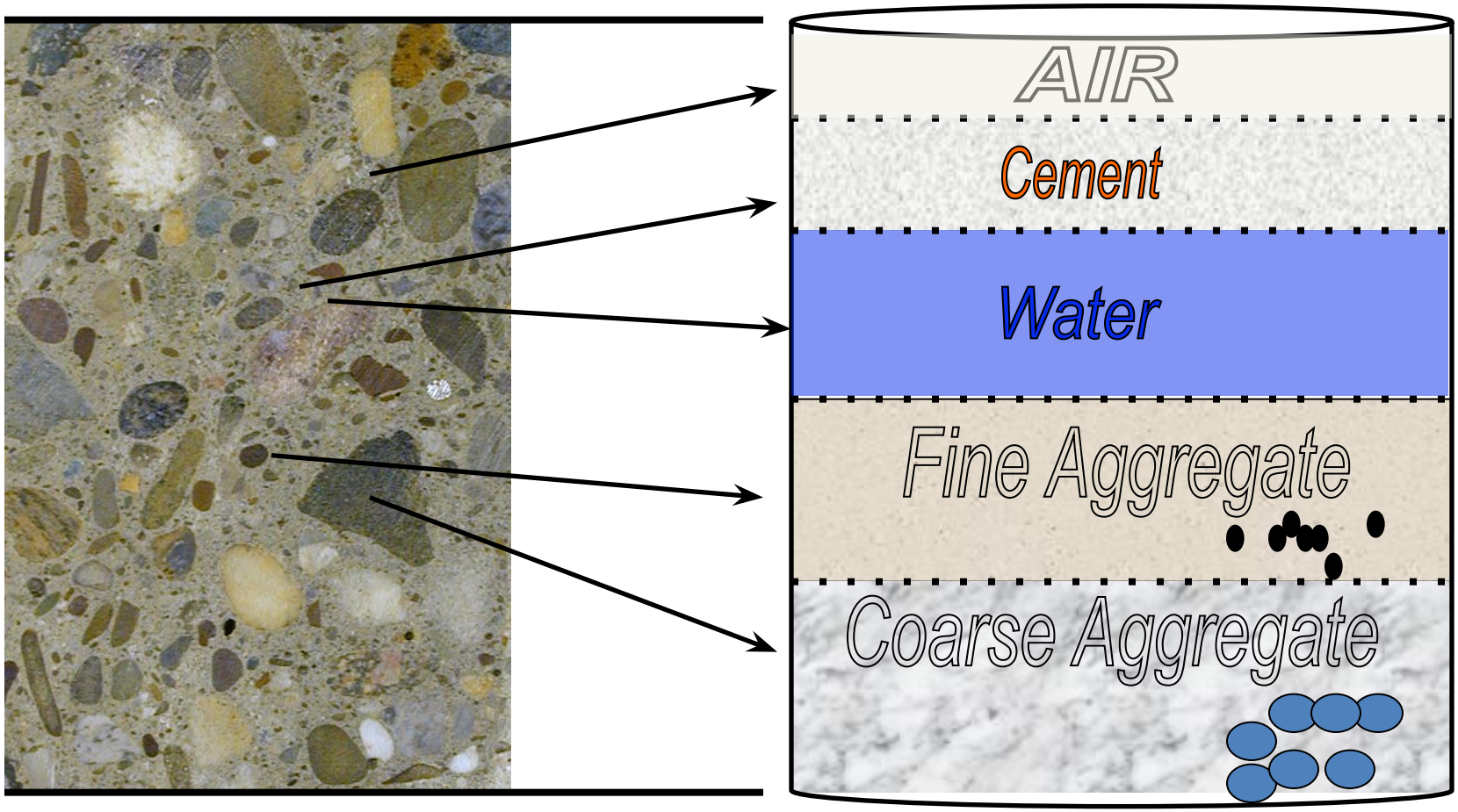
# Break Down of **Concrete** Components



# **Mineral Admixtures:** Pozzolans & Cementitious

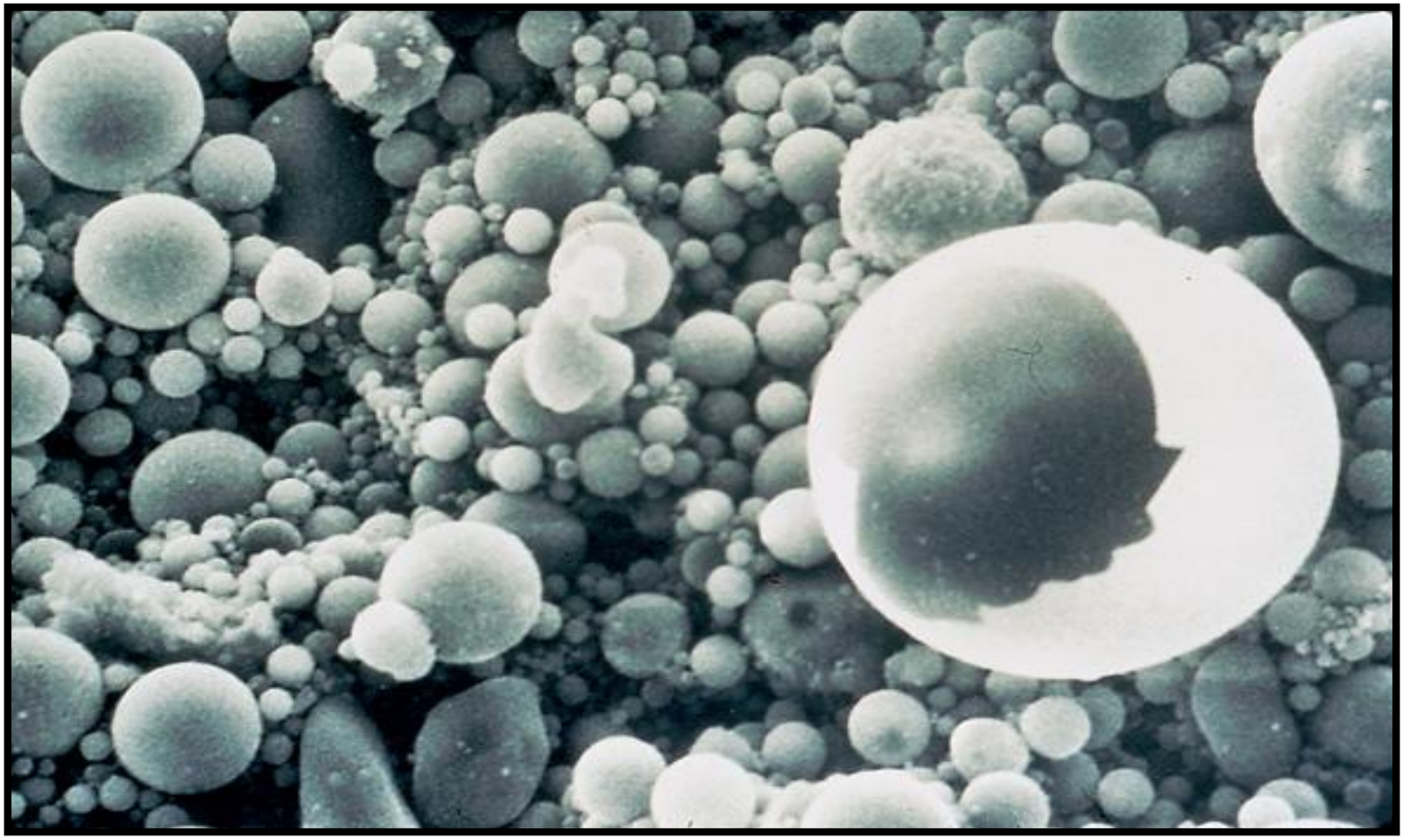
Fly Ash

Slag Cement

Silica Fume

– Benefits
  - Higher strengths at later age (over 28 days)
  - Higher impermeability
  - Improved workability
  - Some may have cementitious value (Slag & Class C Fly Ash)
  - Environmental

# **Fly Ash** particle shape



# Silica Fume or Microsilica

- Used to reduce the permeability of a concrete mixture
- Very fine material with High water demand (finer than cigarette smoke)
- Produces a very dense concrete with excellent late age strength
- Difficult to finish because of little or no bleed water
- Usually have to use High Range Water Reducer
- Typical dosage between 3 to 10% of total cementitious weight

Cement grains

Silica Fume grains

# Fine Aggregates

- **Types**
  - Natural Sand
  - Crushed Stone Sand
  - Manufactured Sand
  - Natural sand 35% to 38% voids
  - > 40% void = high water demand
  - ACI: for every 1% voids > 40% add 1 gallon of water
- **Size**
  - less than 0.2 in. (#4 sieve)(95-100 % passes #4)
  - fineness modulus (FM) used to describe the quality
  - usually consist of 35 to 45% of the concrete volume

# Coarse Aggregates

- **Types**
  - Crushed Limestone
  - Gravel
  - Crushed Granite

- **Size**
  - up to 3½ in. to #4 sieve
  - most concrete will use a #57 stone, ranging from 1 in. to #4 sieve
  - other examples are:
    - #467 (11/2” to No.4)
    - #67 (3/4” to No. 4)
    - #7 (1/2” to No. 4)
    - #8 (3/8” to No. 8)

# What is Gradation?

**“Gradation is the particle size distribution of an aggregate as determined by sieve analysis (ASTM C 136)”**