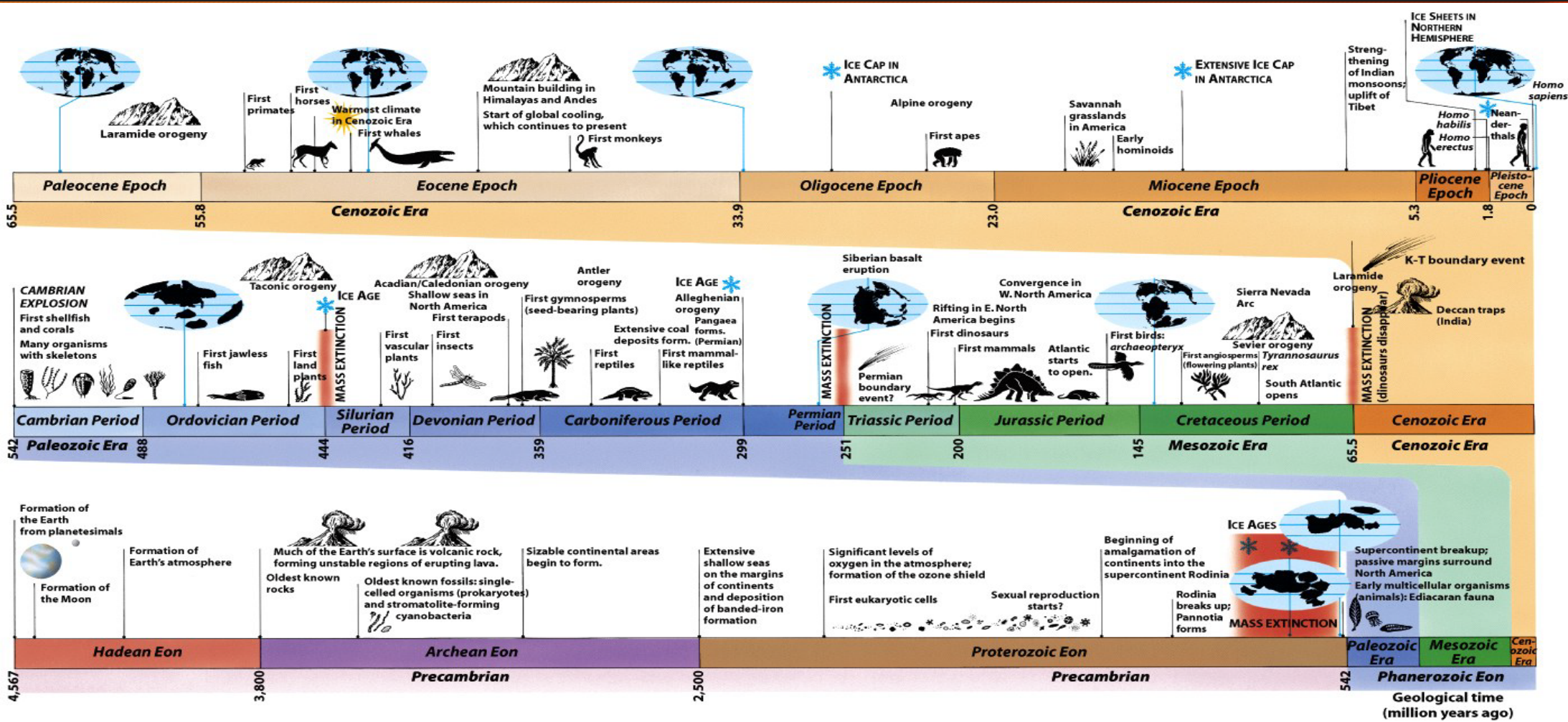


# Carboniferous - Mississippian - Last major sea

323 Ma  
To  
358 Ma



# Carboniferous - Mississippian - Last major sea

323 Ma  
To  
358 Ma

- The stratigraphic record contains TEN Transgression-Regression (T-R) Cycles
- Oolites and sand-sized fossil fragments are abundant
  - Exceptionally preserved fossils!
- Likely similar to the Bahama Banks environment of deposition today
  - Uniformitarianism
- Is as an important groundwater reservoir for northcentral Iowa





Acadian/Caledonian orogeny

Shallow seas in North America

First theropods

First vascular plants



First insects



First gymnosperms (seed-bearing plants)



Antler orogeny

First reptiles



Extensive coal deposits form. (Permian)

First mammal-like reptiles



ICE AGE 

Alleghenian orogeny

Pangaea forms.

ian od

Devonian Period

Carboniferous Period

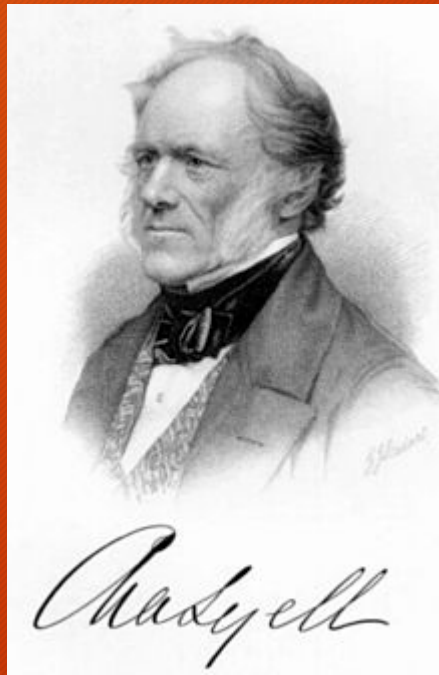
416

359

299

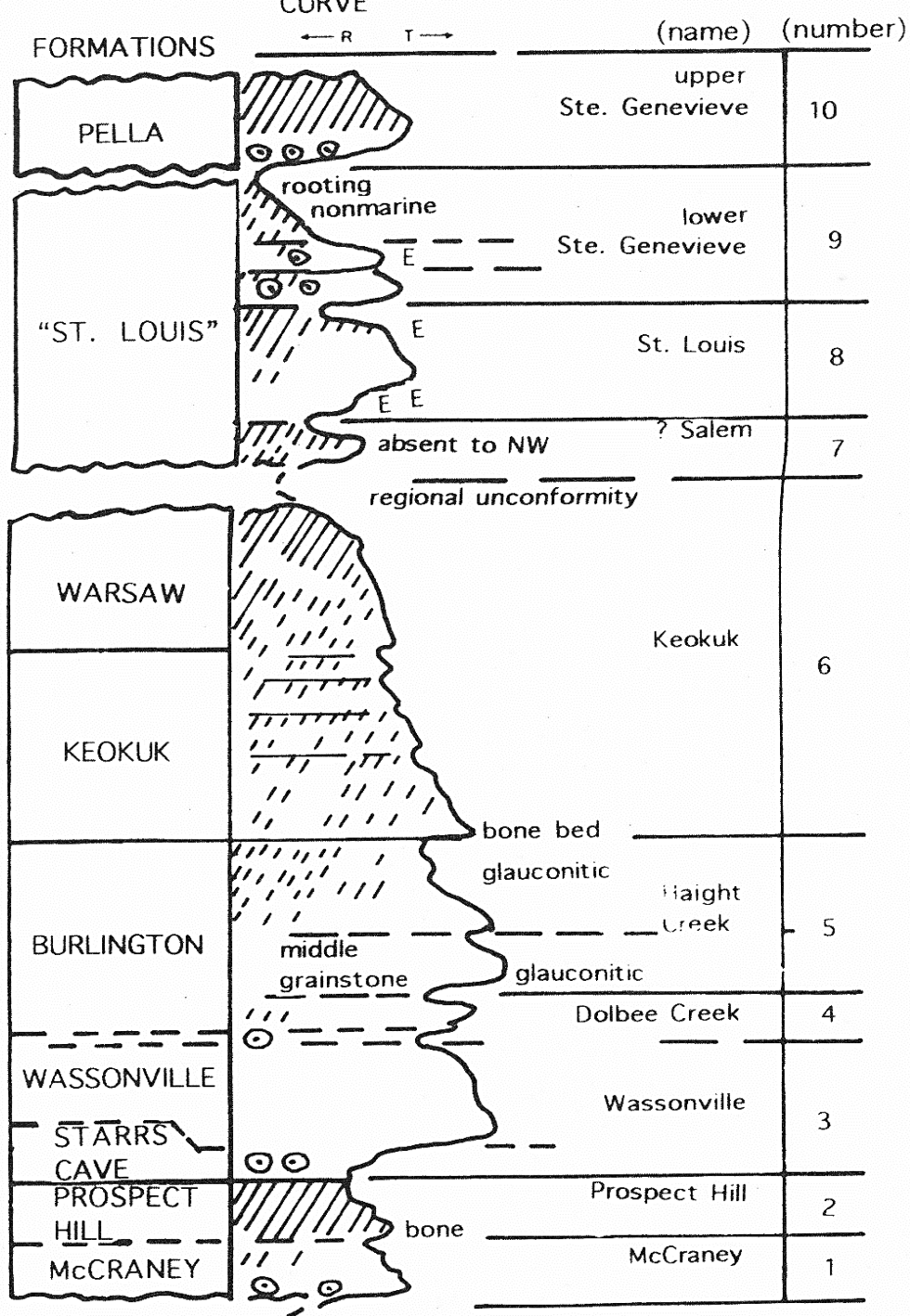
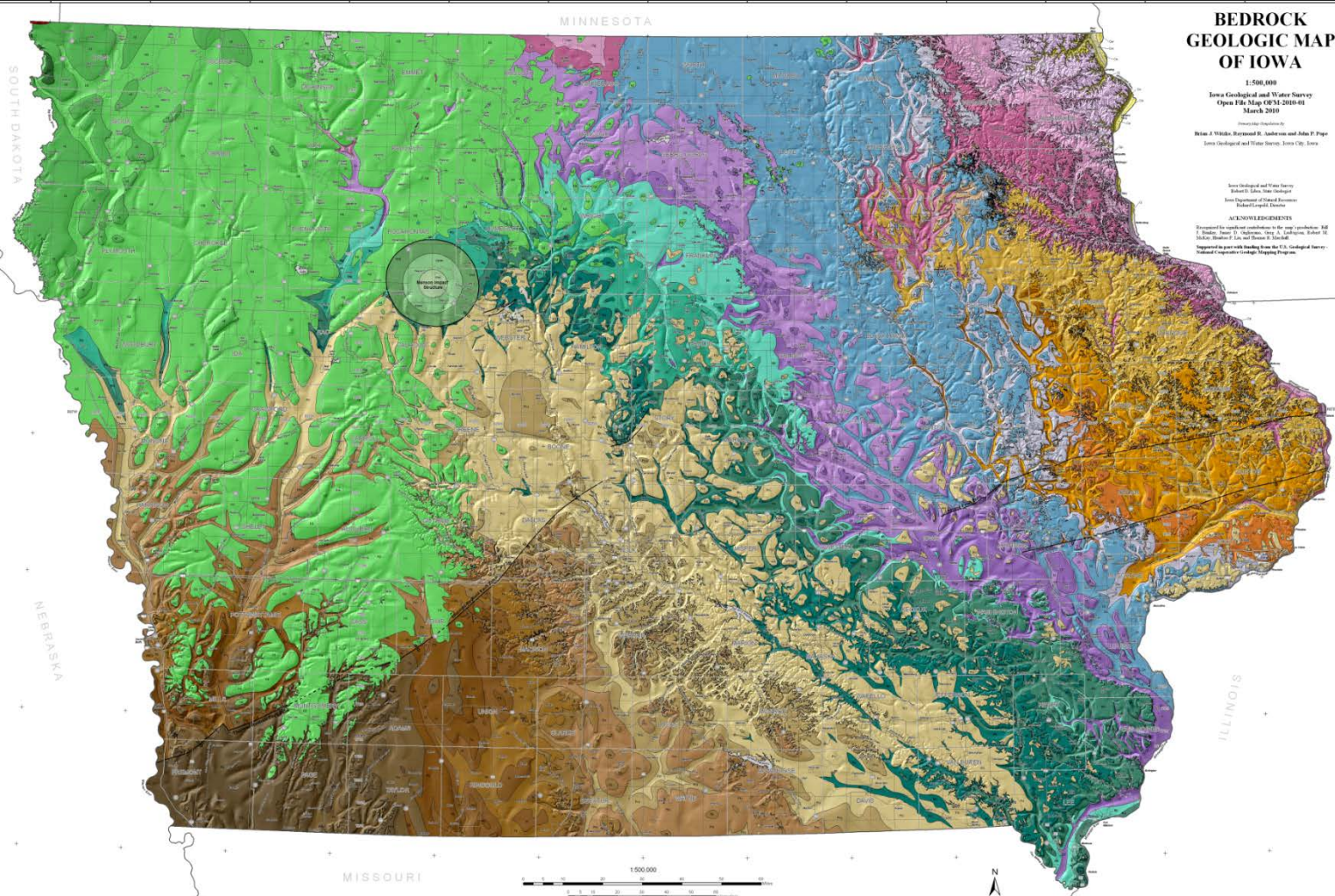
# Uniformitarianism

- The Present is the Key to the Past





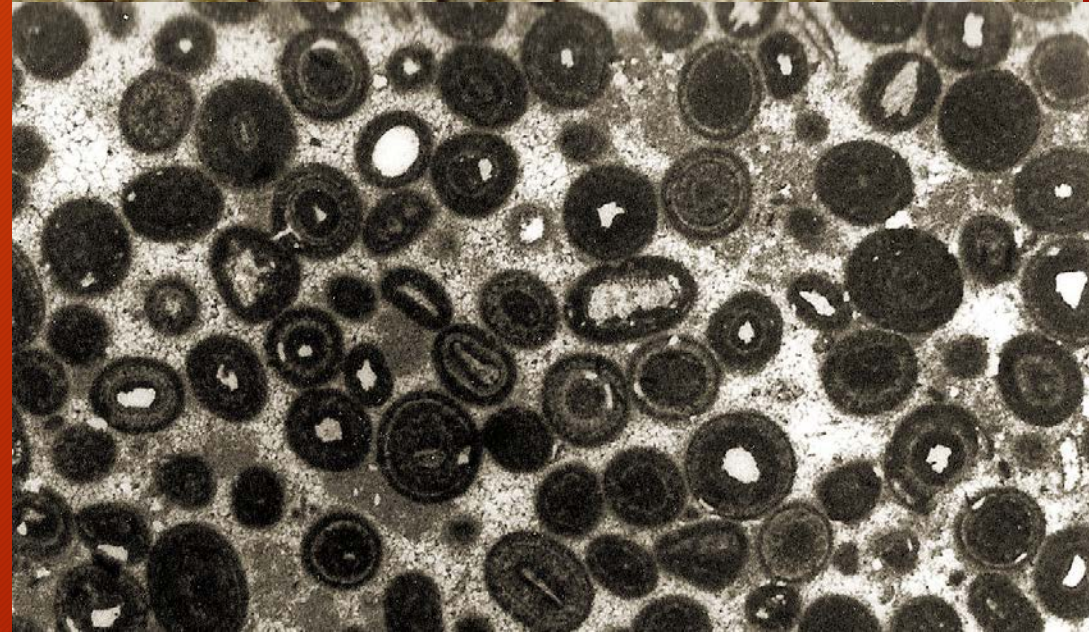
# Mississippian





# Starrs Cave Formation

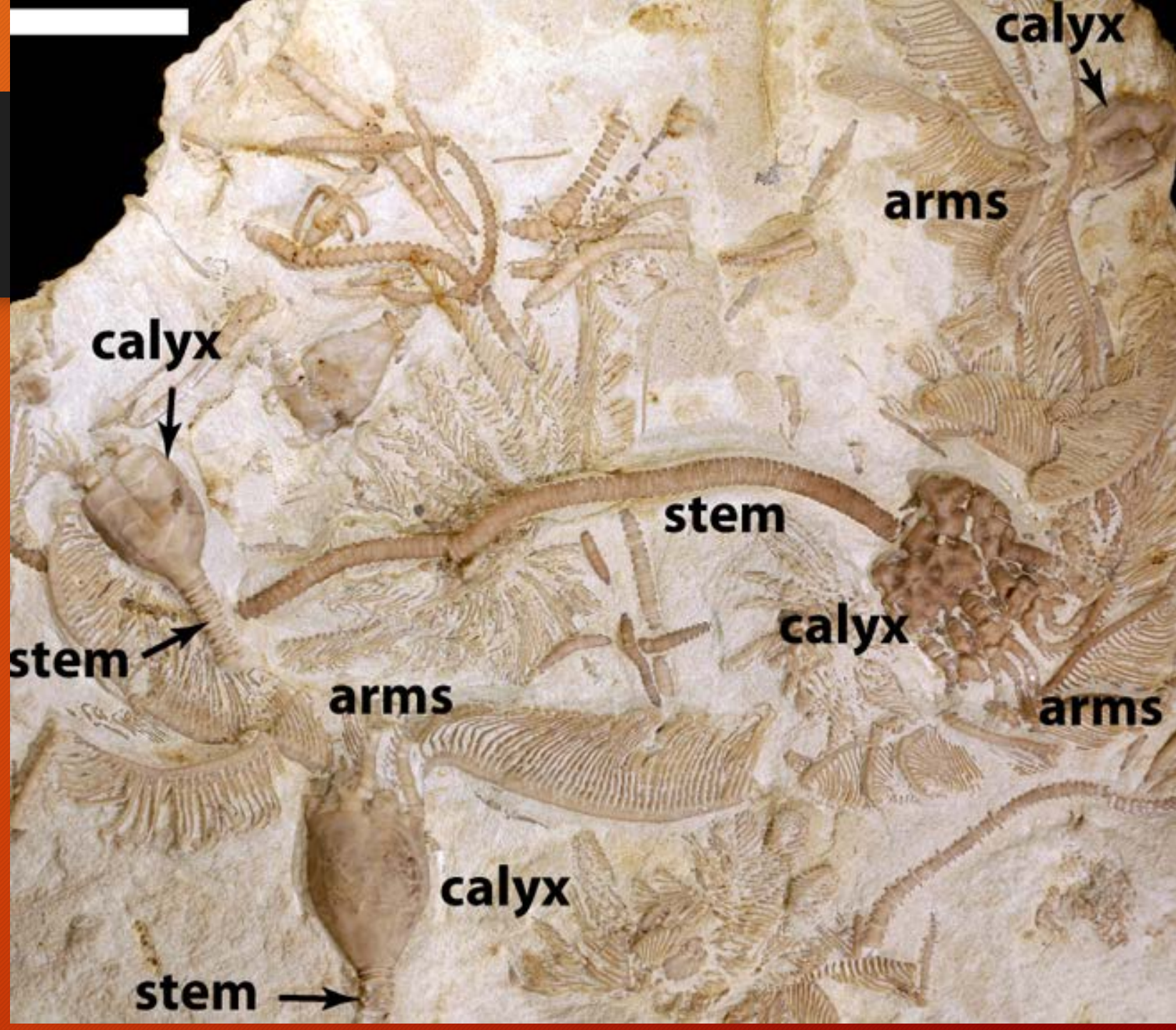
- Burlington, Iowa along Flint Creek
- Oolitic grainstone





# Burlington Formation

- Excellent source for chert used by Native Americans
- Crinoidal limestones (packstones and grainstones)





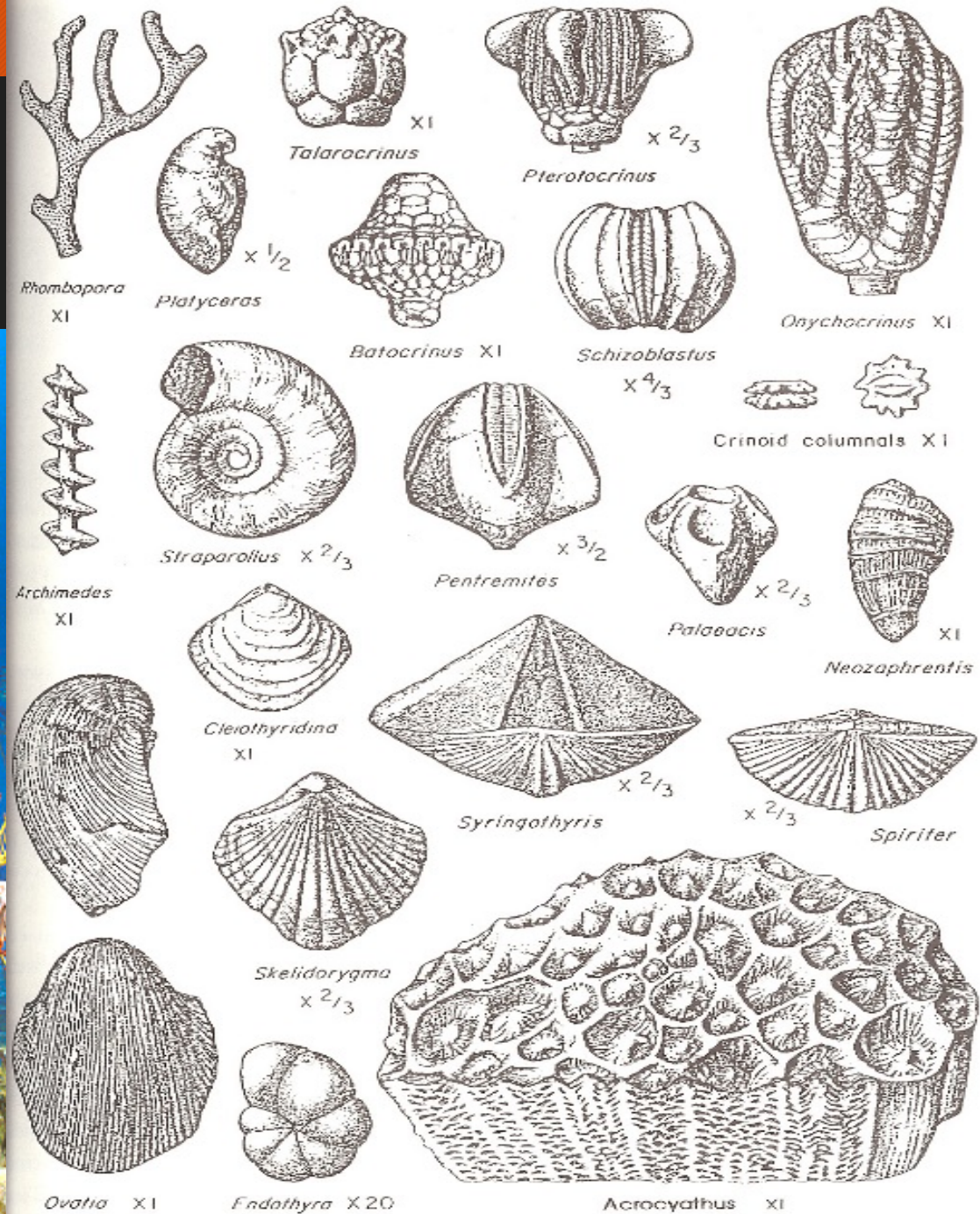
# Warsaw Formation

- First described by James Hall near Warsaw, Illinois
- Southeastern Iowa
- Lower clay-rich dolostone unit yields abundant geodes





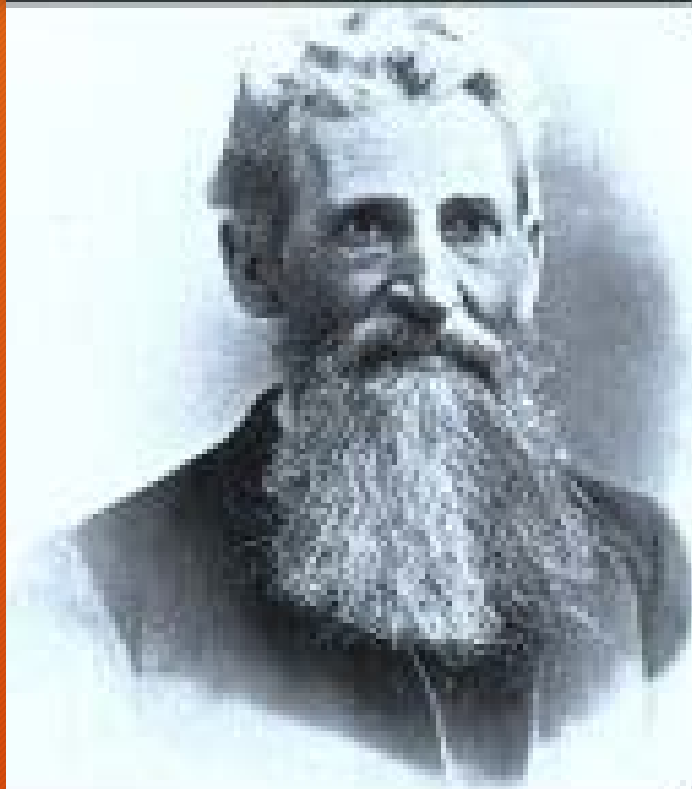
# Mississippian Life





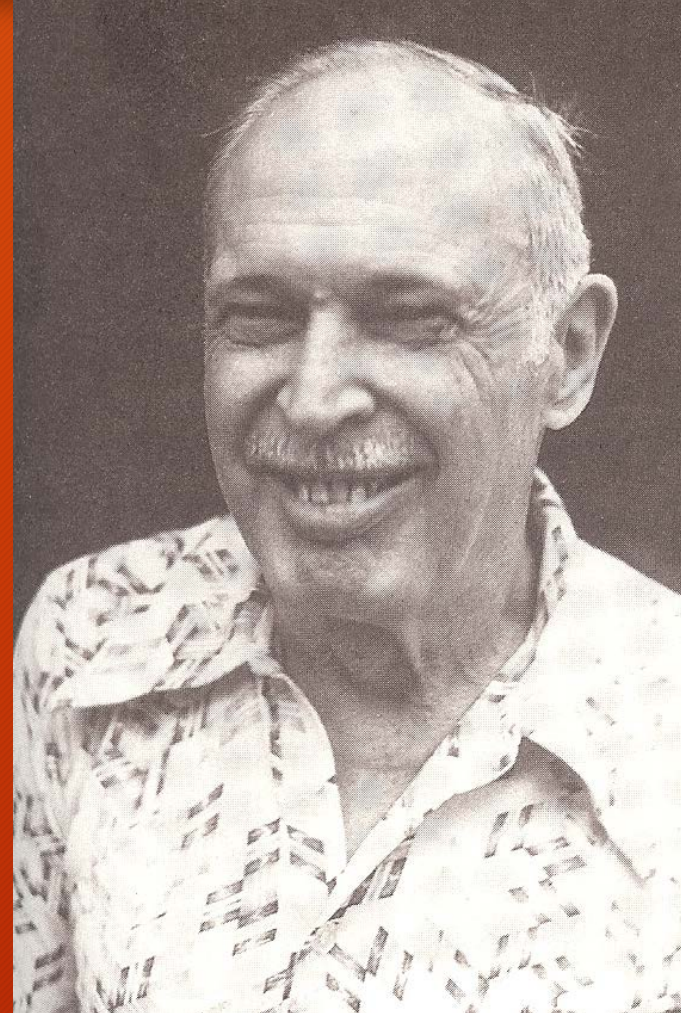
# Paleontologists of all kinds!

- Charles Wachsmuth  
1850s



*Wachsmuth and Springer's  
monograph on crinoids*

F. A. Bather



- Harrell Strimple  
1970s



# Carboniferous - Pennsylvanian

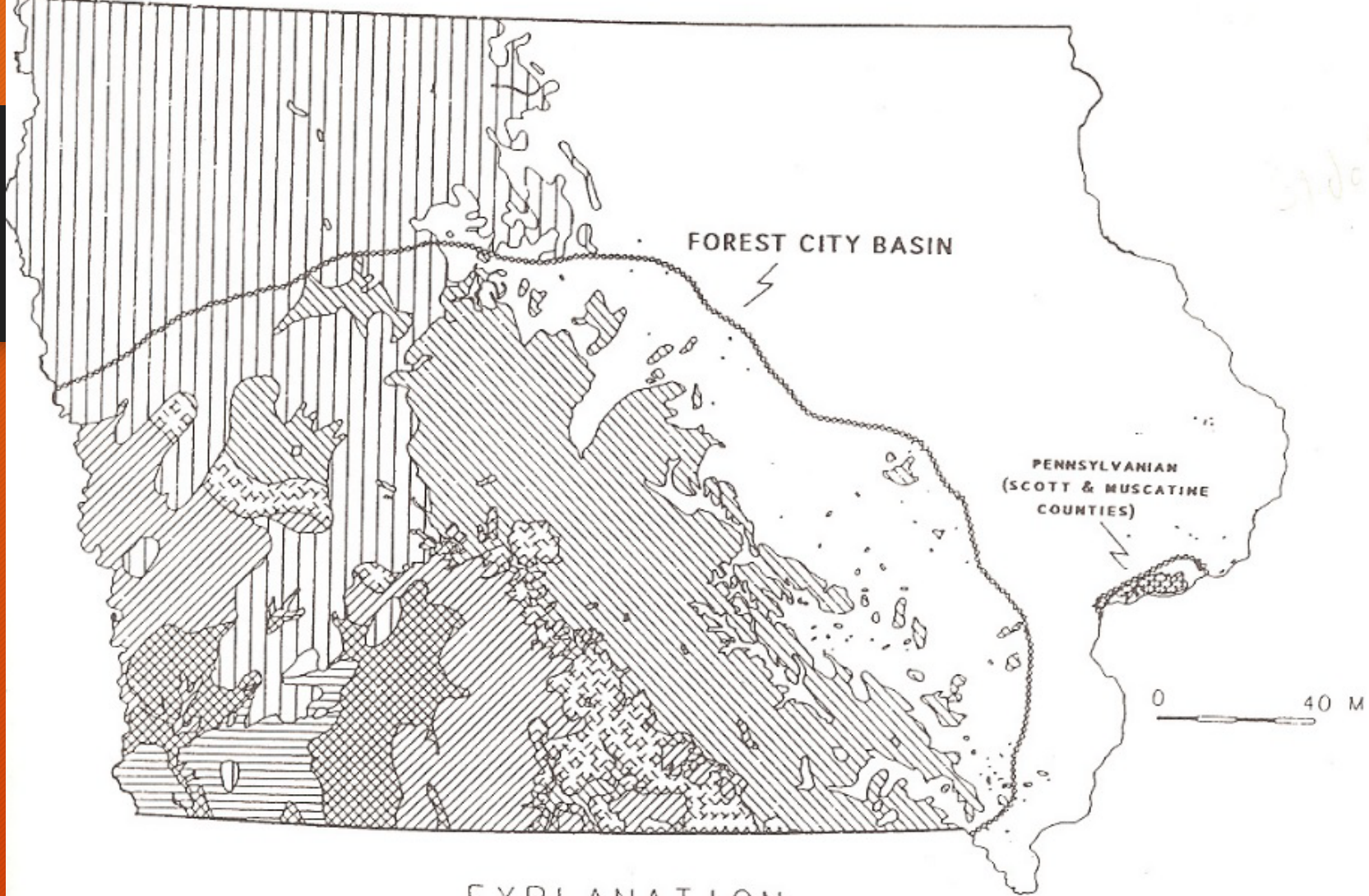
232 Ma  
to  
298 Ma



- Coastal shorelines
  - Coal deposits
  - Cliff-forming Sandstone
    - Dolliver Memorial State Park
    - Ledges State Park
    - Wildcat Den State Park
    - Red Rock Reservoir
    - Pilot Knob County Park
- Deltas



# Forest City Basin



## EXPLANATION

Cretaceous System

undifferentiated

Pennsylvanian System

Virgil Supergroup

Wabaunsee Group

all other units

Missouri Supergroup

undifferentiated

Des Moines Supergroup

Marmaton Group

Cherokee Group

Morrow Supergroup

Caseyville and Spoon Fms.

Older Paleozoics



# BEDROCK GEOLOGIC MAP OF IOWA

1:500,000

Iowa Geological and Water Survey  
Open File Map OGI-2010-01  
March 2010

Prepared by  
Brian J. Wilks, Raymond R. Anderson and John F. Pope  
Iowa Geological and Water Survey, Iowa City, Iowa

Iowa Geological and Water Survey  
Richard H. Eskin, State Geologist  
Iowa Department of Natural Resources  
Richard Leopold, Director

### ACKNOWLEDGEMENTS

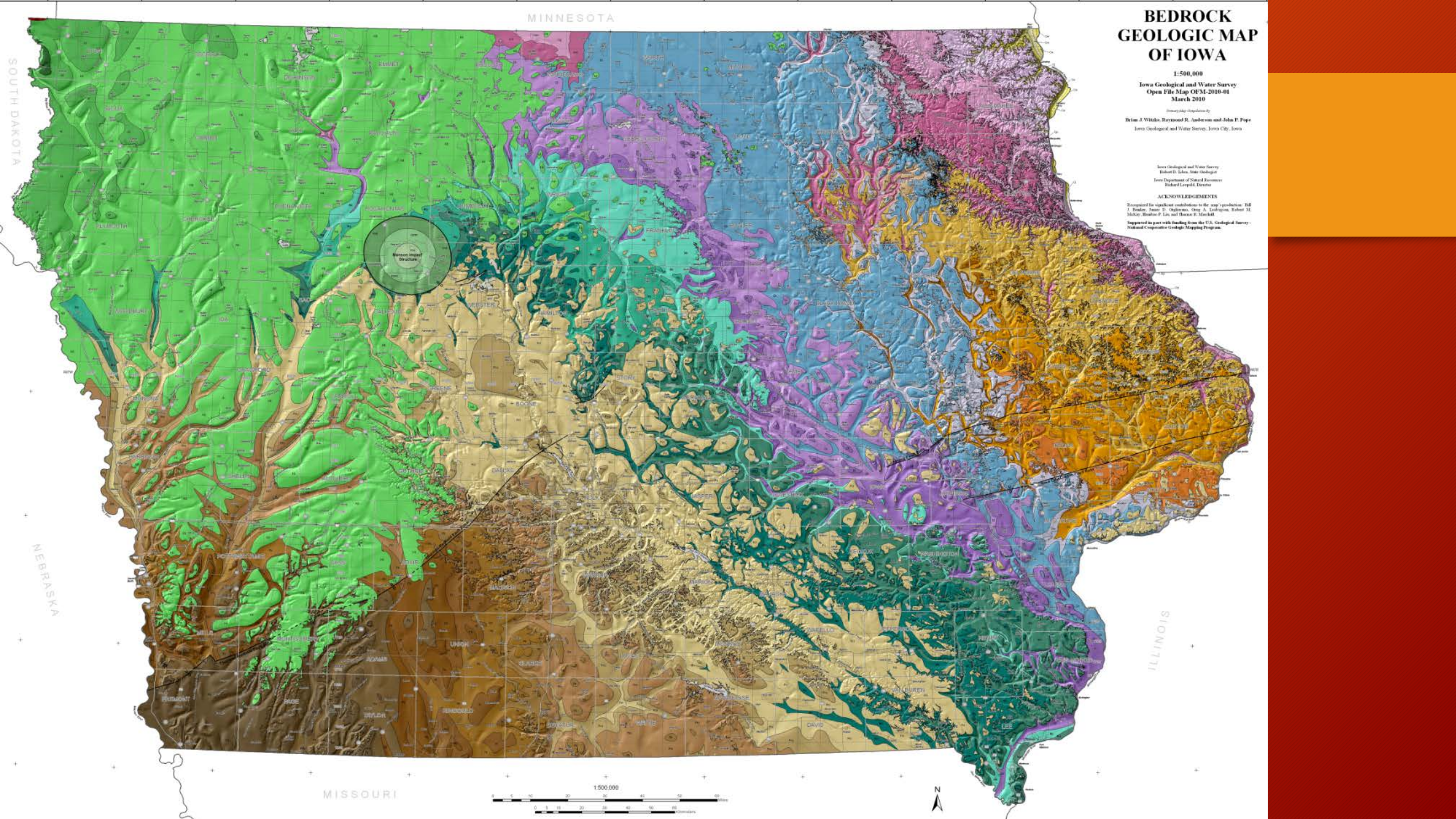
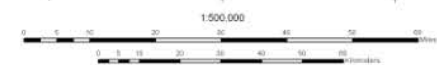
Recognized for significant contributions to the map's production: Bill F. Dunbar, James D. Chalkers, Steve A. Lindquist, Robert H. McKay, Douglas F. Lee, and Thomas E. Marshall.  
Supported in part with funding from the U.S. Geological Survey - National Cooperative Geologic Mapping Program.

SOUTH DAKOTA

NEBRASKA

ILLINOIS

MISSOURI





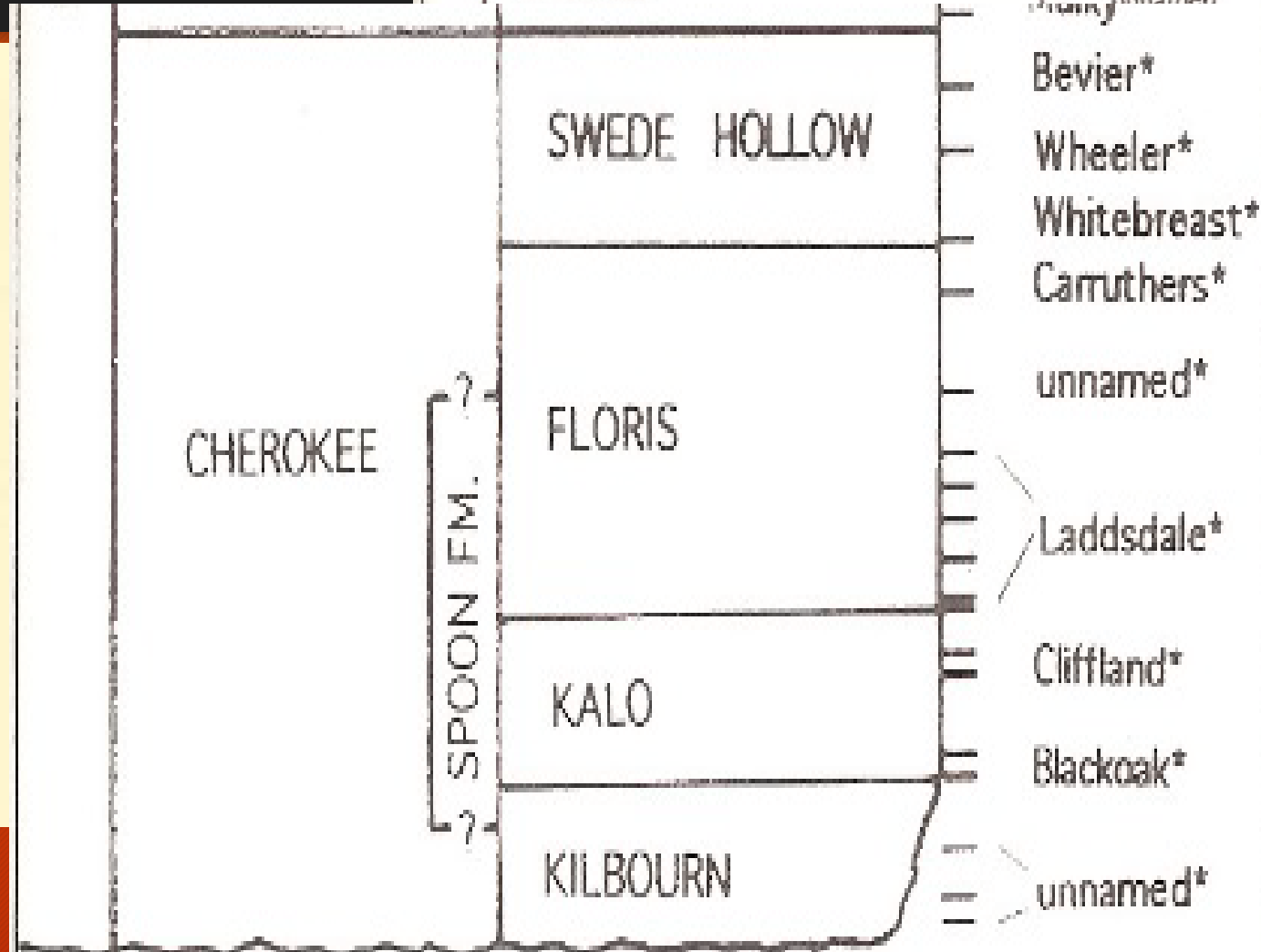
# Cherokee Group -

Stratigraphy, petrology, and paleogeography  
of the upper portion of the  
**Cherokee Group**  
(Middle Pennsylvanian),  
eastern Kansas and northeastern Oklahoma

Robert L. Brenner

Geology Series 3 1989  
Kansas Geological Survey

SUPERGROUP		FORMATION	COALS
GROUP			
VIRGIL	WABAUNSEE		Nyman Elmo Nodaway*
	SHAWNEE		
	DOUGLAS		

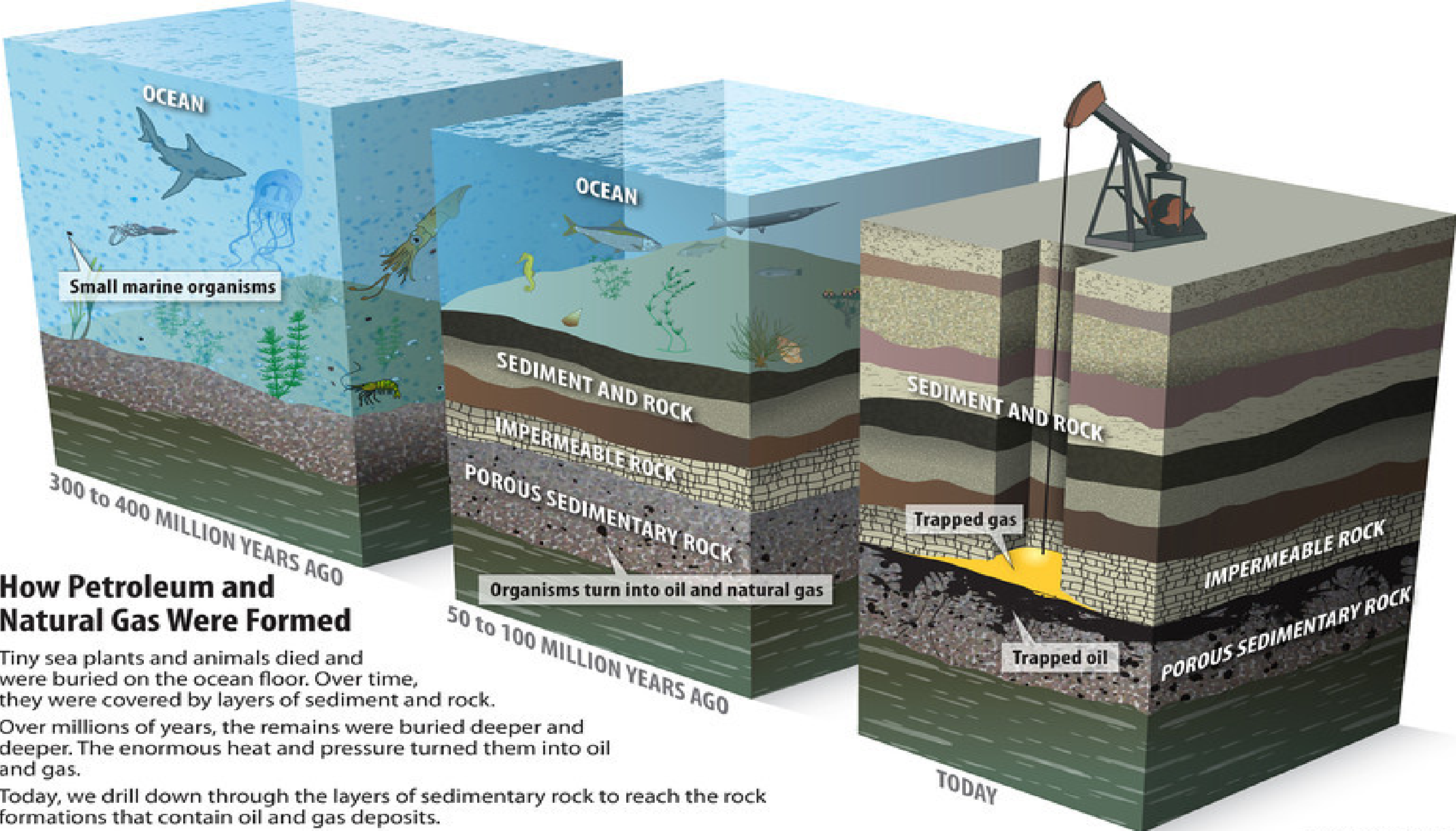




# Lepidodendron







## How Petroleum and Natural Gas Were Formed

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of sediment and rock.

Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.

Today, we drill down through the layers of sedimentary rock to reach the rock formations that contain oil and gas deposits.

Note: not to scale



# Types of Coal

- Anthracite
- Bituminous
- Sub-Bituminous
- Lignite





# Iowa Coal

- Sub-Bituminous to Bituminous
- High ash and sulfur content ( $\text{FeS}_2$ )
  - Ash results from sediment (impurities) that were washed into the swamps





# Ottumwa Coal Palace 1890

