Where do Minerals concentrate *within* the crust? (Ch.2)

1. Soil (through weathering)
2. Groundwater
3. Magmatic / Metamorphic processes

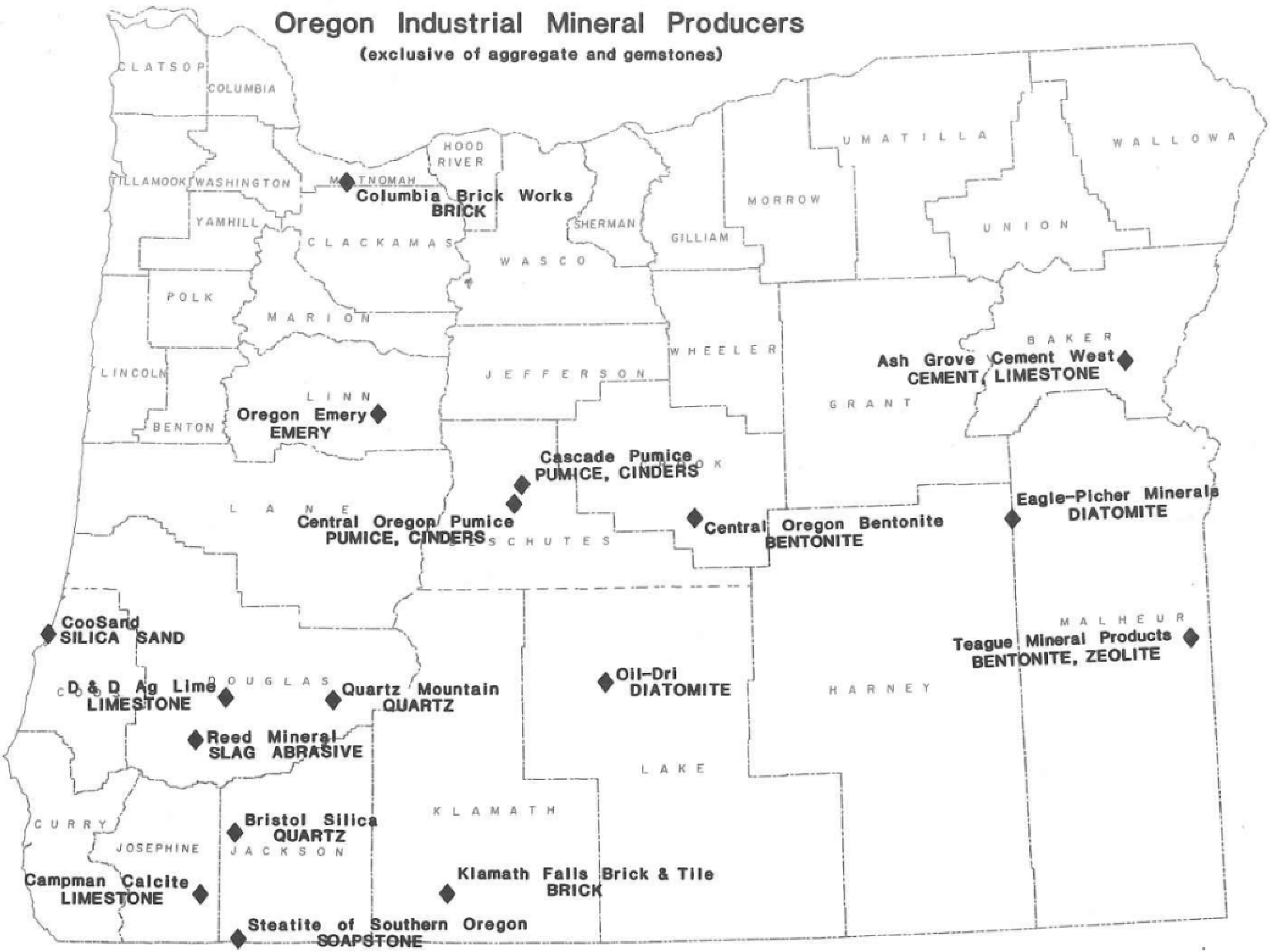
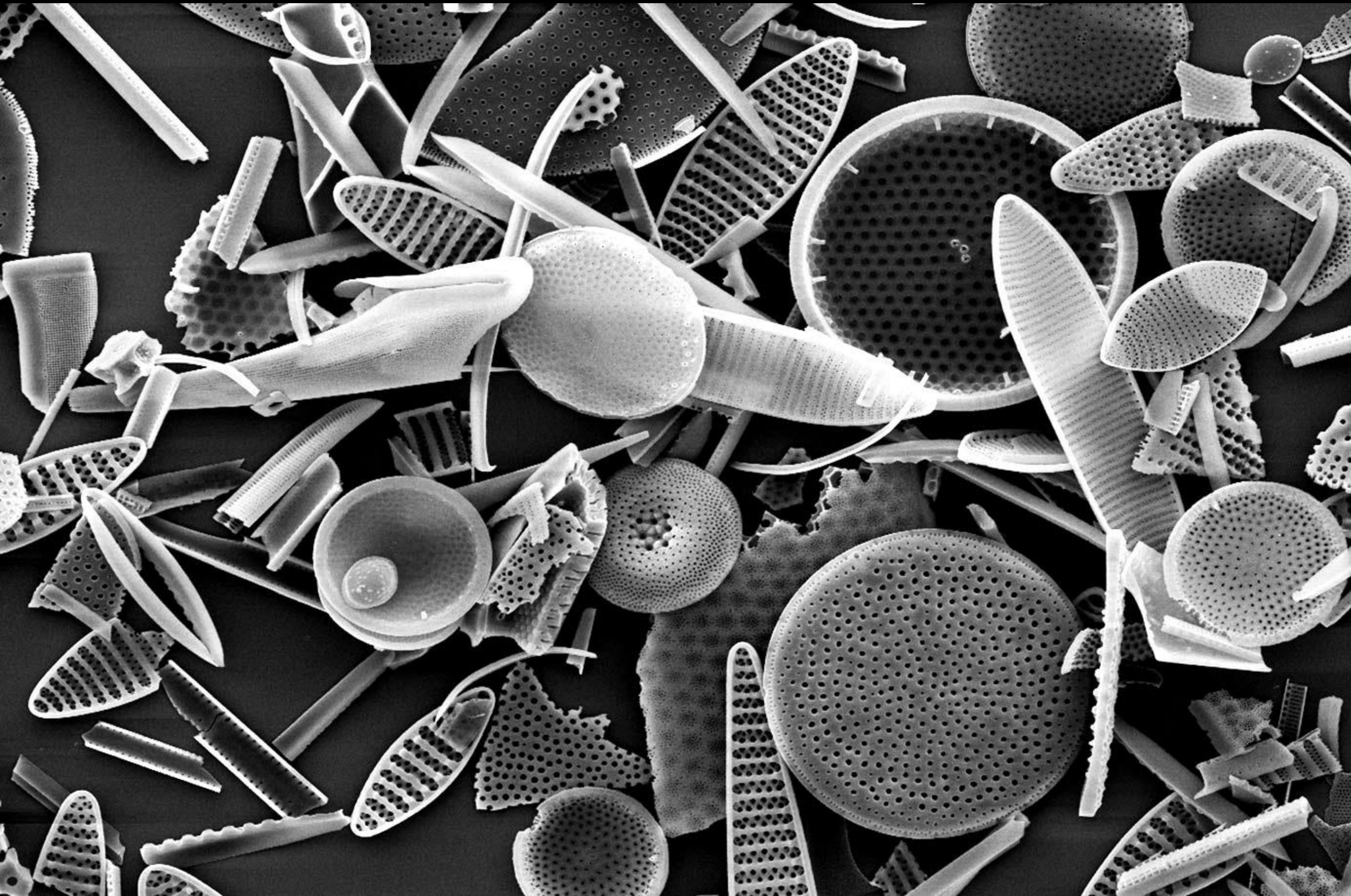
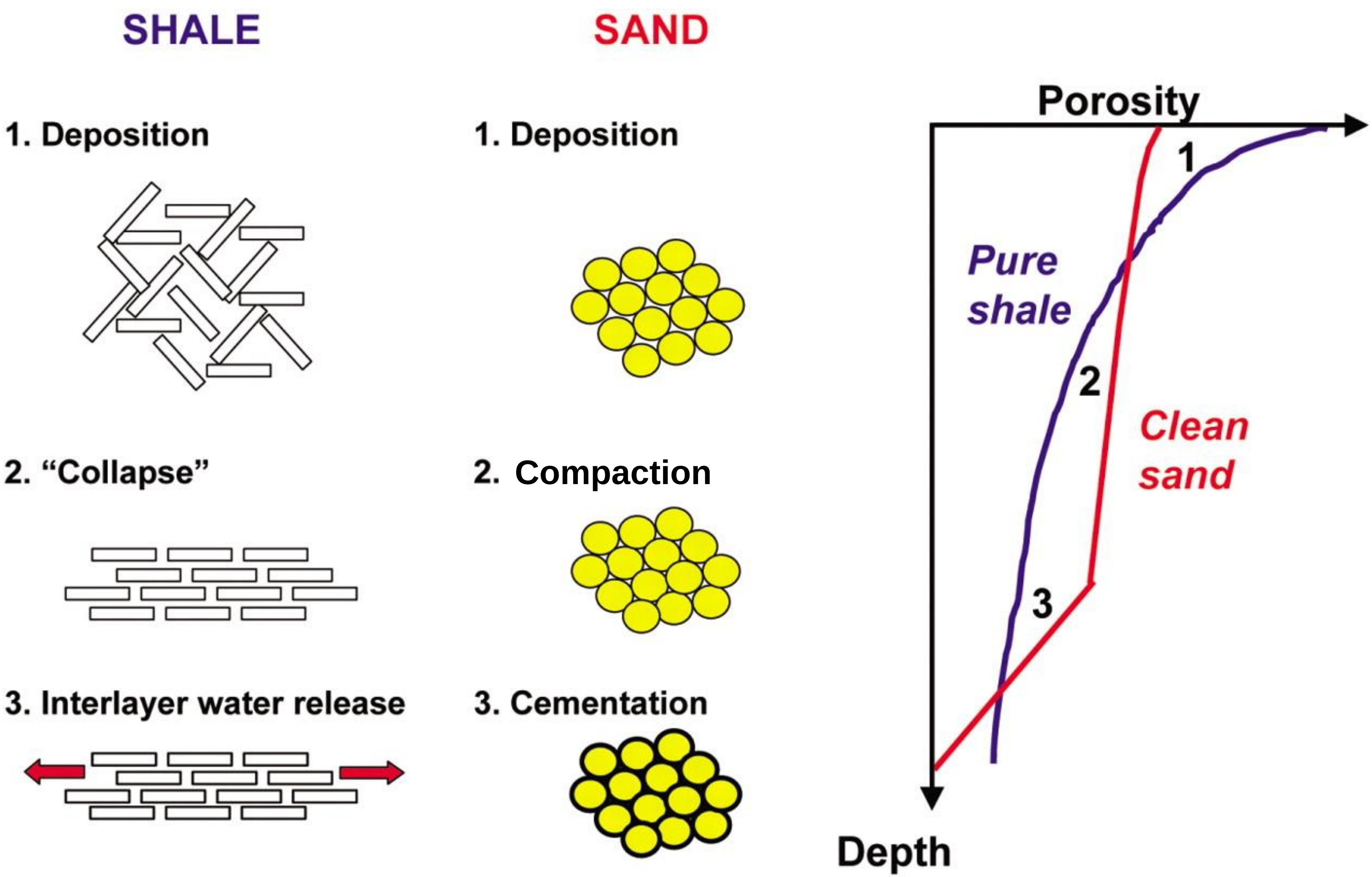
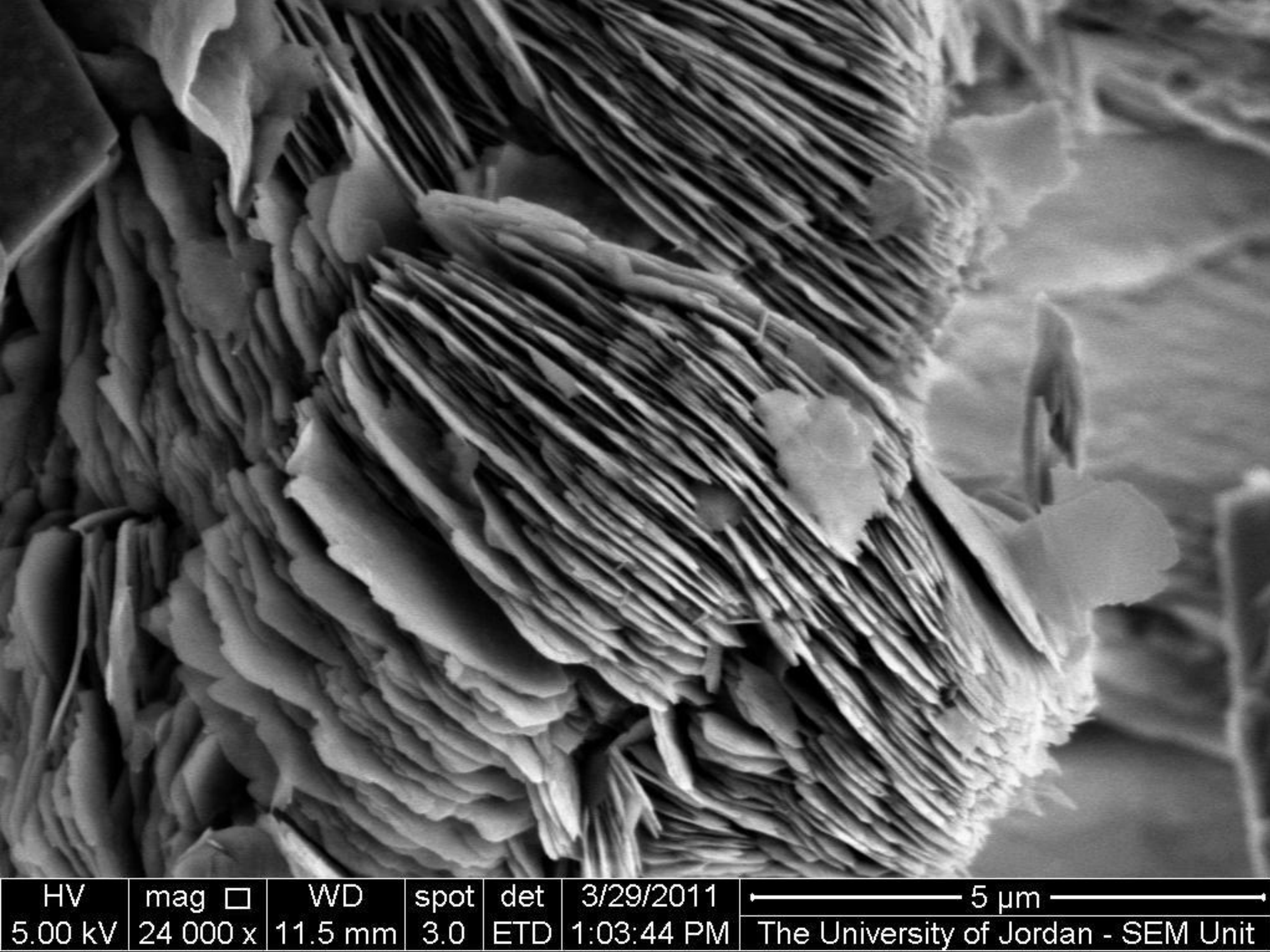


Figure 1. Current producers of industrial minerals in Oregon.

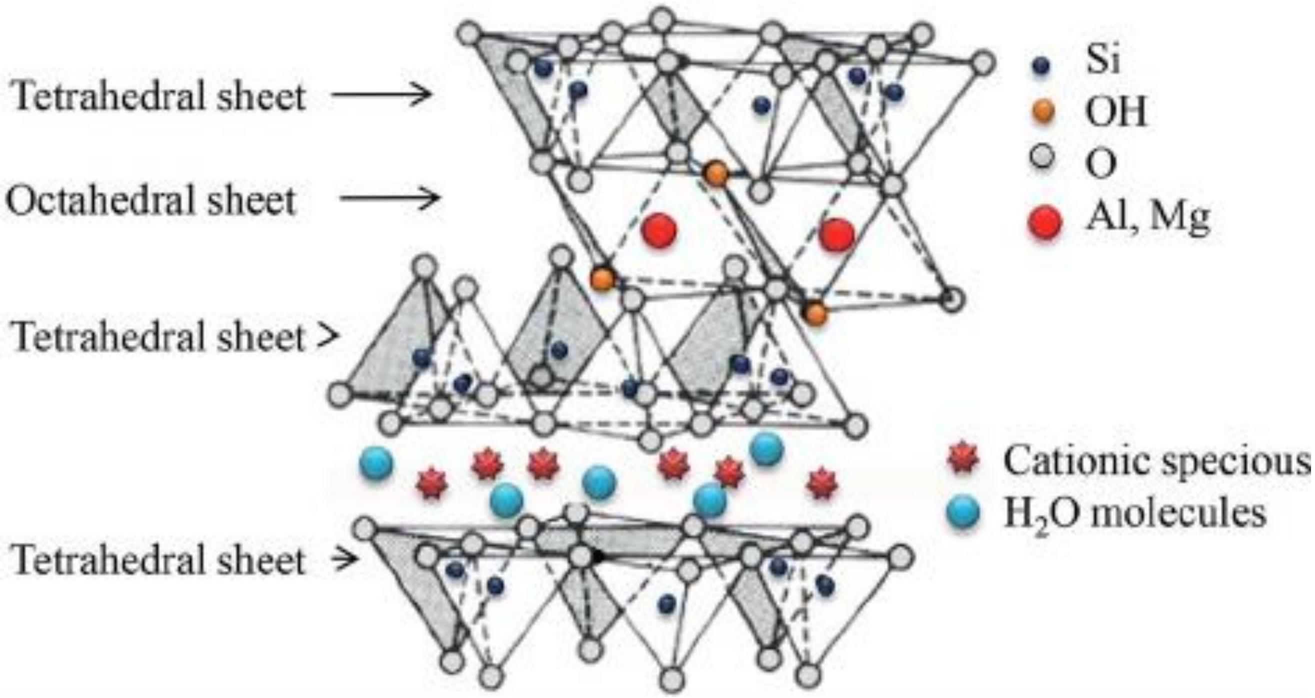
Diatoms (microfossils with silica shells)



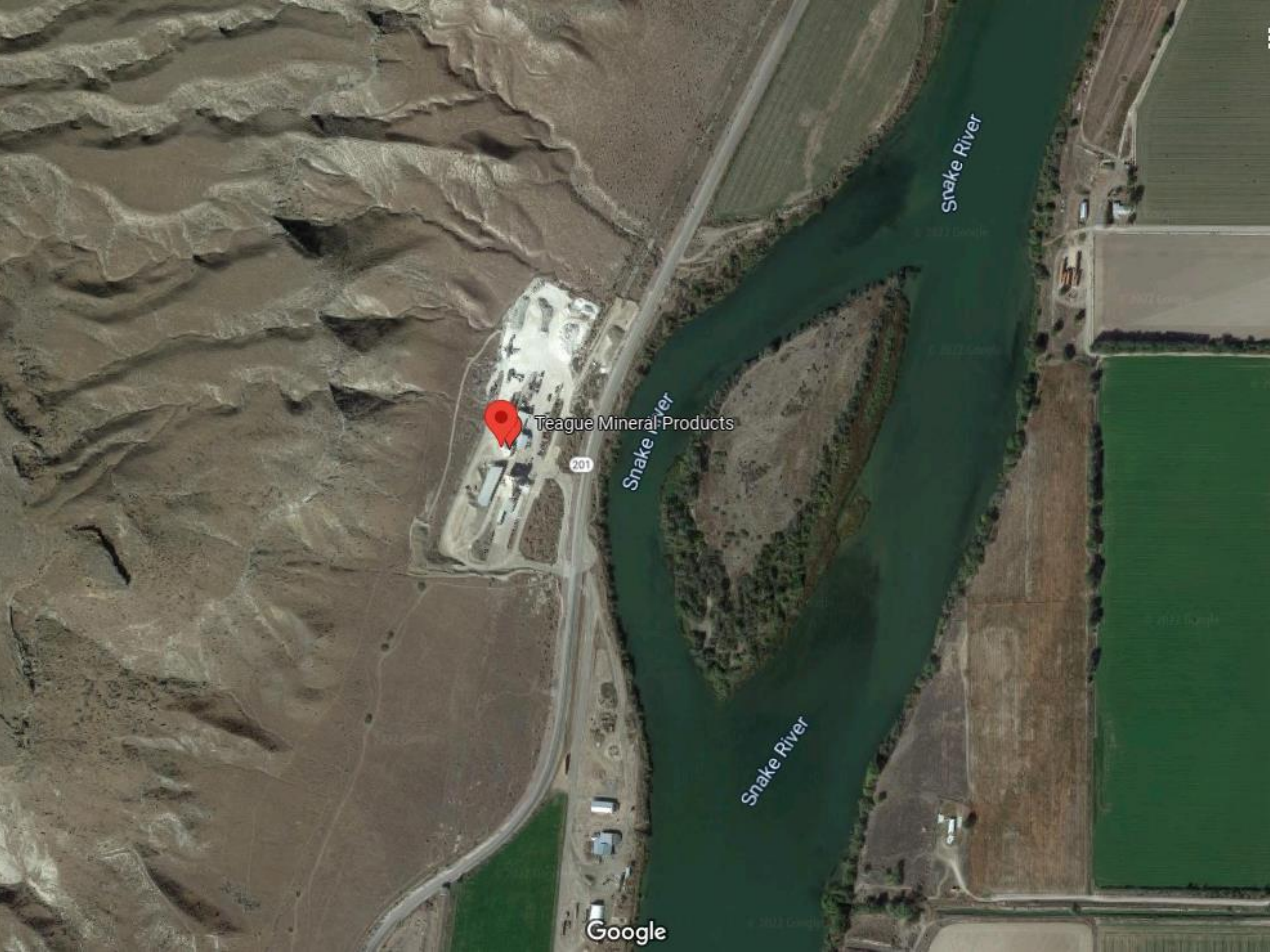

SHALE
SAND
1. Deposition
2. "Collapse"
3. Interlayer water release
1. Deposition
2. Compaction
3. Cementation
Porosity
Depth
Pure shale
Clean sand
1
2
3


HV
5.00 kV
mag ◻
24 000 x
WD
11.5 mm
spot
3.0
det
ETD
3/29/2011
1:03:44 PM
5 μm
The University of Jordan - SEM Unit

Clay mineral structure (generalized)




Kaolin(ite)

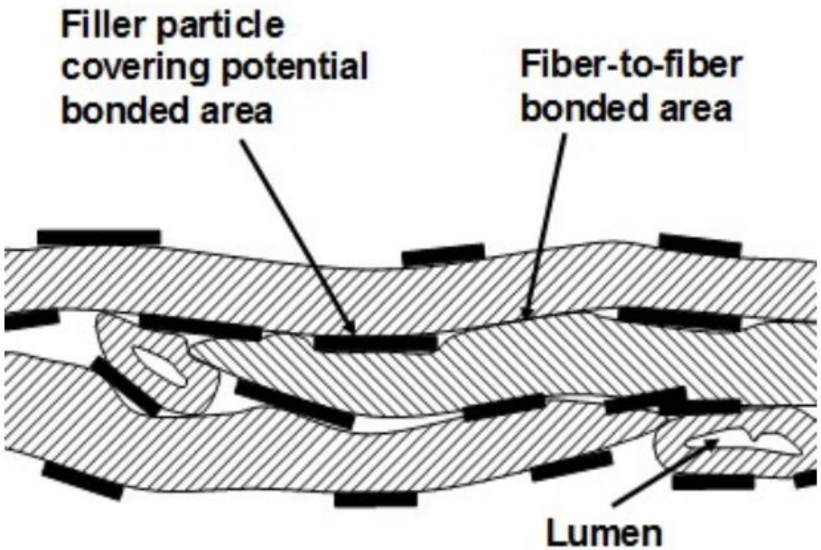

Teague Mineral Products
201
Snake River
Snake River
Snake River
Google

Clay, what's it good for?

Absorption

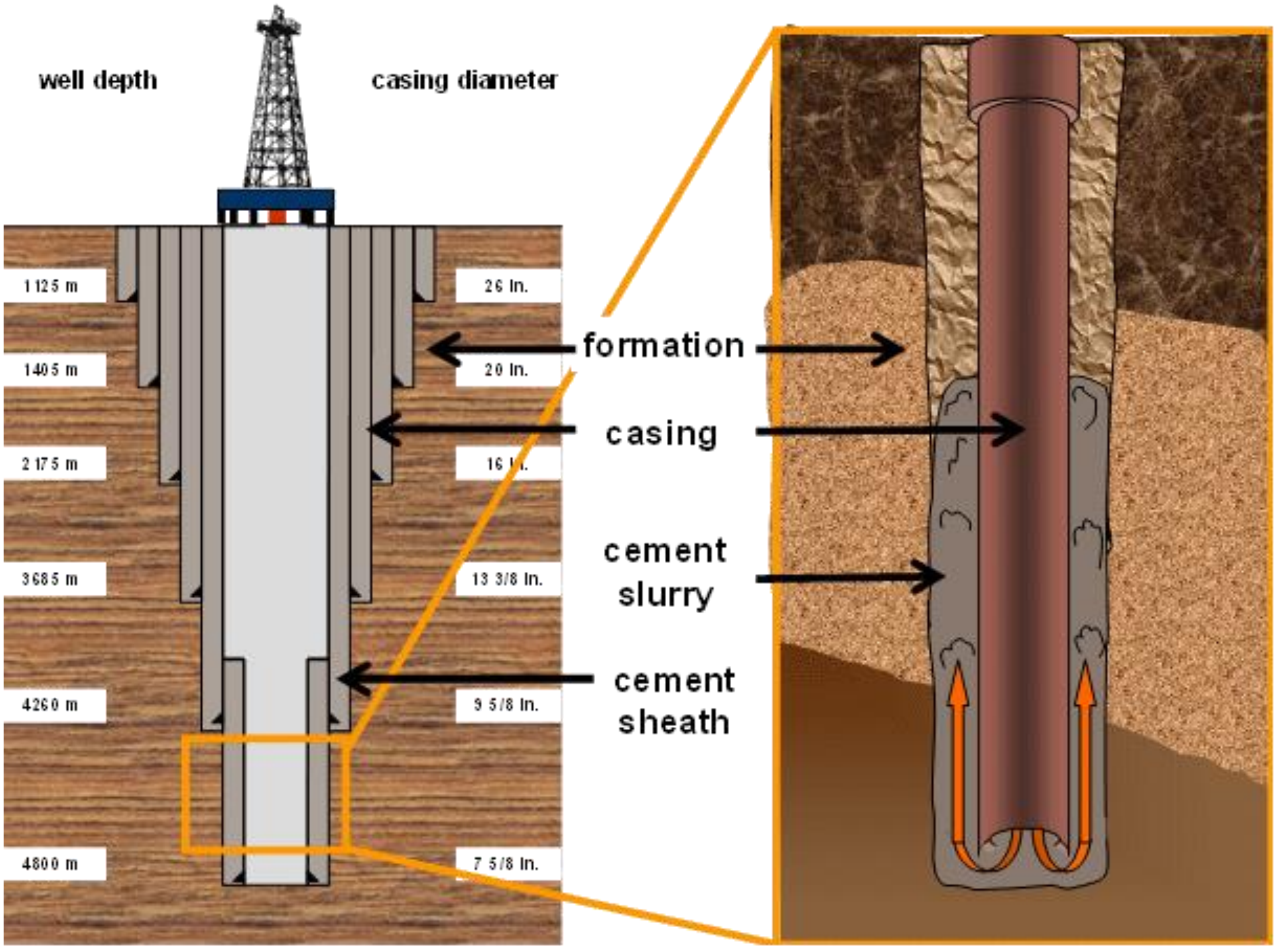
(spills, drilling, etc.)

Paper!!



Benefits of Filler Use	Ways to Maximize the Benefits	Citations
Cost reduction	Increased filler content, using low-cost fillers	Davidson 1965
Brightness	Increased filler content, using bright fillers	Bauch 1992
Opacity	Increased filler content, especially using fillers with optimum size of the primary particles. Best results with high refractive index filler	Bown 1998
Reduced energy of drying the paper	Increased filler content	Kapoor *et al.* 1996
Friction – to *increase* the paper-to-paper coefficient	Composite structure of filler, *e.g.* calcined clay, scalenohedral PCC	Rooks 1993
Friction – to *decrease* the paper-to-paper coefficient	Platy filler with easy delamination, *e.g.* talc	Biza 1999
Control of pore size, *e.g.* for filter papers	Selection of size and particle shape of filler	Schwalbe 1962
Controlled burn rate, *e.g.* for cigarette paper	Use of aluminum trihydrate (ATH)	Schwalbe 1962

Clay is used primarily for drilling (mud)



Multifunctional Clay in Pharmaceuticals

Abstract

Clay has its widespread applications in pharmaceuticals from ancient world to modern era. It is one of the excellent excipients present in the commercially available pharmaceuticals. Its use in many of dosage forms viz. in suspension, emulsion, ointments, gels, tablet and as drug delivery carrier as suspending agent, emulsifying agent, stiffening agent, binder, diluent, opacifier, and as release retardant have been explored in many studies. Variety of minerals is used as both excipient and as an active ingredient; among that kaolinite, talc, and gypsum are important. Their inertness, low toxicity, versatile physiochemical properties and cost effectiveness has increased its usage in pharma industries. Many minerals have its own pharmacological action as antacid, anti-bacterial, anti-emetic, anti- diarrheal agent and as skin protectant etc. Their unique structure which helps them to absorb material onto their layered sheets has opened a wide variety of applications in drug delivery. The understanding of surface chemistry and particle size distribution of clay minerals has led the pharmaceutical field in many directions and future perspectives.

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PLASTER COLOR PACK
AMERICAN CLAY
SNAKE RIVER
PLASTER COLOR PACK
AMERICAN CLAY
SUGARLOAF WHITE
PLASTER COLOR PACK
AMERICAN CLAY
MAUNA LOA
PLASTER COLOR PACK
AMERICAN CLAY
ACACIA
PLASTER COLOR PACK
AMERICAN CLAY
KENTUCKY MOON

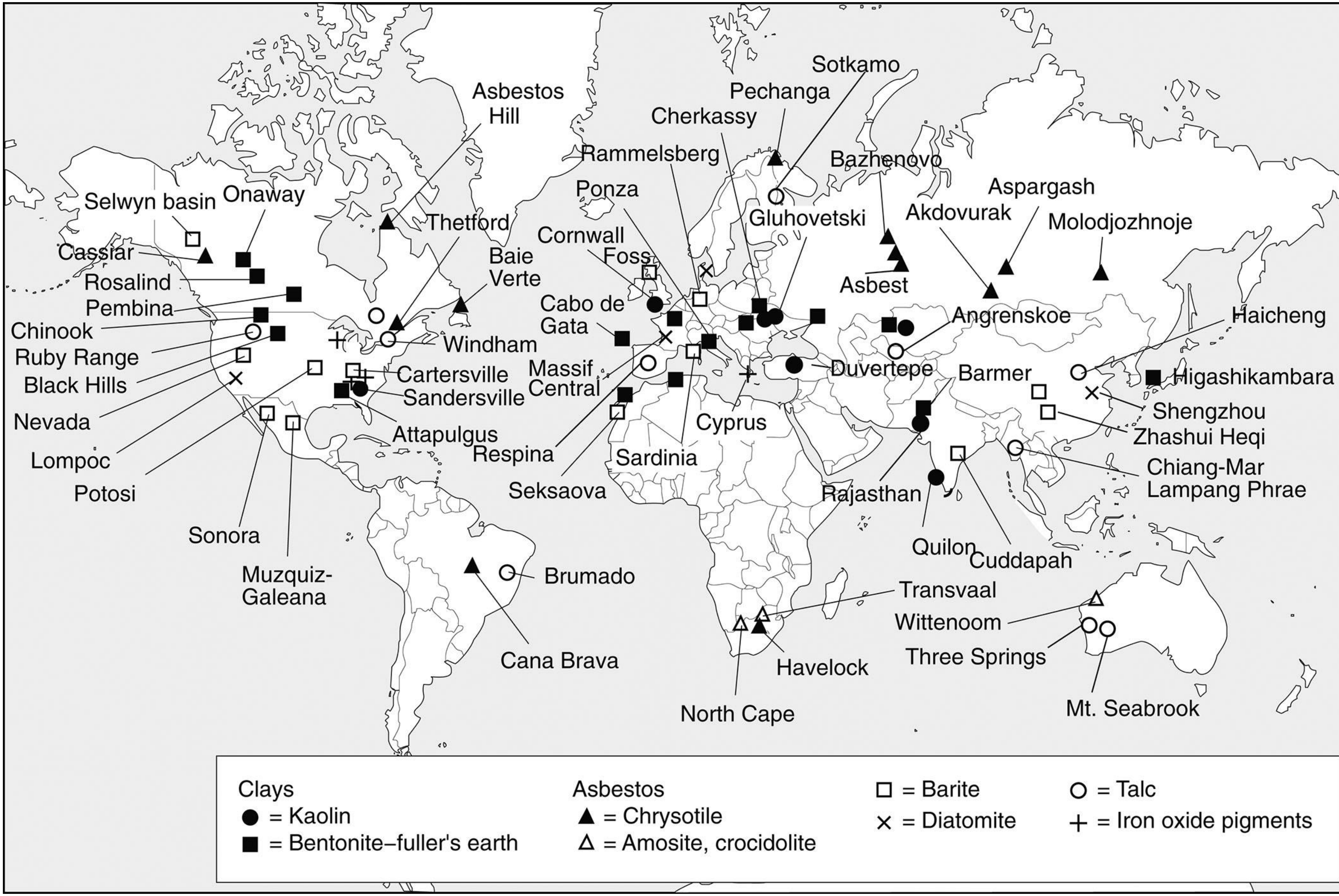
A


Gypsum is an “evaporite”
Salts form when lakes dry up

Empire Mining Company (Gypsum)


"Tufa Towers" at Mono Lake
Calcium Carbonate ($CaCO_3$) = Calcite!

MARS!

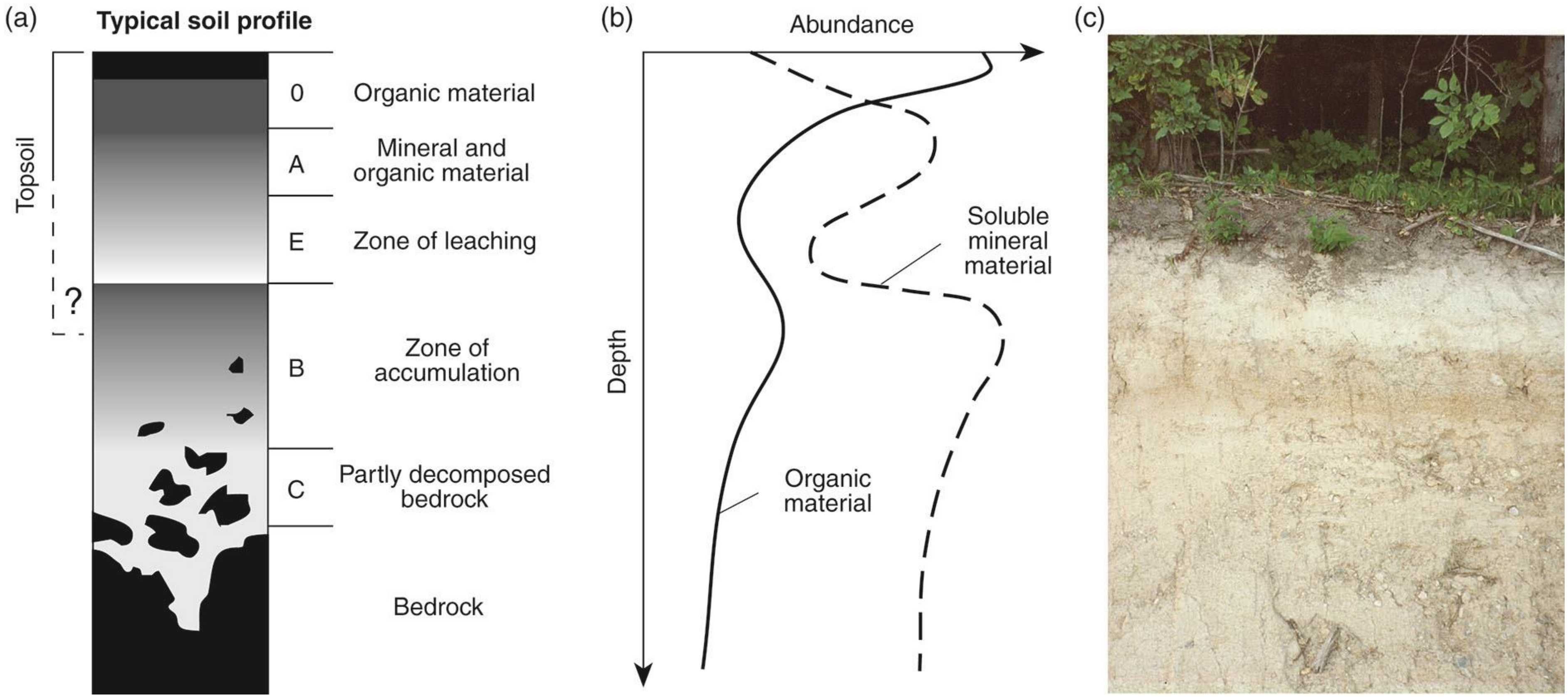


Asbestos Hill
Sotkamo
Pechanga
Cherkassy
Rammelsberg
Bazhenovo
Ponza
Aspargash
Selwyn basin
Onaway
Gluhovetski
Akdovurak
Molodjozhnoje
Thetford
Cornwall
Cassiar
Baie Verte
Foss
Rosalind
Asbest
Pembina
Cabo de Gata
Angrenskoe
Haicheng
Chinook
Windham
Ruby Range
Massif Central
Duvertepe
Cartersville
Barmer
Higashikambara
Black Hills
Sandersville
Shengzhou
Nevada
Attapulgus
Cyprus
Zhashui Heqi
Respina
Lompoc
Sardinia
Chiang-Mar Lampang Phrae
Potosi
Seksaova
Rajasthan
Sonora
Quilon
Cuddapah
Muzquiz-Galeana
Brumado
Transvaal
Wittenoom
Three Springs
Cana Brava
Havelock
North Cape
Mt. Seabrook
Clays
● = Kaolin
■ = Bentonite–fuller's earth
Asbestos
▲ = Chrysotile
△ = Amosite, crocidolite
□ = Barite
× = Diatomite
○ = Talc
+ = Iron oxide pigments

Talc mining in Afghanistan

$(Mg_3Si_4O_{10}(OH)_2)$

Leaching of the soil (concentrating minerals)



Laterites (soil enriched in Fe, Ni, Al)

Some vocabulary:

- Talc
- Laterite
- Evaporites (salts)
- Playas