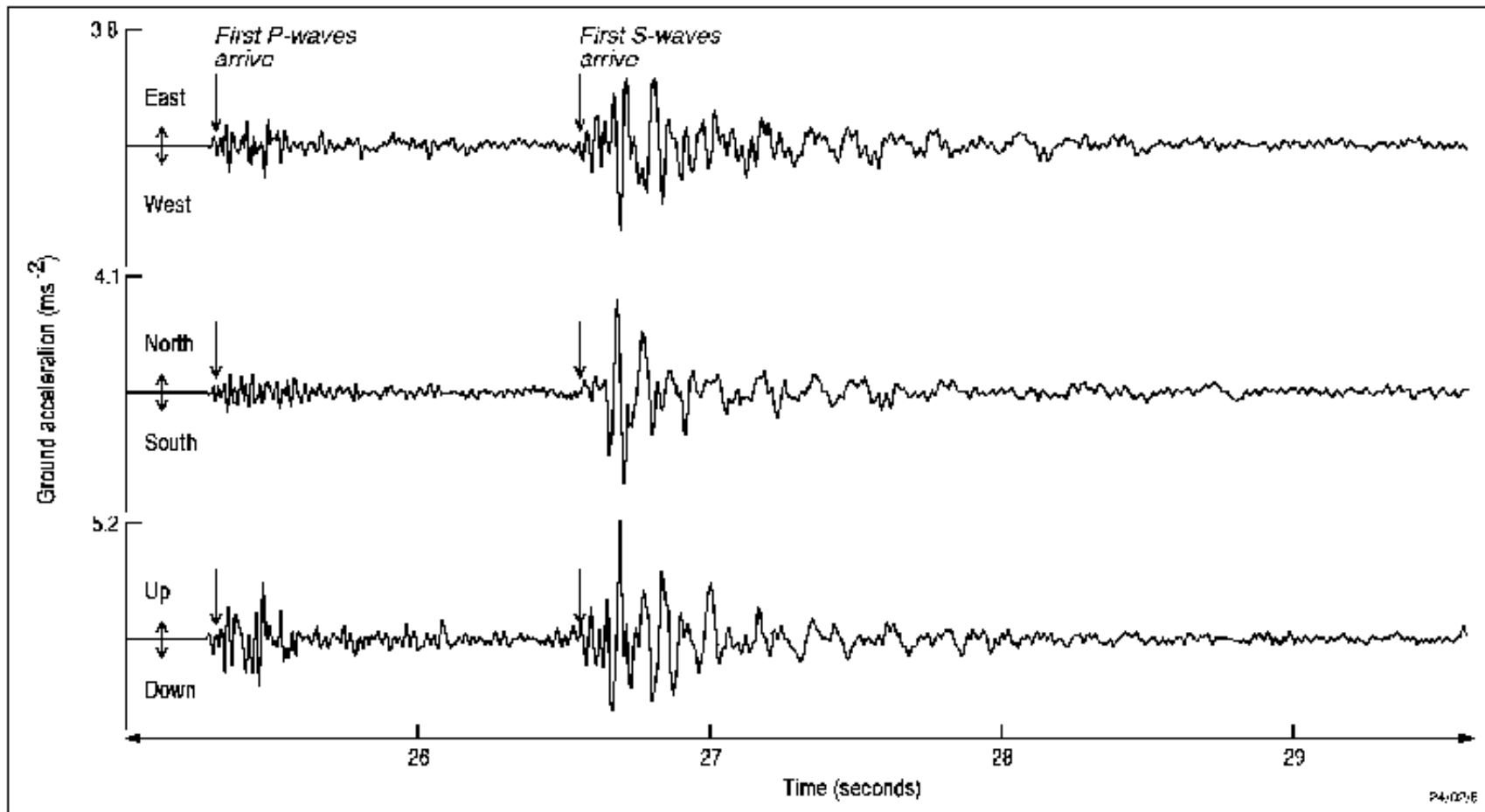




# Interpreting Seismographs

- Three types of waves
  - P waves: **compressional wave**, is a seismic body wave that shakes the ground back and forth in the same direction and the opposite direction as the direction the wave is moving.
  - S waves: **shear wave**, is a seismic body wave that shakes the ground back and forth perpendicular to the direction the wave is moving.
  - L waves

# Example seismograph





# Interpreting Seismographs

- Terms:
  - Focus – exactly where earthquake originates
  - Epicenter – place on earth surface directly above the focus
    - To accurately locate, must use 3 different seismograph stations
    - Travel-time graphs compare distance between P and S waves and time (minutes) to locate the distance to an epicenter



## 2 Ways to Measure a Quake

- 1. The Richter scale measures the energy released in an earthquake by measuring the size of the seismic waves.
- 2. The Mercali scale measures the results of an earthquake, such as the shaking and damage that people actually feel and see



# Geologic Time

## Eons

- Precambrian – the oldest and largest division of geologic time (87% of Earth's history)
  - Time Frame – 4600 to 544 million years ago
- Phanerozoic
  - 544 million years ago – present
  - 3 Eras
    - Paleozoic
    - Mesozoic
    - Cenozoic



## ■ Organisms –

- oldest definite fossils known
- prokaryotes (lacking a cell membrane)
- Similar to cyanobacteria; (oxygen-producing & underwent photosynthesis)
- It was 2 billion years later before the origin of eukaryotes
- By the end of this era we had the origin of shell-less invertebrates



# Paleozoic

- Time Frame – 544 to 245 million years ago
- Periods – (from oldest)
  - Cambrian
  - Ordovician
  - Silurian
  - Devonian
  - Carboniferous
  - Permian



- **Organisms – (referred to as the explosion of life)**

- At the beginning was the origin of most invertebrates

- Then the first vertebrates & first land plants appeared

- Around the middle of this era the first amphibians and insects appeared

- During the second half of this era the first reptiles appeared.

- Three Epochs: Age of:

- Invertebrates, Fishes, Amphibians





# Mesozoic

- Time Frame – 245 to 66 million years ago
- Periods – Triassic, Jurassic, and Cretaceous
- Age of Reptiles
- Organisms –
  - During Triassic the first mammals & dinosaurs appeared
  - Jurassic-dinosaurs become dominant
  - Cretaceous- mammals began to spread out and flowering plants appeared & the dinosaurs became extinct



# Cenozoic

- Time Frame – 66 million years ago to the present.
- Age of Mammals
- Periods –
  - Tertiary – Paleocene, Eocene, Oligocene, Miocene, Pliocene
  - Quaternary – Pleistocene, Recent



# Evidence - fossils

- Relative Dating – The age of a fossil in terms of other fossils around it.

Fossils in layers of sedimentary rocks, younger are on top & older are in the lower layers.

- Index Fossils – are used to coordinate the fossils at one location with those at another. For ex. One island with another



## Evidence Cont.

- Absolute Dating – age is given in years instead of relative terms
  - Ex. Radioactive Dating – determines the age of fossils by looking at the isotopes of elements that accumulate with the organisms when they were alive



# Imperfection of the Fossil Record

- Organisms had to die on the right place and right time for burial conditions to favor fossilization
- Rock must be exposed for us to see
- The fossil record is incomplete because of this.



# Fossils

## Description

- Fossils are mineralized or petrified replicas of skeletons, bones, teeth, shells, leaves and seeds or impressions of such items; usually found in sedimentary rock.



# Types


- Remainers – the actual body or parts of an organism
- Petrified – the bone has been replaced by mineral




- Molds/Casts –


- Molds – bone gets buried and the sediment turns into rock, and the animal is dissolved away
- Casts – if another mineral fills the mold and hardens in the shape of the old animal it becomes a cast






■ Carbonization – if an animal dies and the sediment crushes the animals as fossilization is occurring, you will have a thin black coating on the fossil. Much of this is coal.

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- Impression – (trace fossil) there is an impression of the fossil, but the fossil is gone
  - Amber – resin from certain trees that small insects and other organisms get trapped in
  - Tracks – footprints left in the sediment that solidifies
    - Ex. dinosaur tracks in Texas

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- Burrows – an animal like a worm burrows into the mud, then the burrow becomes fossilized
  - Coprolites – fossil excrement (poop) can sometimes give definitive knowledge about the eating habits of the animals

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- Gastroliths – smooth, polished stones that are found in the abdominal cavities of the skeletons of dinosaurs. They are thought to have helped the huge animals grind up vegetation in their stomachs.



# Fossil Record

- Ideal Conditions – quick burial and the presence of some hard parts
- Meaning – tells us the date of the organism by dating the rock. You can tell what came before what by superposition; mass extinctions; pop. explosions.
- Support for Evolution – changes over time can be seen