

A Technique for Microscopical Soil Examinations

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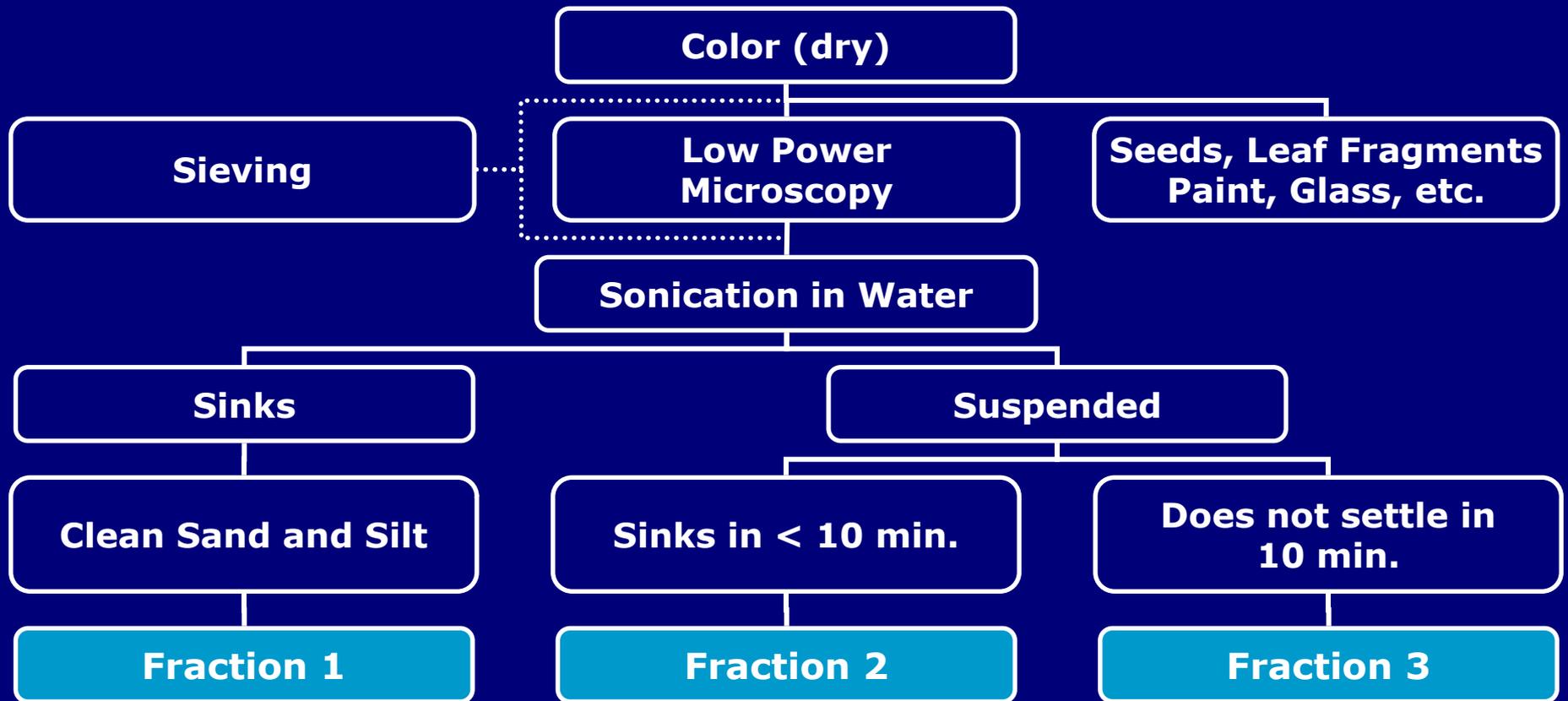
50001-85 D.L. Mapes
Boots from Suspect

Edmond Locard





Preliminary Separation



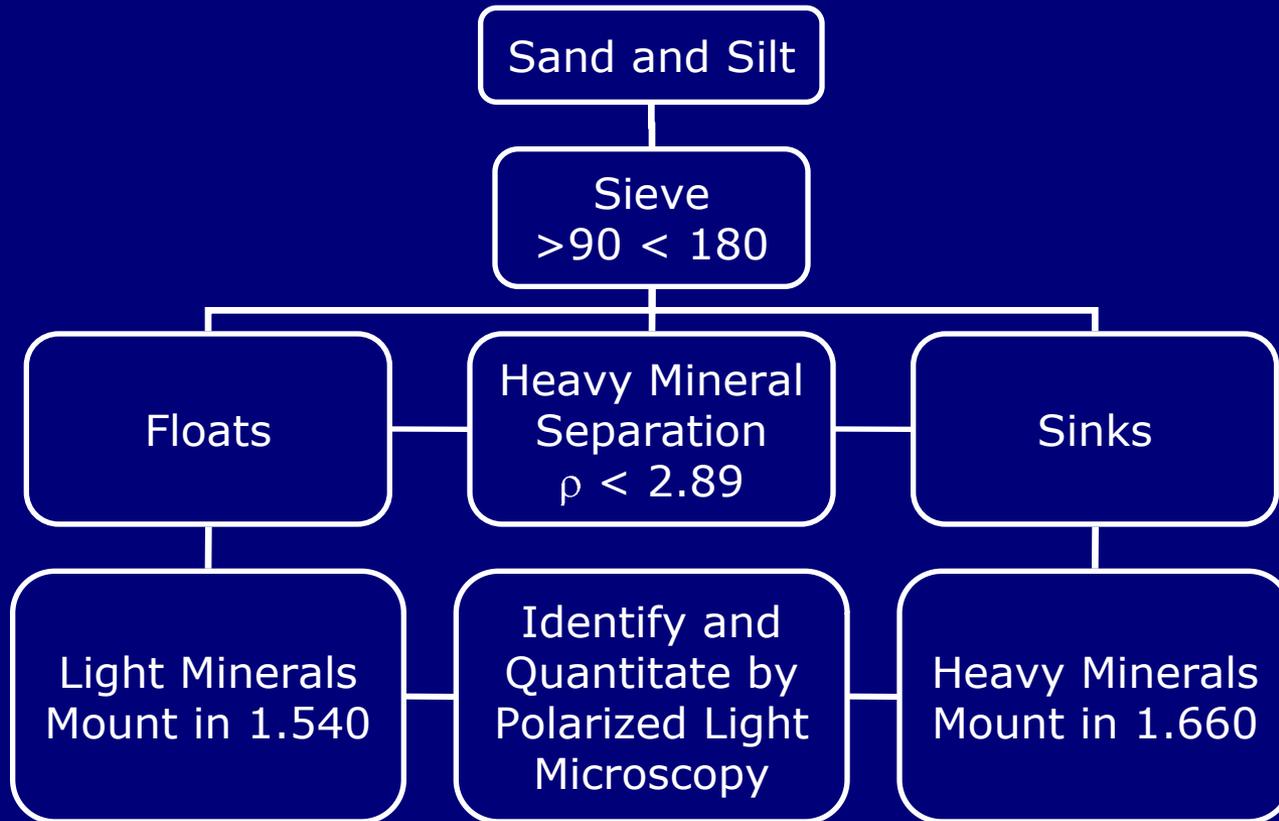
Color

EFR 79-00445

G-107601-04



Fraction 1





DECOTT'S LTD. LONDON, ENGLAND
PAT No. 667924
FRAME
MESH

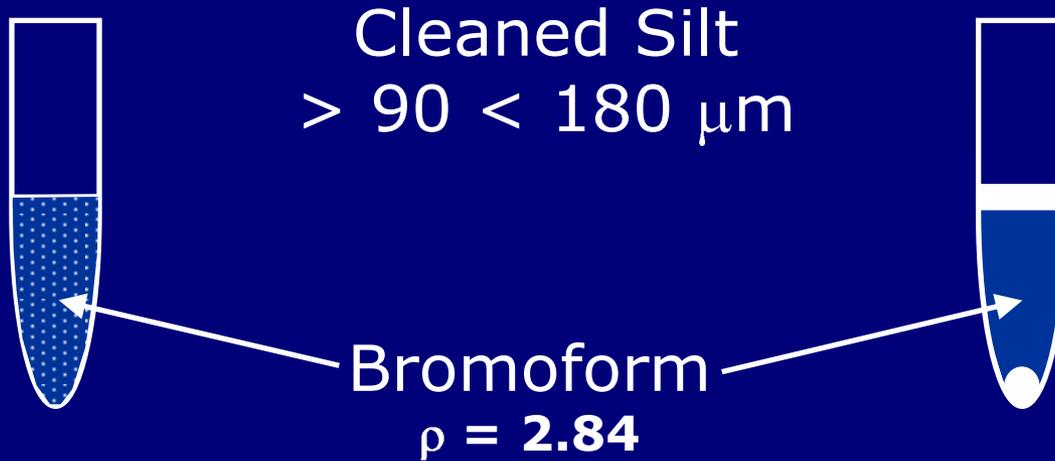
DECOTT'S LTD. LONDON, ENGLAND
MESH No. PAT No. 667924
100
FRAME
MESH

DECOTT'S LTD. LONDON, ENGLAND
FRAME
MESH

DECOTT'S LTD. LONDON, ENGLAND
FRAME
MESH

DUPON Instruments SORVEY LABORATORY INSTRUMENTS

Heavy Mineral Separation



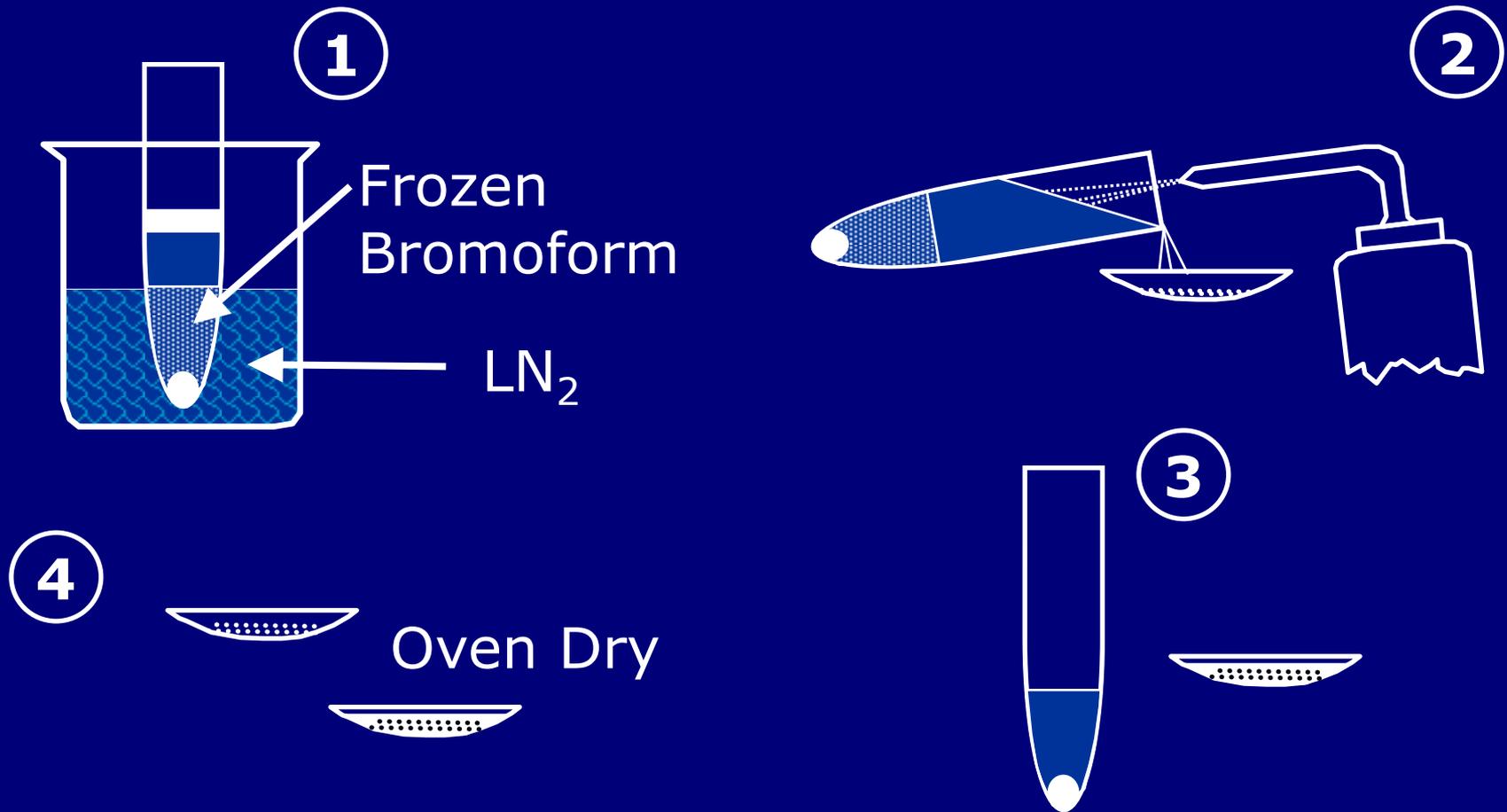
Mineral Separation in Heavy Liquids



Freezing Heavy Minerals in Tip of Tube with LN2



Isolation of Mineral Separates



Heavies Frozen in Bottom of Microcentrifuge Tube



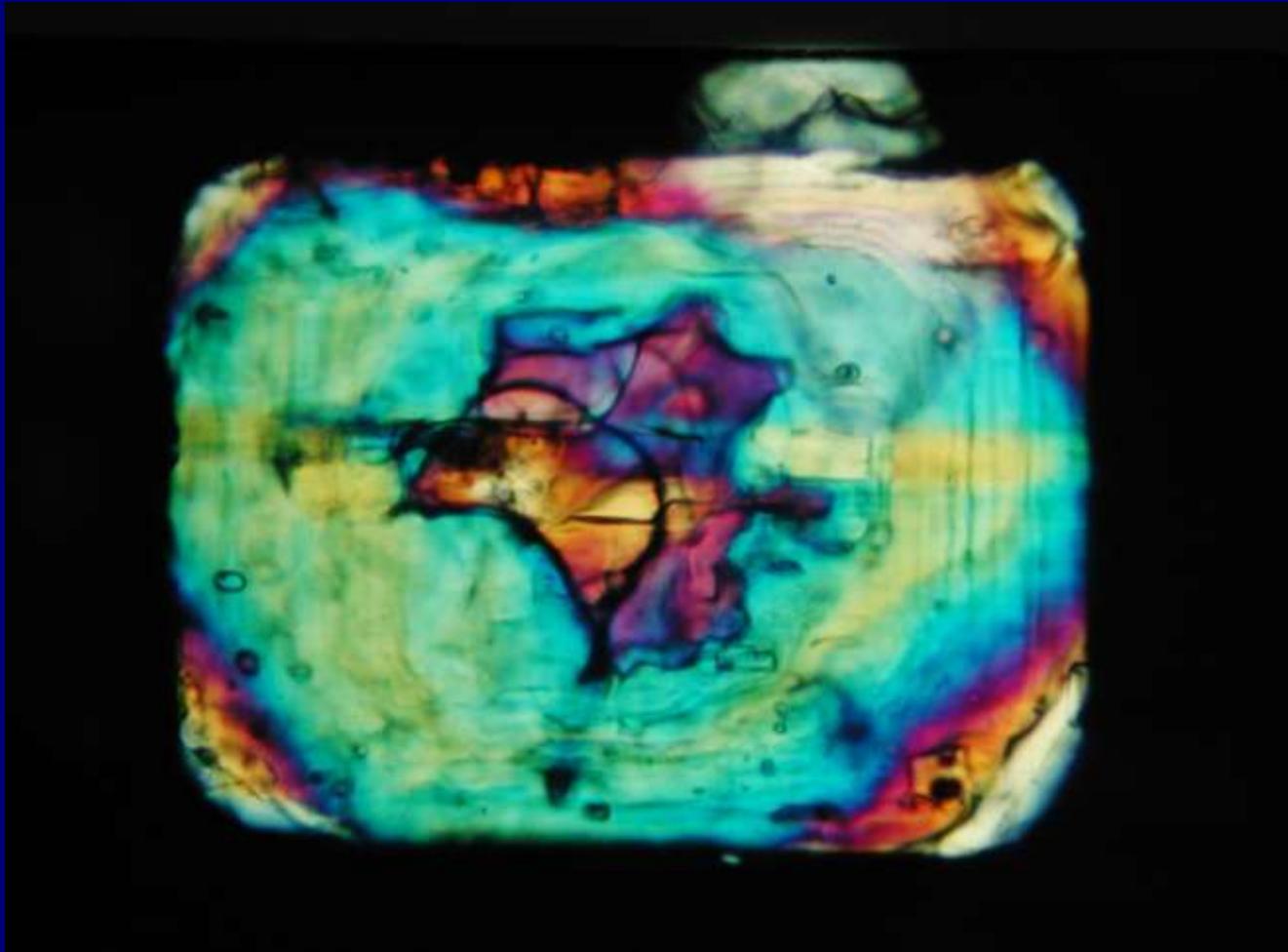
Light Mineral Fraction Washed from Tube



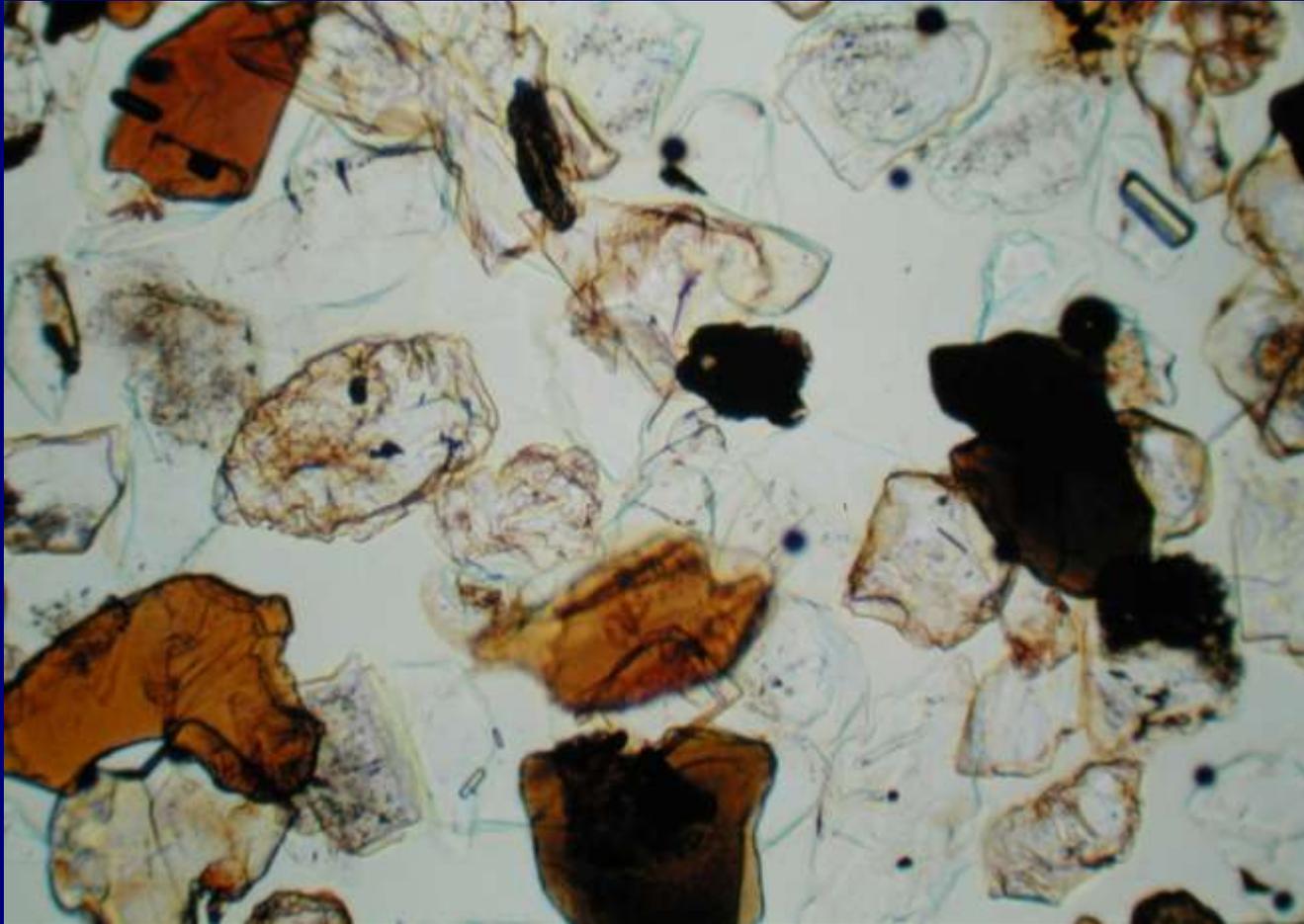
Light and Heavy Fractions Ready for Mounting



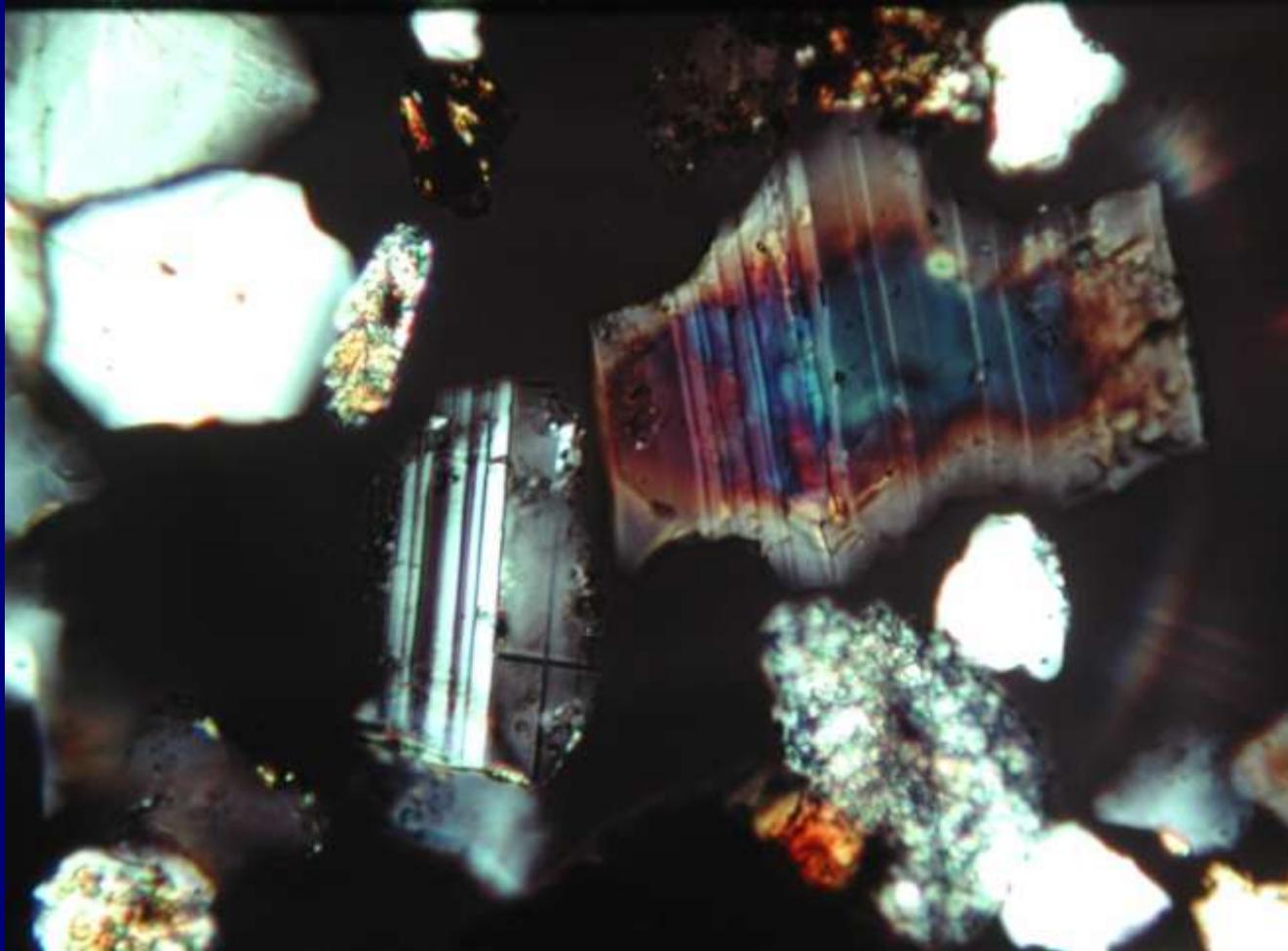
PLM Study of Density Fractions



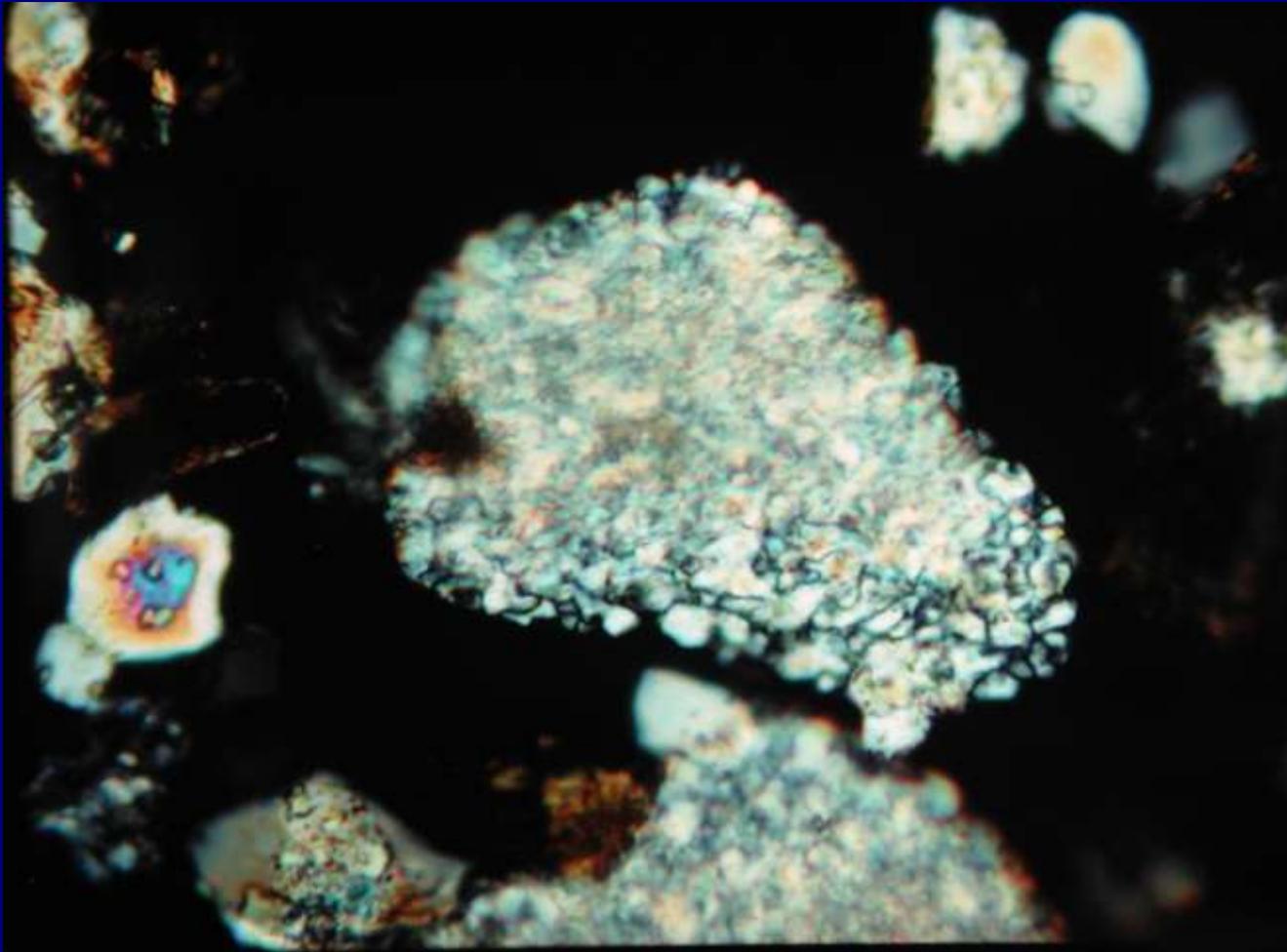
Light Mineral Fraction in 1.540 Cargille Liquid



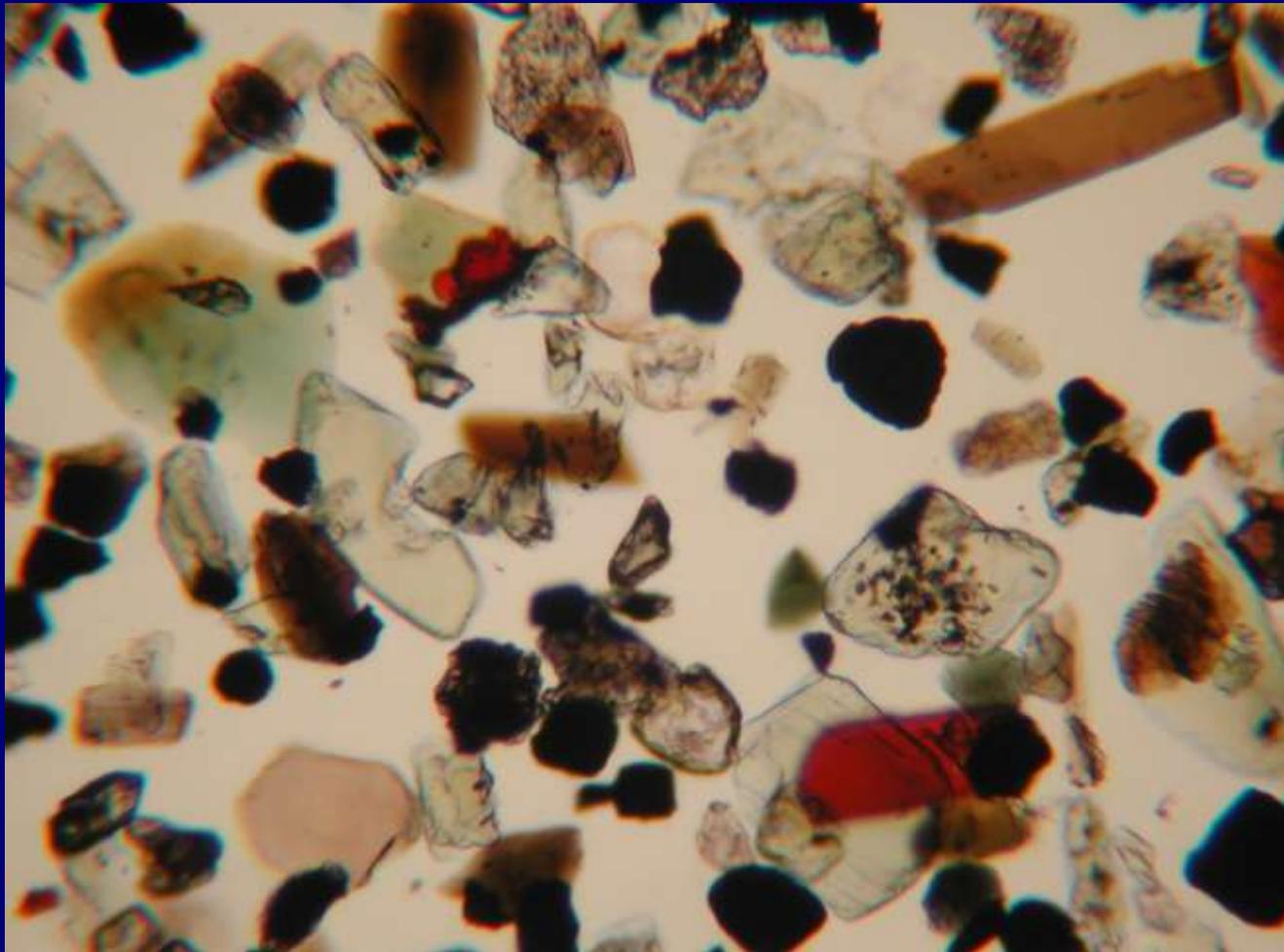
Plagioclase Feldspars Crossed Polars



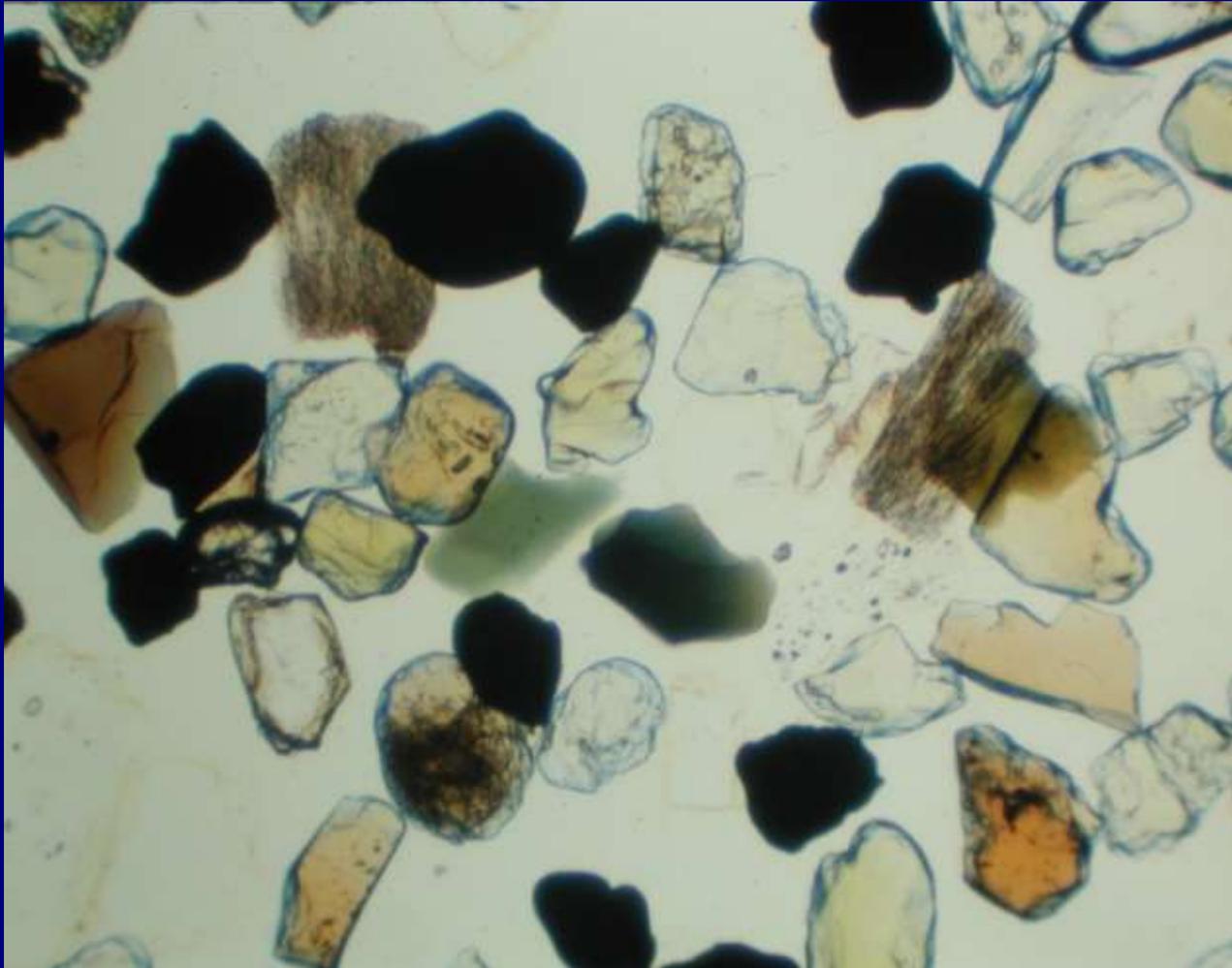
Rock Fragments



Heavy Mineral Suite Plane Polarized Light



Mineral Suite Varies by Provenance of Source Rocks



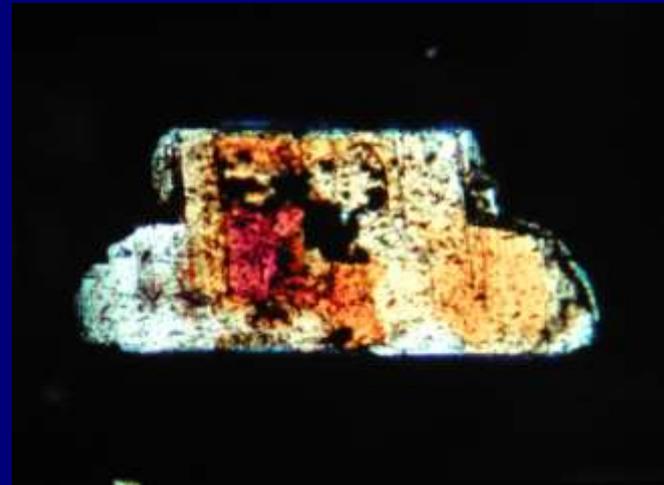
Refractive Index and Dispersion Colors

- Top. Apatite grain in 1.660 refractive index oil. Plane polarized light.
- Bottom. Crossed polars.



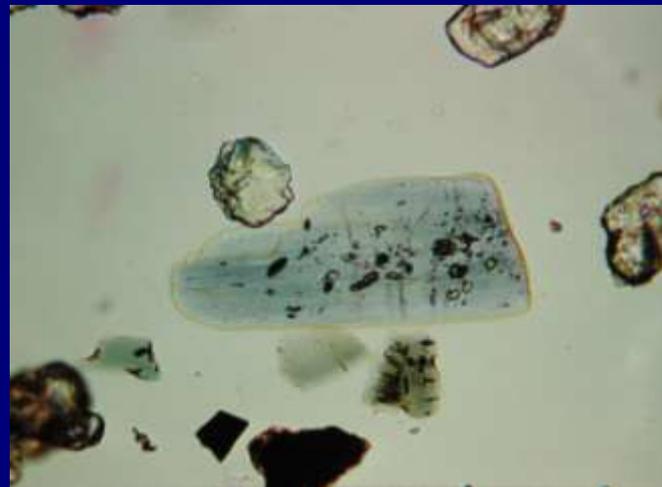
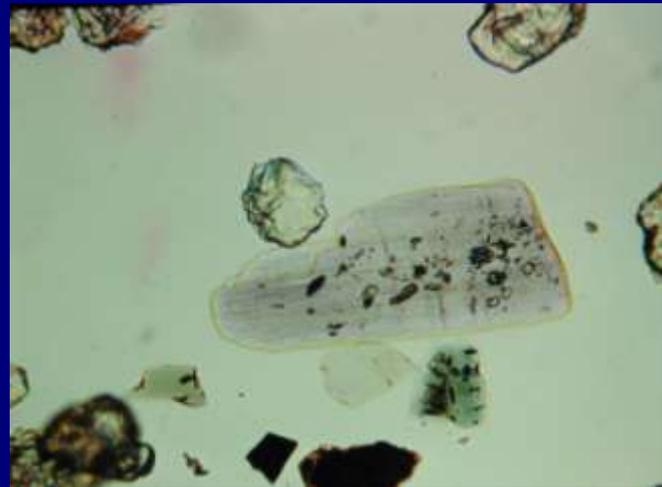
Birefringence

- Top. Kyanite in 1.660 index of refraction oil.
- Bottom. Crossed polars



Pleochroism

- Top. Glaucophane
1.660 refractive
index oil. N-S
polarizer.
- Bottom. E-W
polarizer.



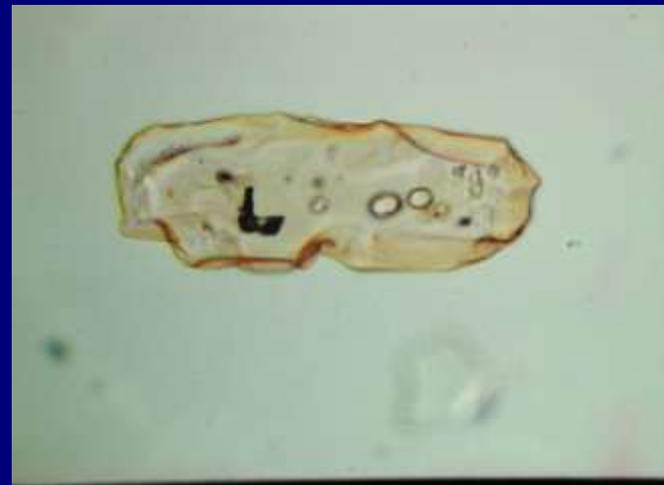
Pleochroism

- Top. Euhedral tourmaline in 1.660 index of refraction oil. N-S polars
- Bottom. E-W polars.



Pleochroism

- Top. Subhedral tourmaline in 1.660 refractive index oil.
- Bottom. E-W polars.



Mineral Varieties

- Hypersthene from Mount St. Helens eruption collected from Yakima, WA days after the event. 1.660 index of refraction oil. Top. N-S polars. Bottom. E-W polars.



Mineral Varieties

- Hypersthene from Africa. 1.660 refractive index oil. Top. N-S polars. Bottom. E-W polars.



Mineral Varieties

- Hypersthene from Martinique. 1.660 refractive index oil. Top. E-W polars. Bottom. N-S polars.



Coarse Mineral Fractions

- Examination for identification and surface texture.
- Stereomicroscopy
- Scanning Electron Microscopy
- Cathodoluminescence



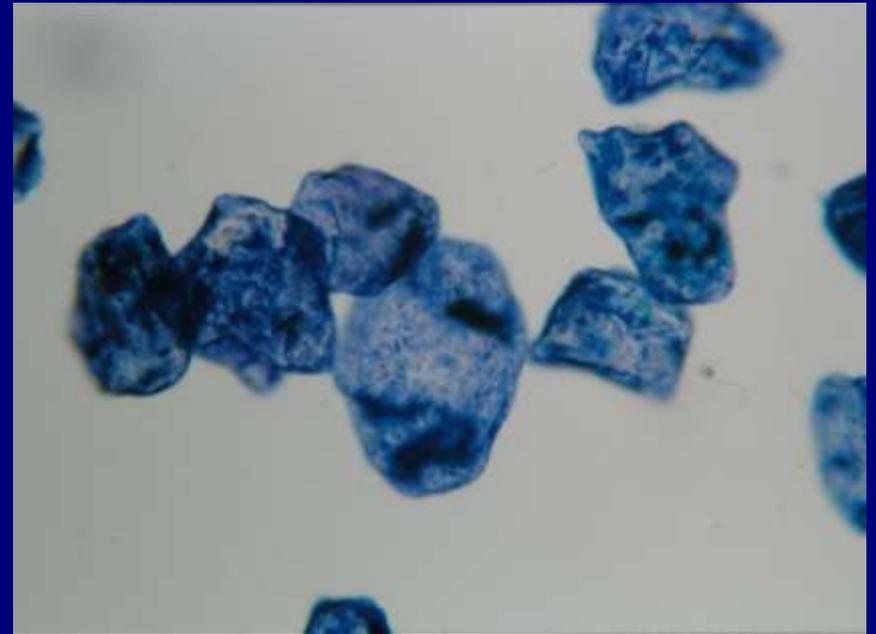
Light Microscopy

- Monahan Sand Dunes in West Texas. Mounted in 1.660 refractive index oil for contrast.



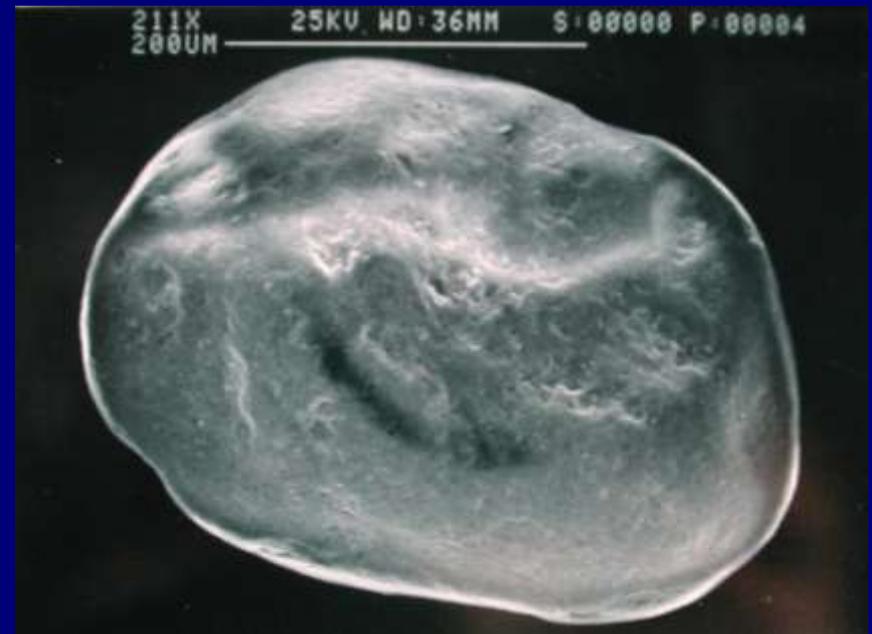
Stains and Reagents

- Sahara sand stained with methylene blue to show distribution of amorphous silica (silicic acid) on grain surfaces.

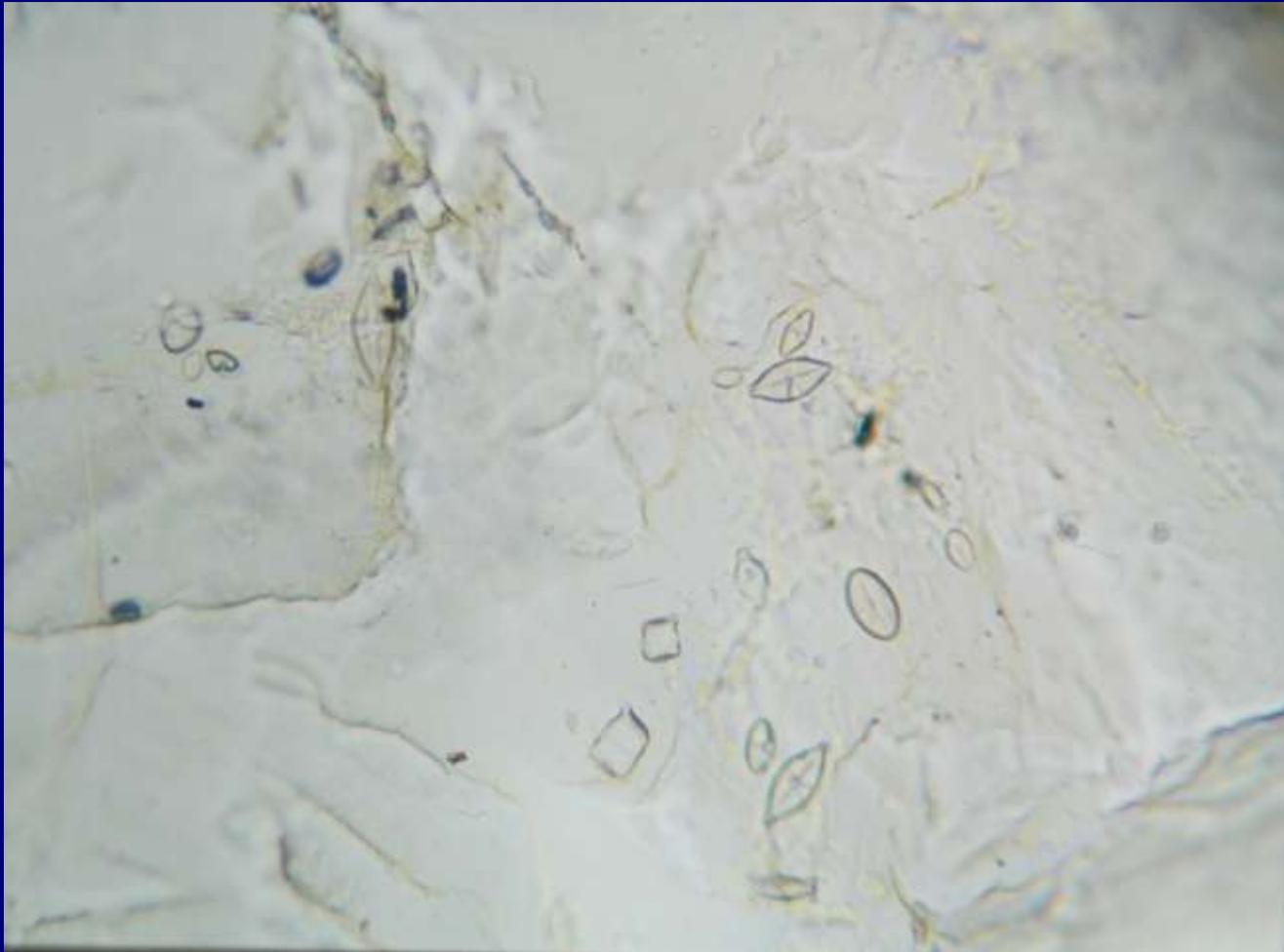


SEM of Quartz Grain Surfaces

- Rounded quartz grain from Monahan Dunes in Texas showing surface coating.



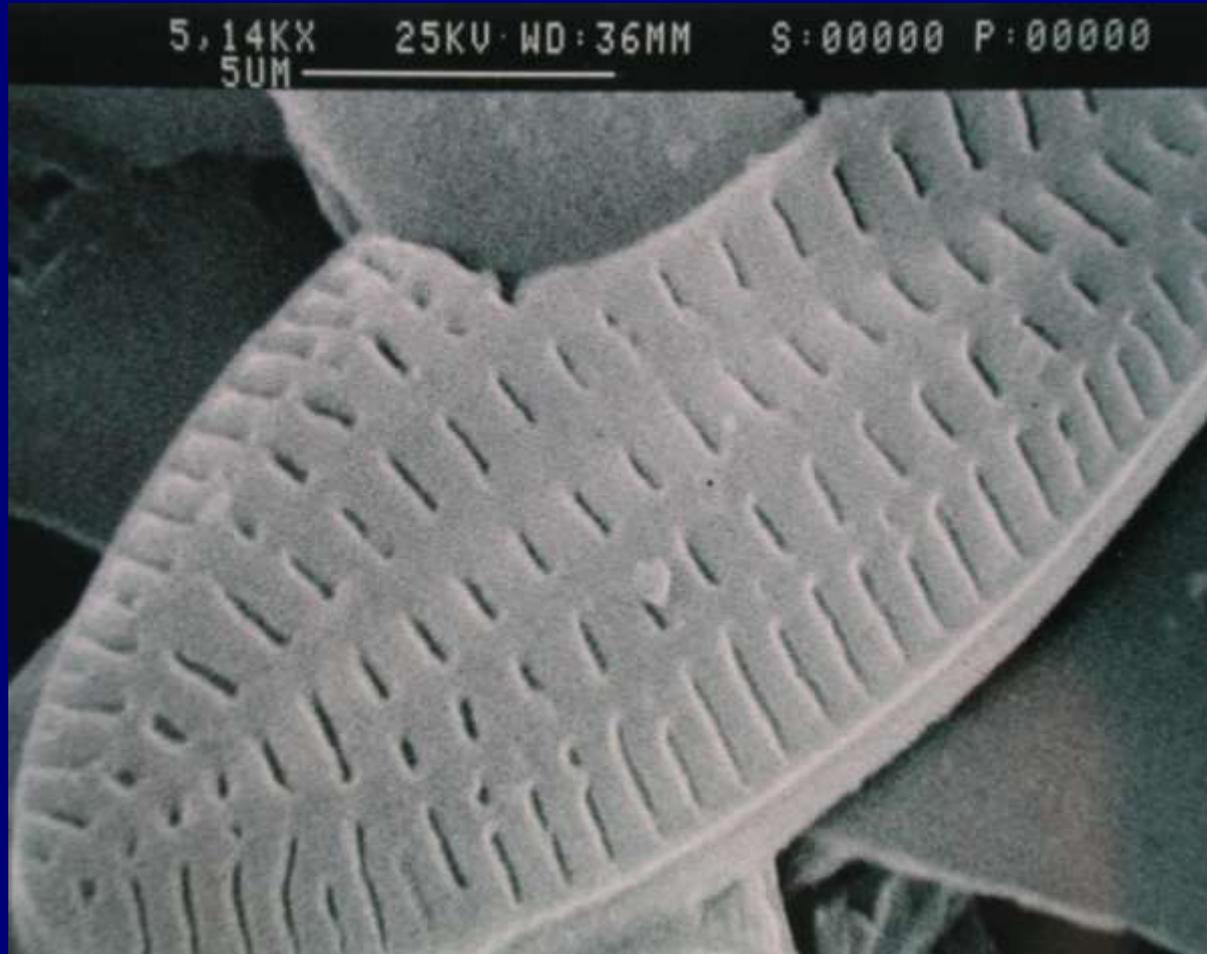
Indicators on Quartz Grain Surfaces



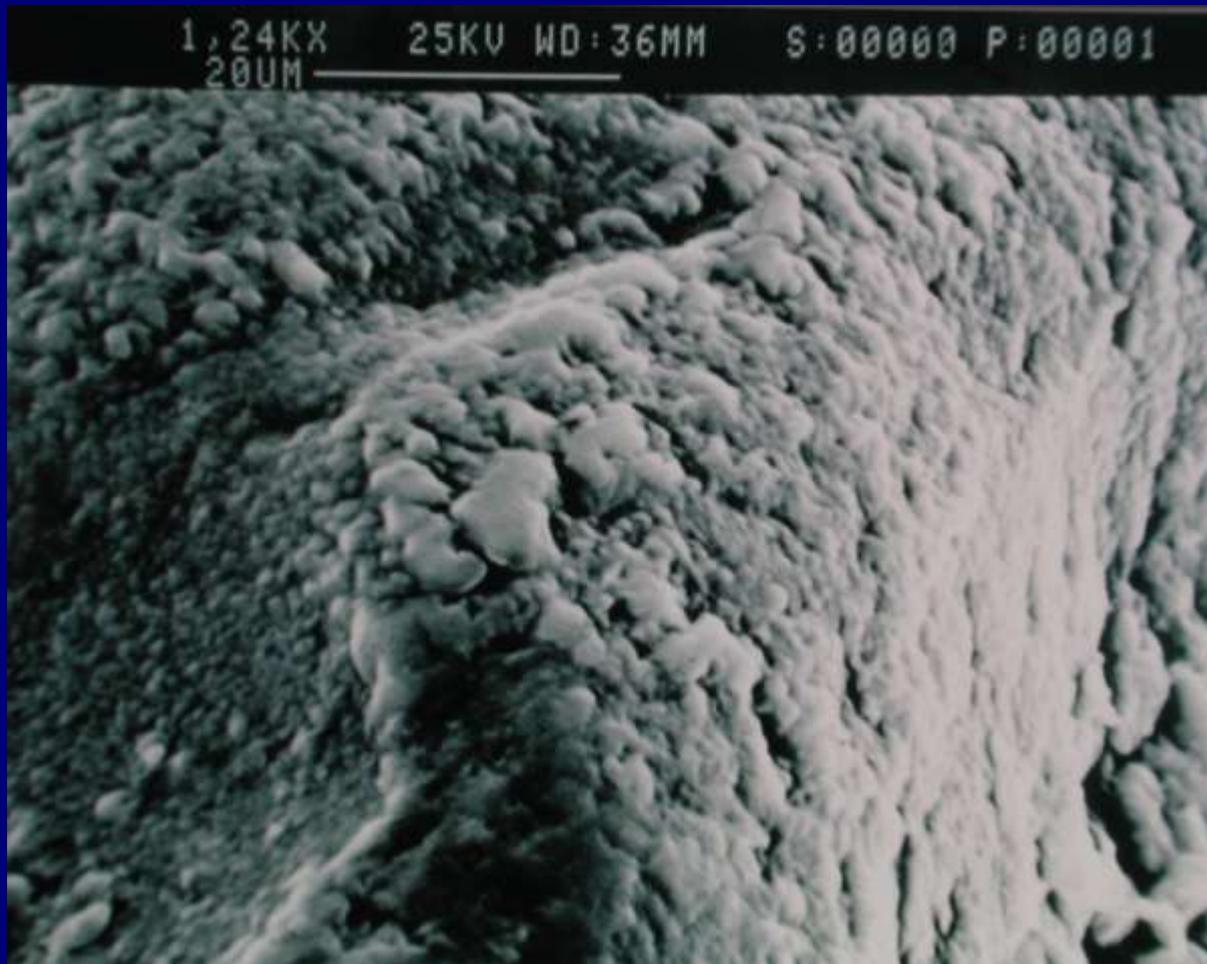
Diatoms on Marine Quartz Grain Surface



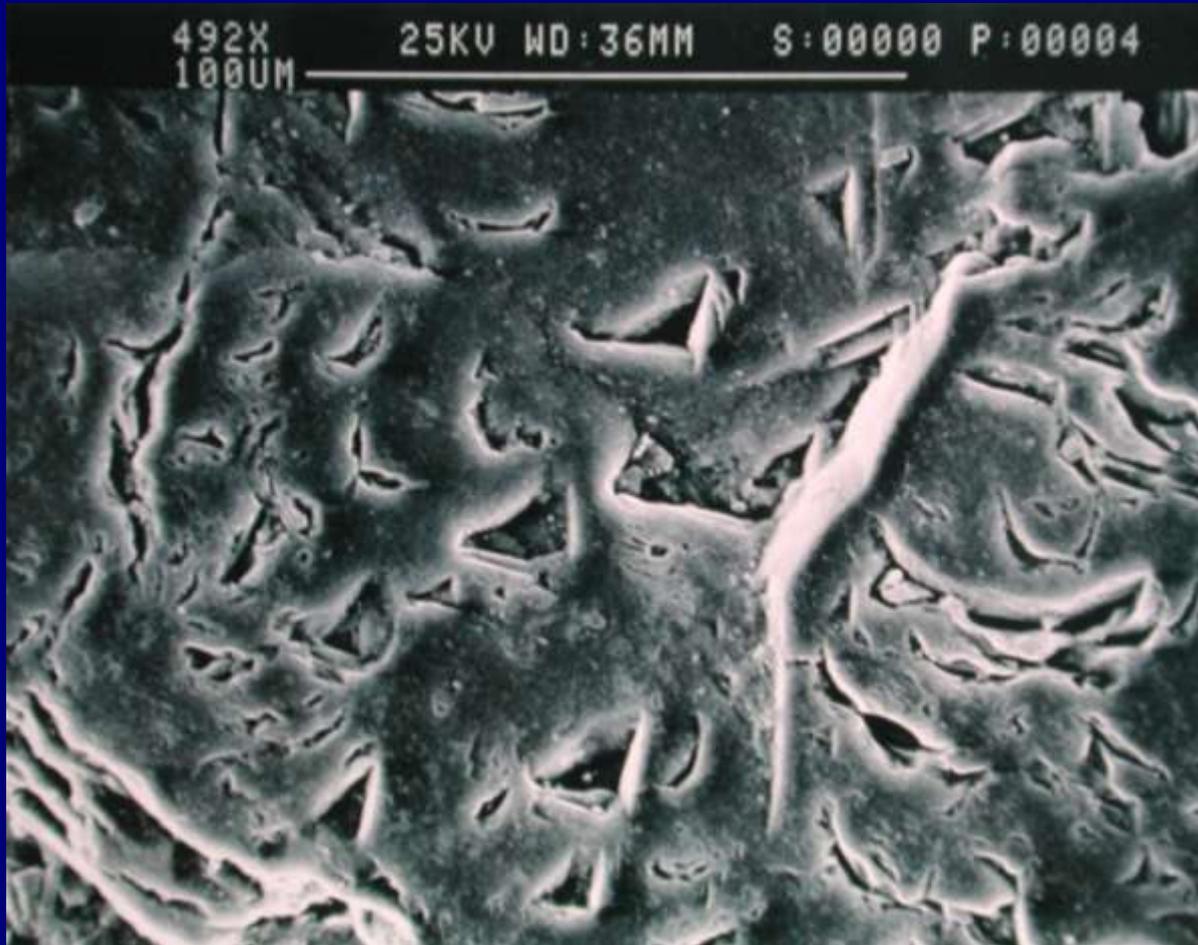
Detail of Diatom on Quartz Grain Surface



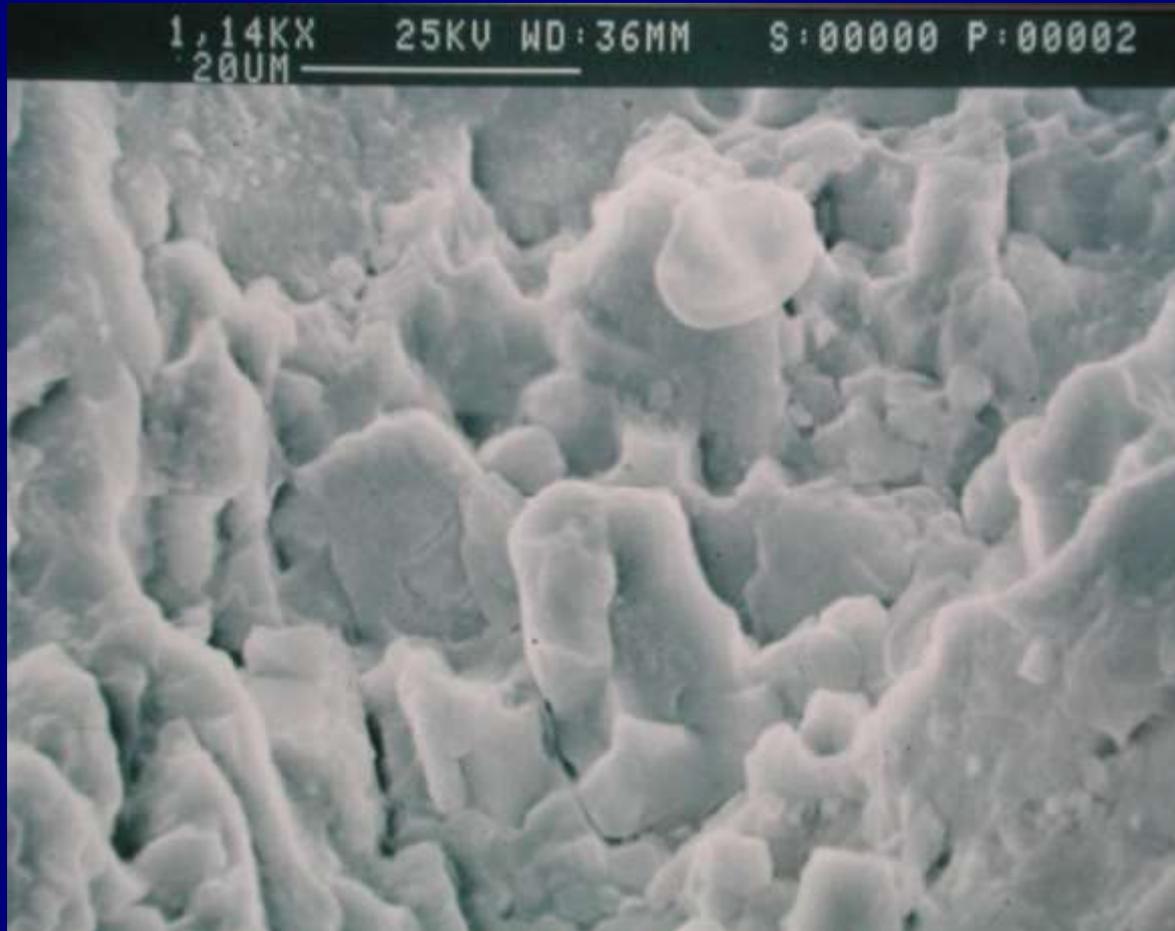
“Silica Flowers” Deposited on Quartz Grain Surface



Etching and Dissolution of Silica on Quartz Surface



Deep Etching on Quartz Grain Surface

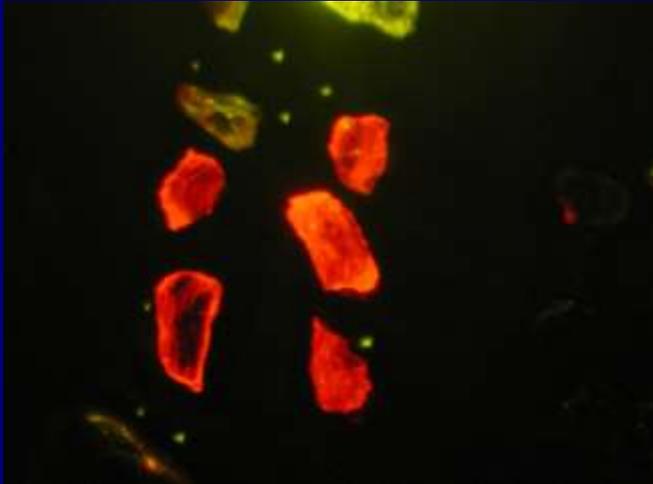


Fresh Quartz Grain from Glacier in Canada

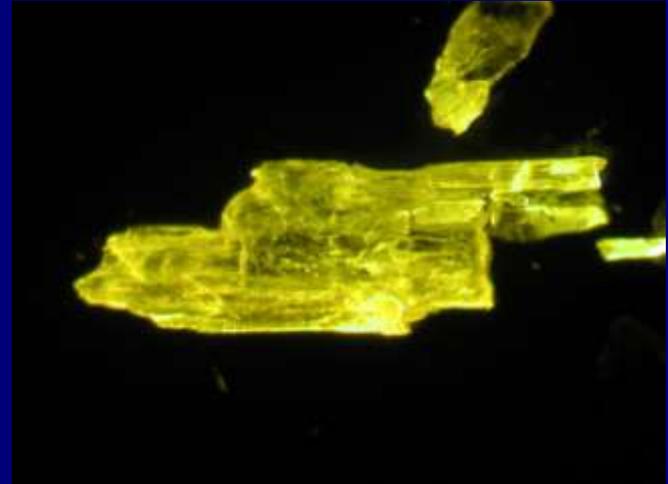


Cathodoluminescence

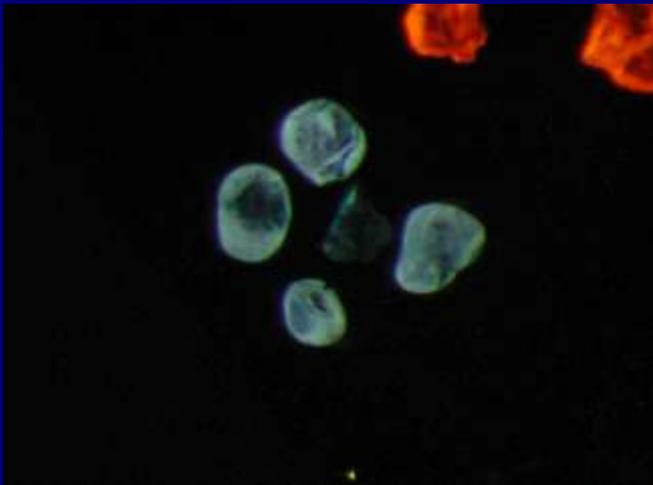




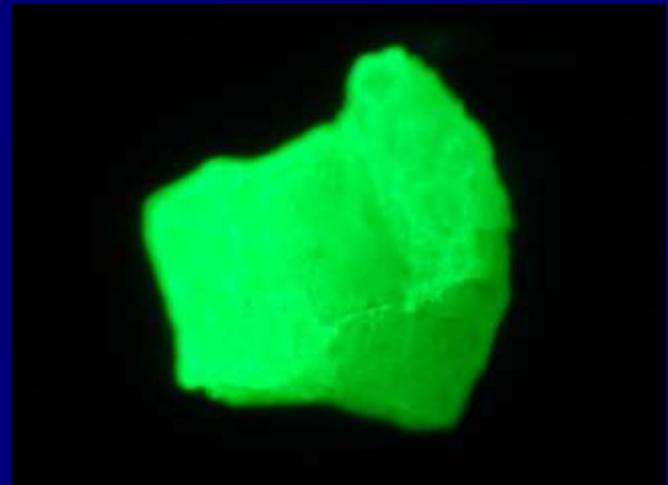
Calcite



Wollastonite

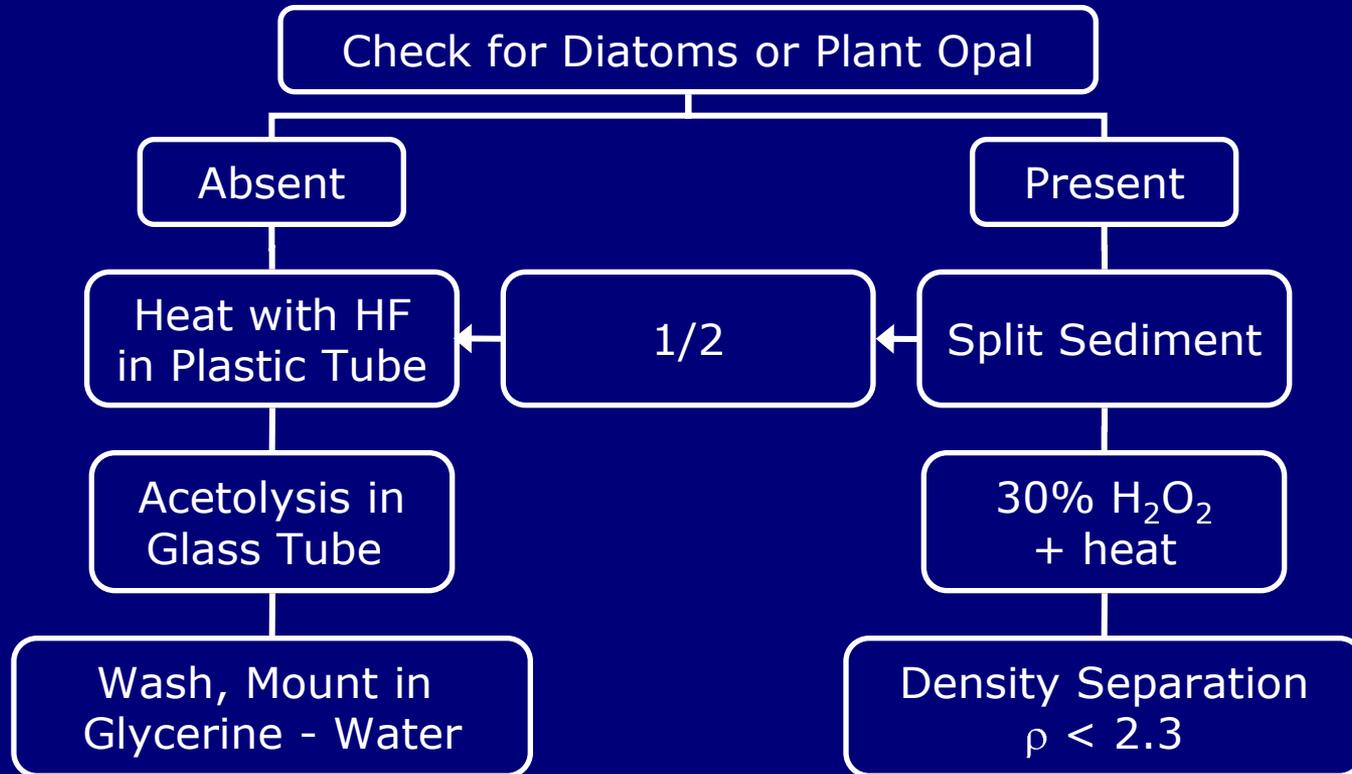


Zircon

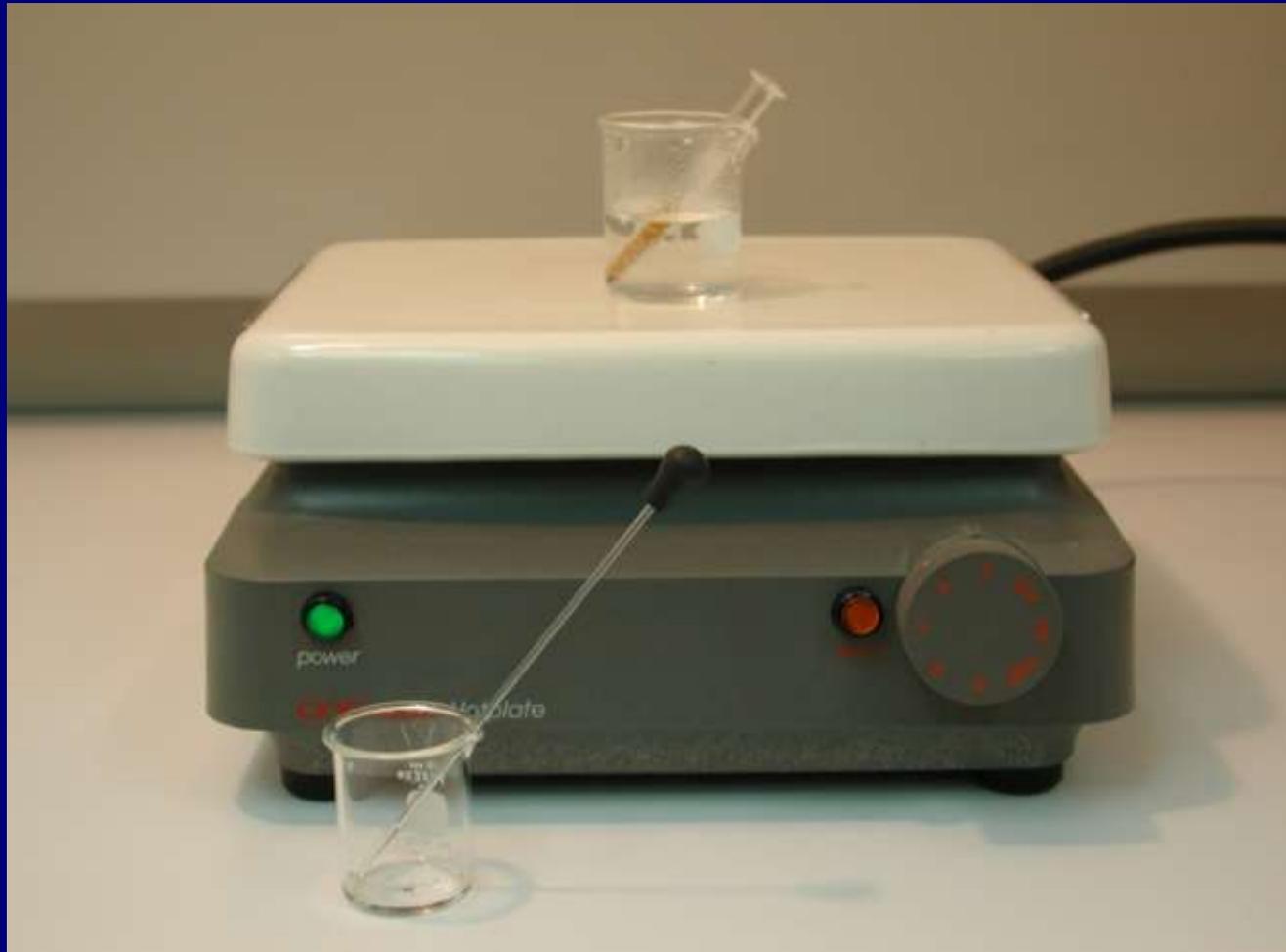


Willemite

Fraction 2



Acetolysis in 1.5 mL Glass Microcentrifuge Tube



Fraction 2 After Acetolysis



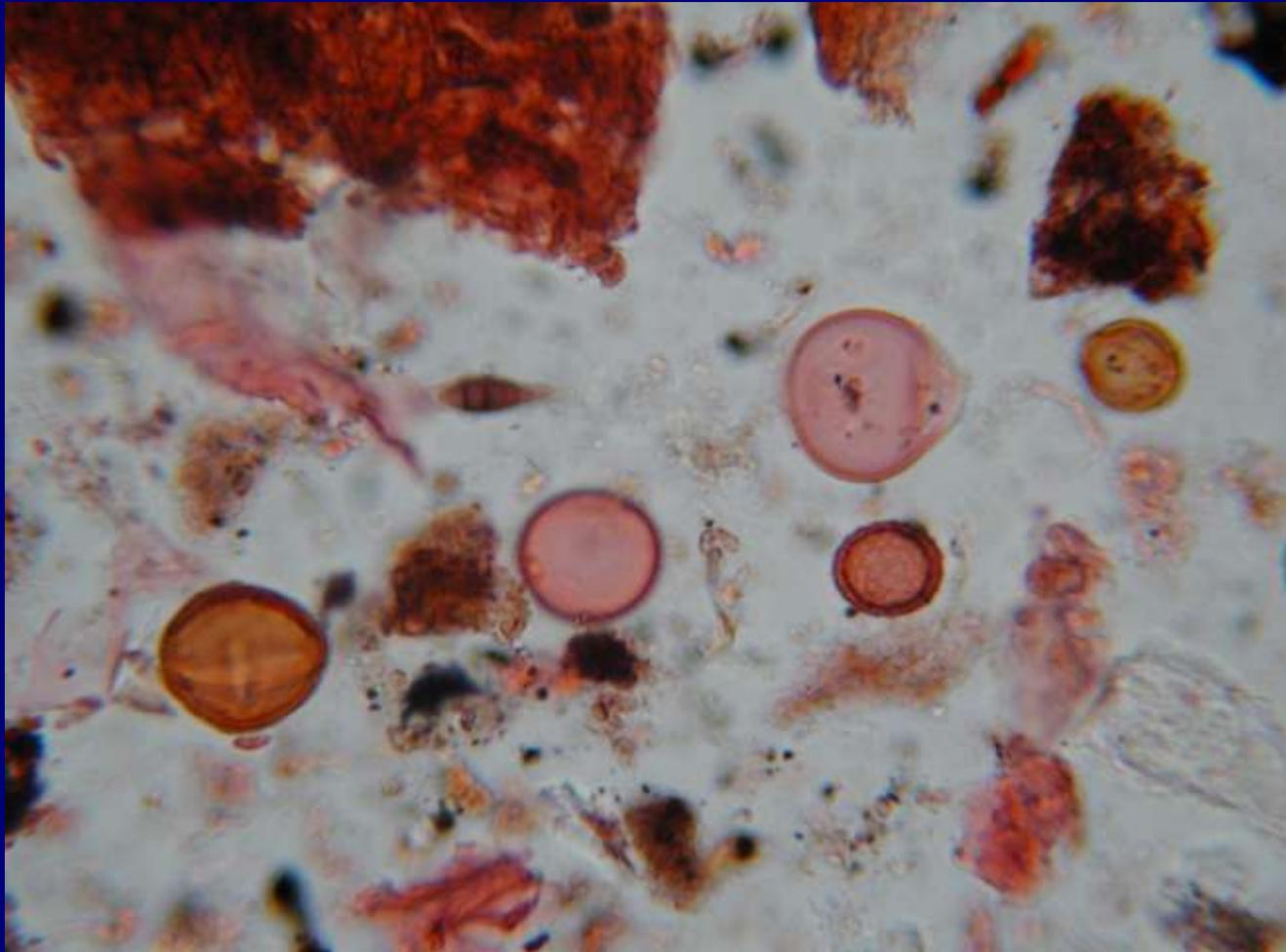
Fraction 2

Identification of Isolates

Light Microscopy

- Pollen and spores
- Resistant plant tissue
- Tire rubber
- Combustion soot
- Diatoms and plant opal

Pollen Fraction after Acetolysis and Staining



Study of Internal Structure at High Magnification

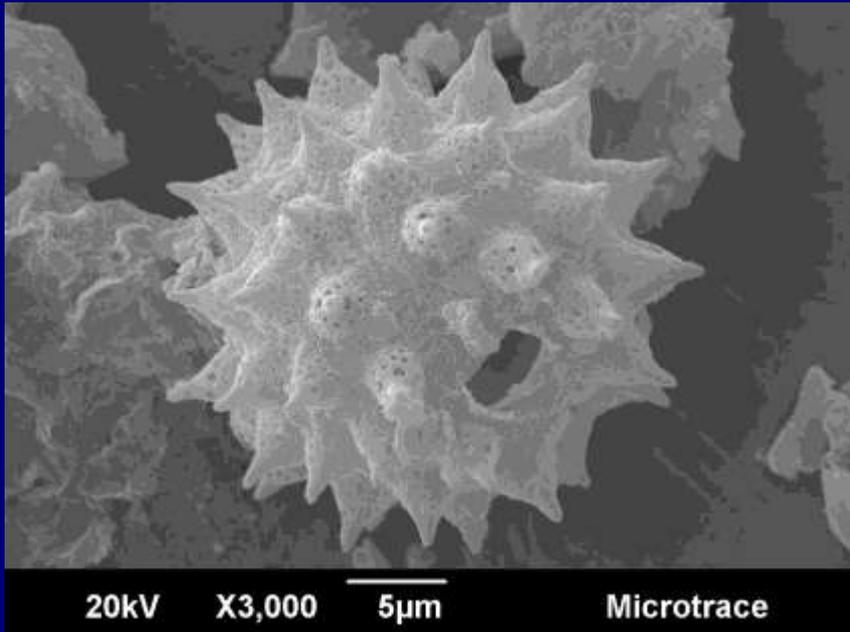


Examination of Exine Sculpturing



Details of surface sculpturing can be enhanced by scanning electron microscopy

Scanning Electron Microscopy

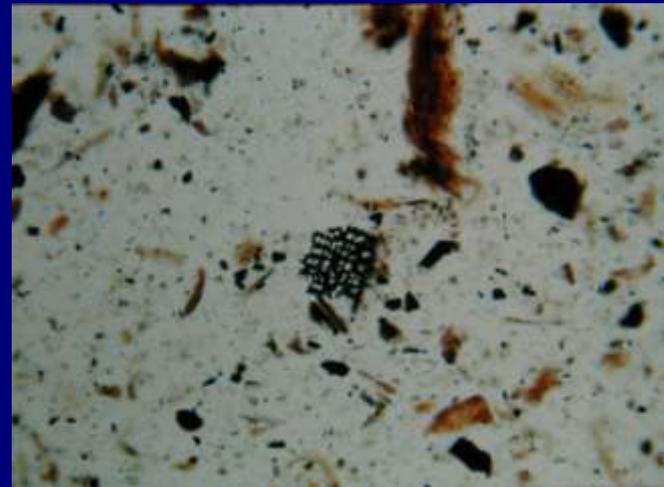


Light Microscopy



Pollen Fraction without Staining

- Top. Charcoal particle.
- Bottom. Difficultly identified plant tissue.



Pollen Fraction without Staining

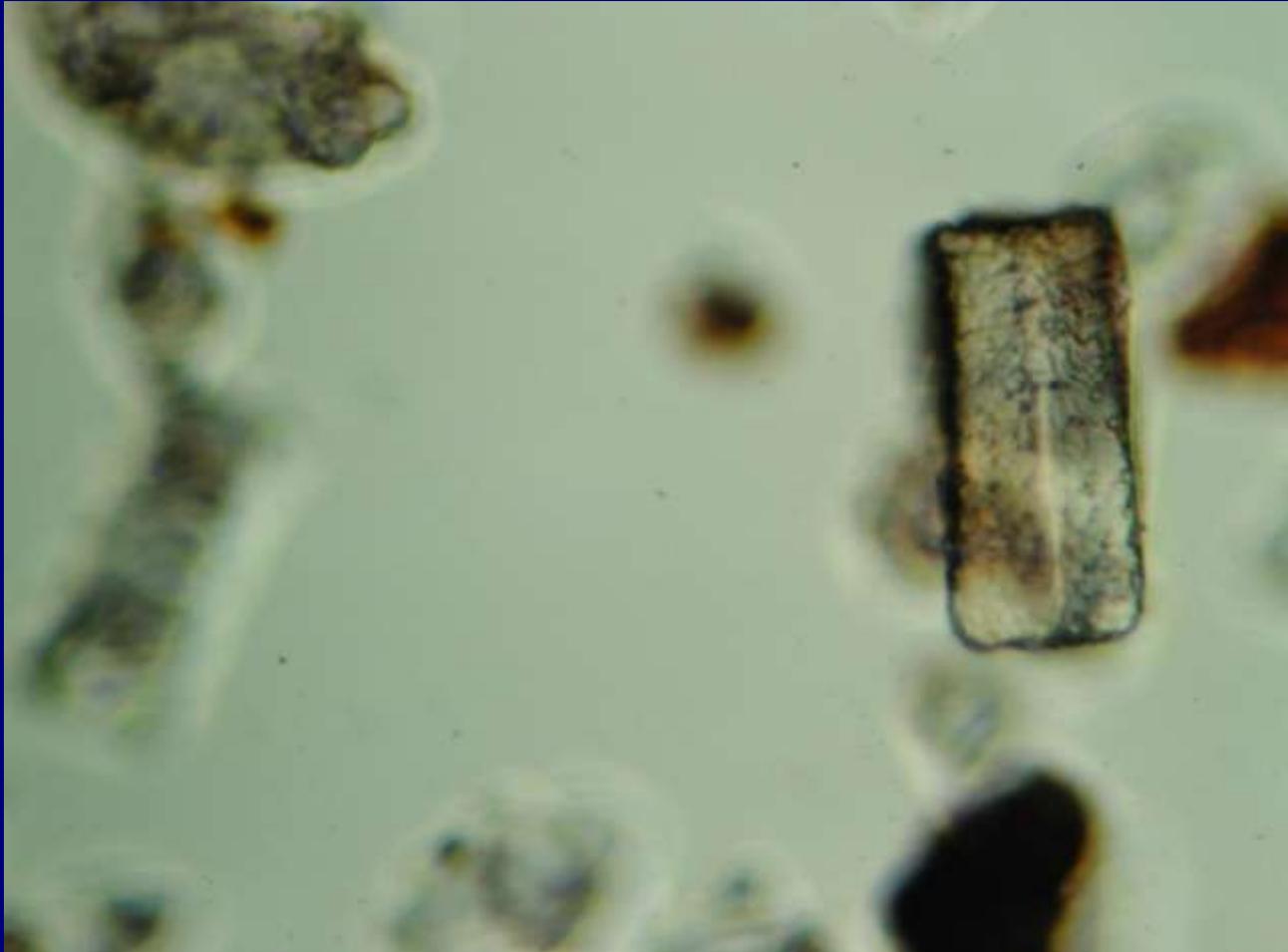


Opal Phytoliths

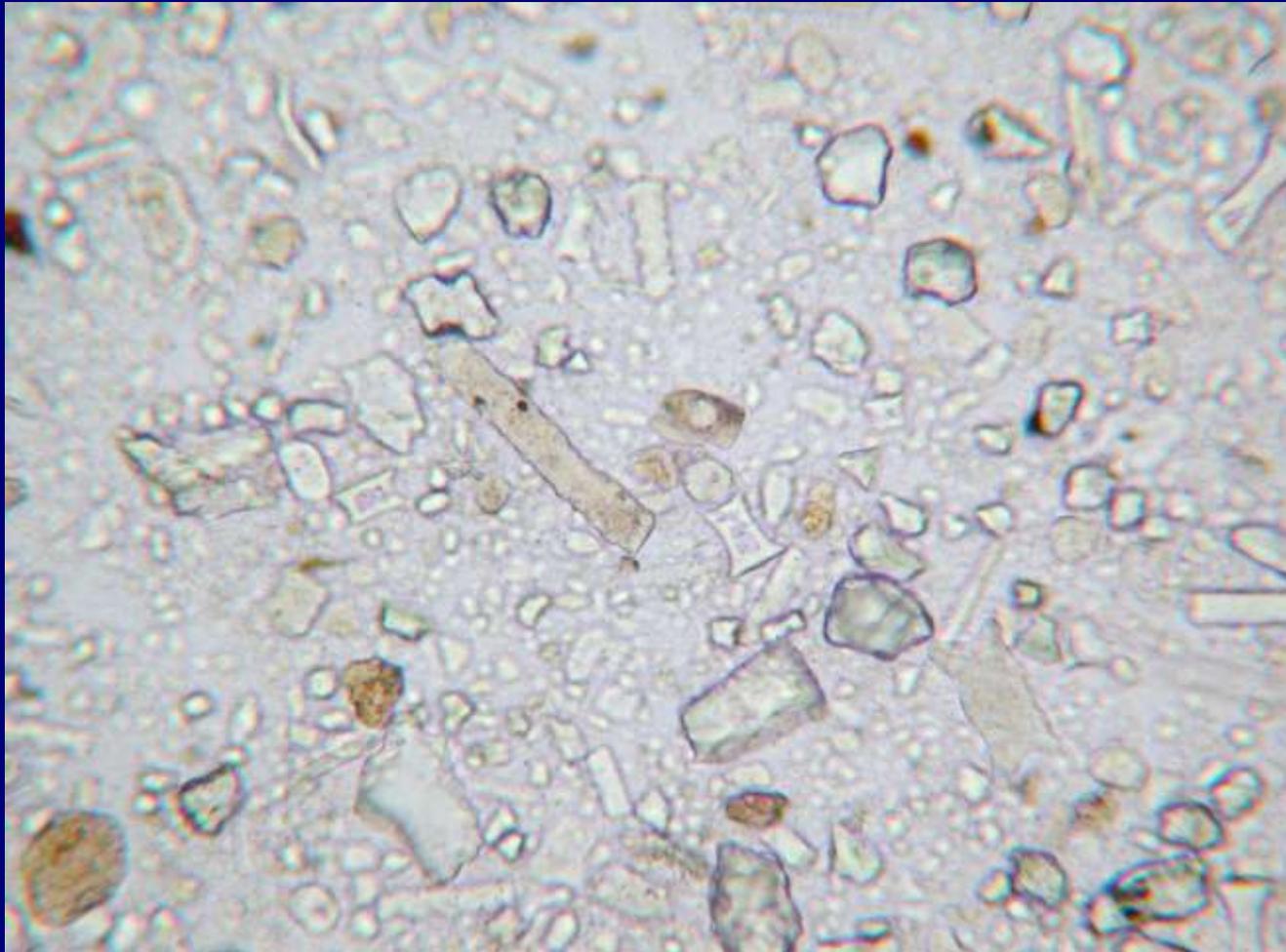
- Distinctive morphology.



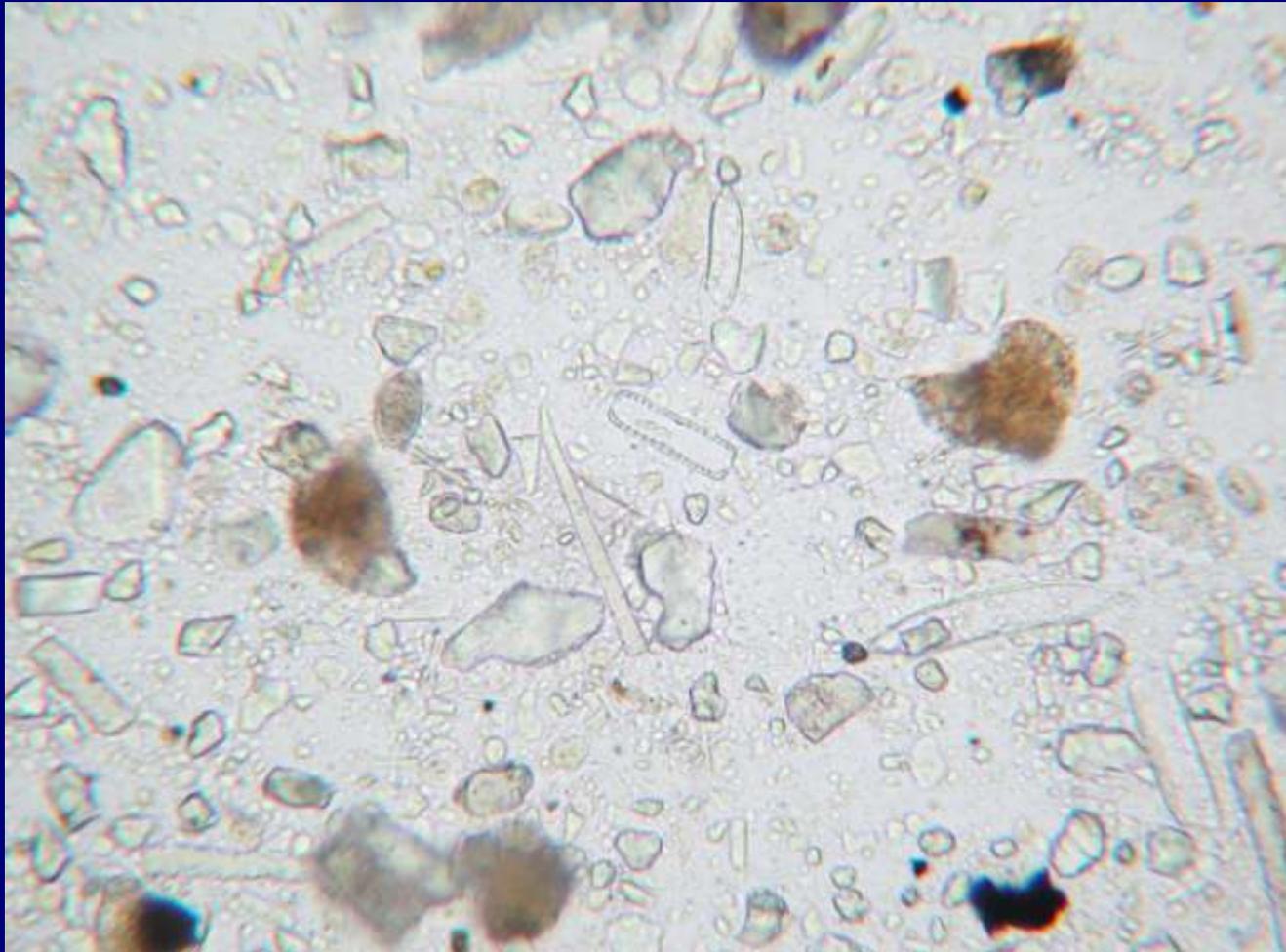
Plant Opal Unprocessed Specimen



**Fraction 2 After Treatment with
Hot Concentrated Hydrogen Peroxide
Opal Phytolith Rich Specimen**



**Fraction 2 After Treatment with
Hot Concentrated Hydrogen Peroxide
Diatom Rich Specimen**



Fraction 3 (clays)

