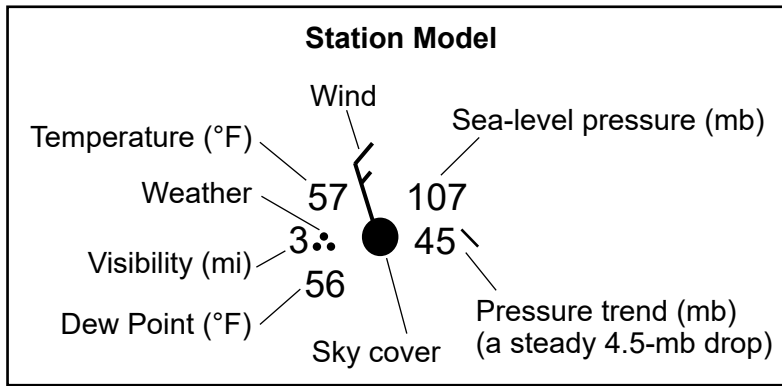
## Mineral Identification Flowchart



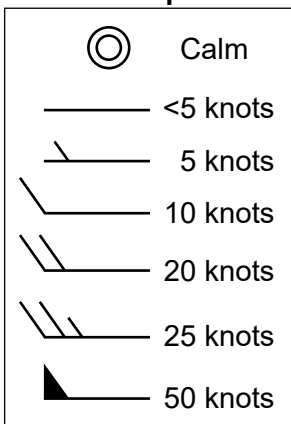
## Mineral Identification Flowchart (Continued)



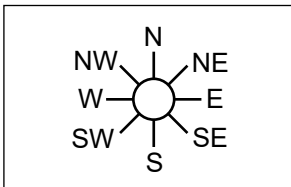
# Key to Weather Map Symbols



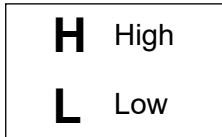
## Wind Speed



## Wind Direction



## Air Pressure

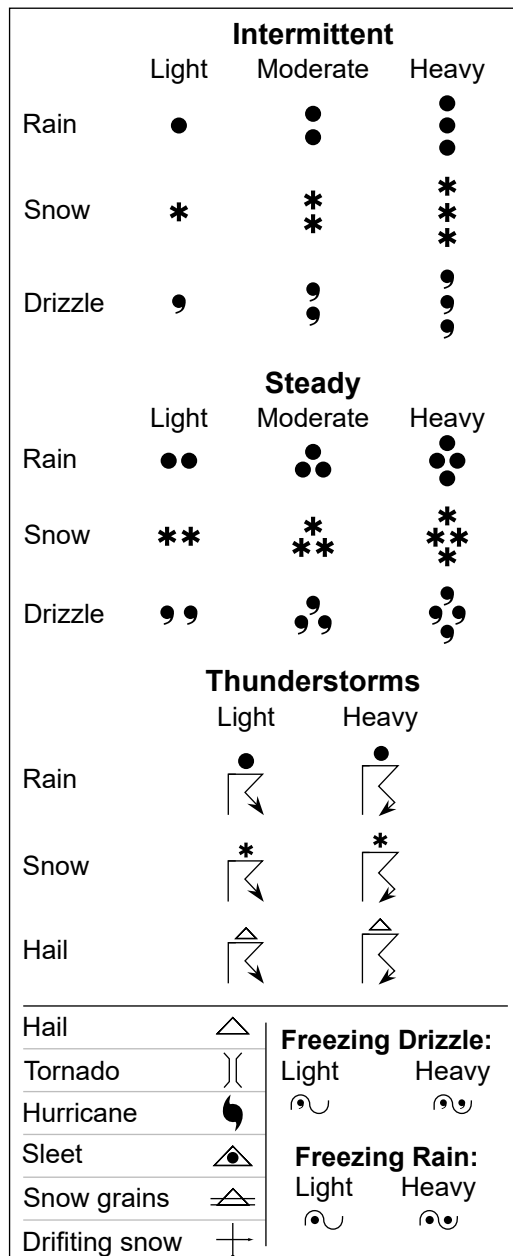


## Pressure

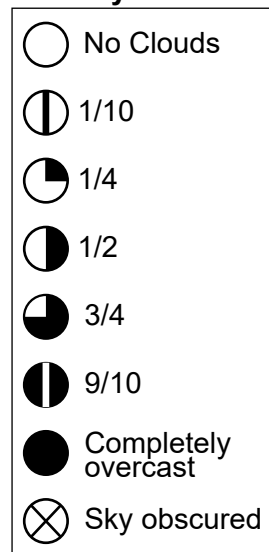
Sea-level pressure is plotted in tenths of millibars (mb) with the leading 10 or 9 omitted.

410: 1041.0 mb  
 103: 1010.3 mb  
 987: 998.7 mb  
 872: 987.2 mb

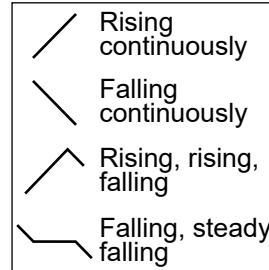
## Weather Conditions



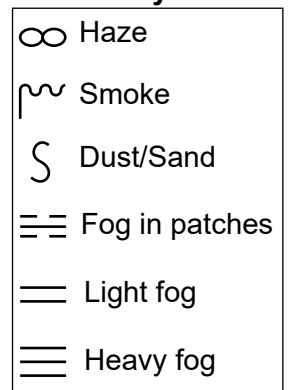
## Sky Cover



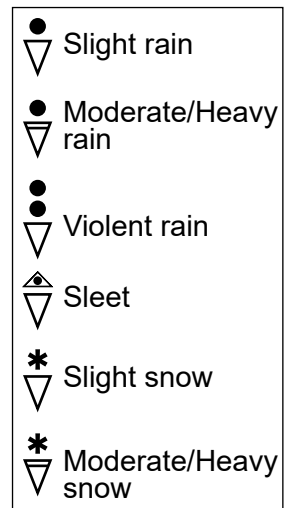
## Pressure Trend (previous 3 hours)



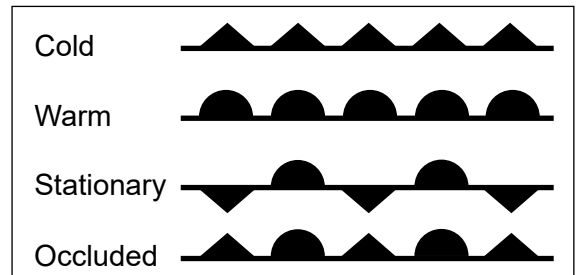
## Misc. Sky Cover



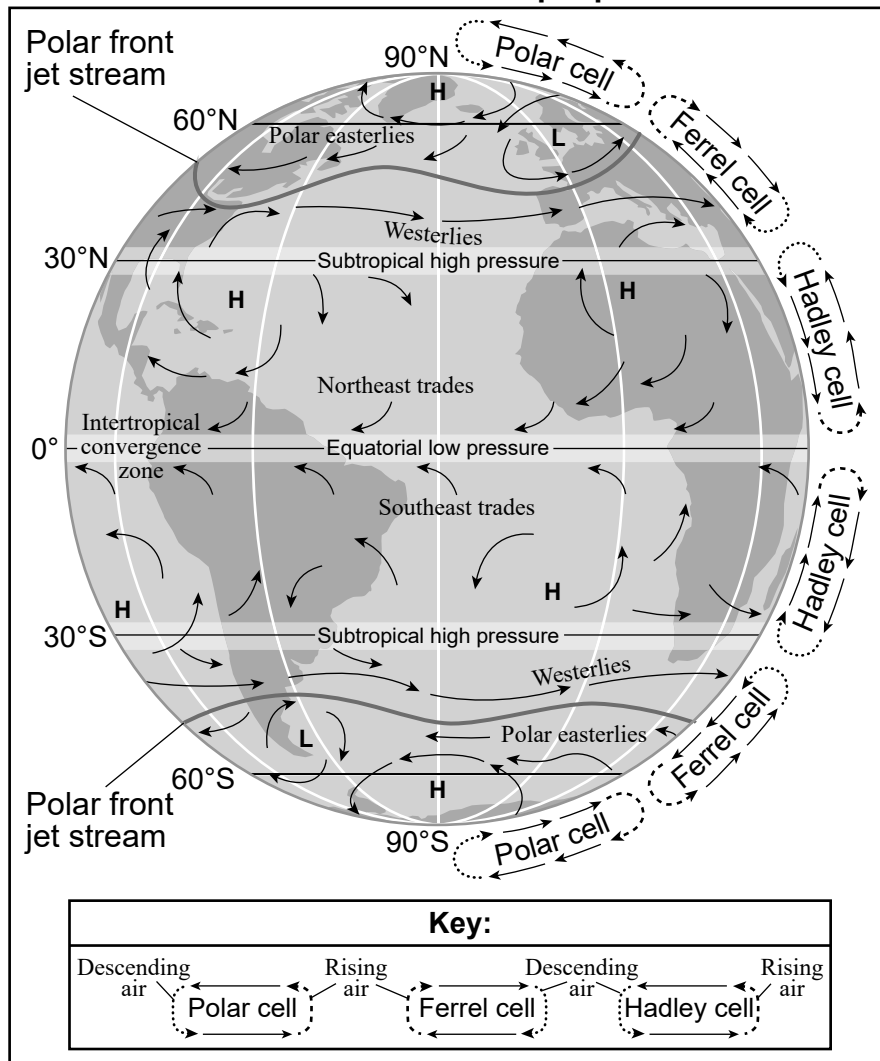
## Showers



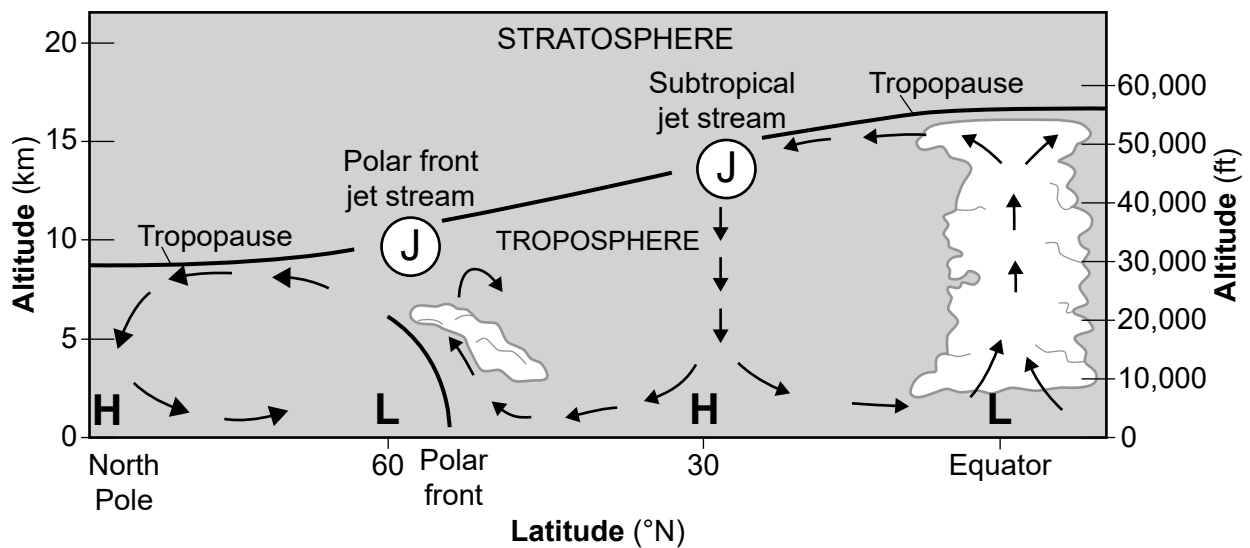
## Fronts



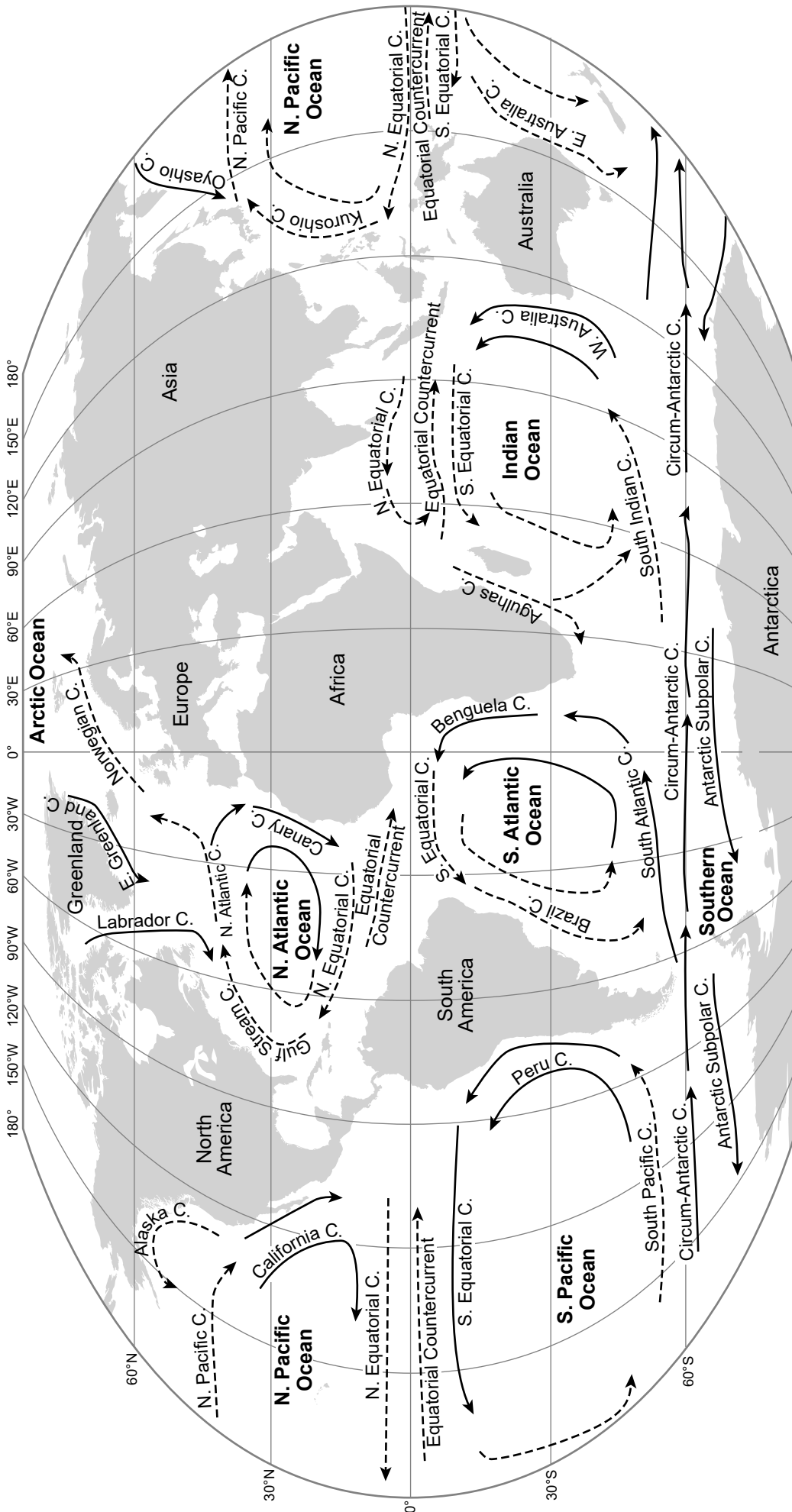
### Model of Generalized Planetary Wind Belts in the Troposphere



### Cross Section Model of Earth's Lower Atmosphere



# Surface Ocean Currents Model



Key	
----->	Warm currents
————>	Cold currents