

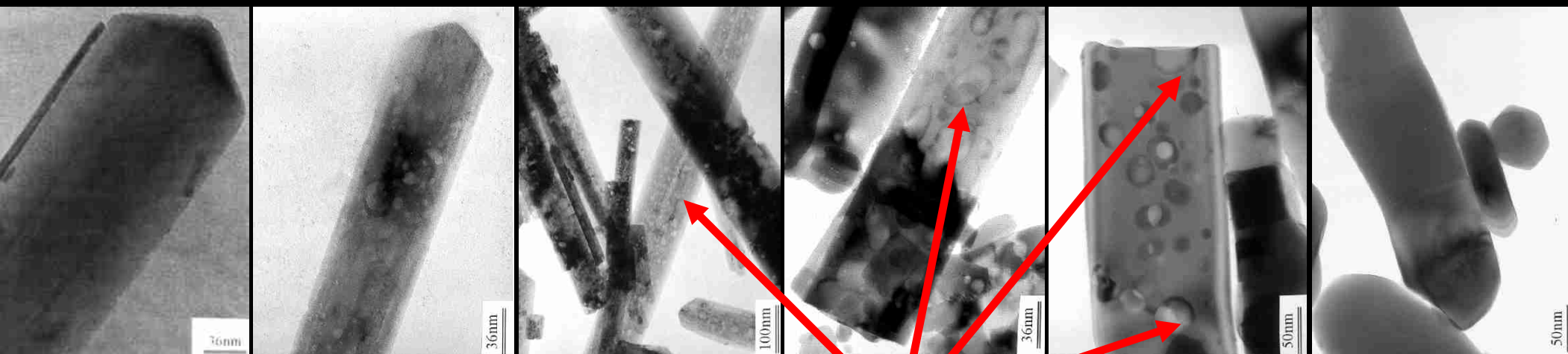
# Heat treatment of pigmented materials

es-Skhul (ca. 100 000 B.P., Israël)

Hélène Salomon, Colette Vignaud, Francesco d'Errico, Yvan Coquinot, Chris Stringer

The **size and shape** of the **dehydration pores** are linked to the **duration** and **T(°C)** of heating

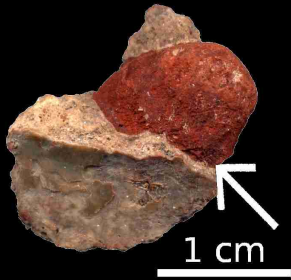
Transmission Electron Microscopy (TEM) observation and mesure of dehydration pores in heamatite crystals that retain the **original shape of goethite**



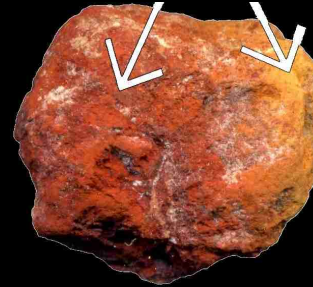
*Heated goethite during 18h (Pomiès 1999)*

Dehydration pores

# The 3 pieces come from 2 different geological formations



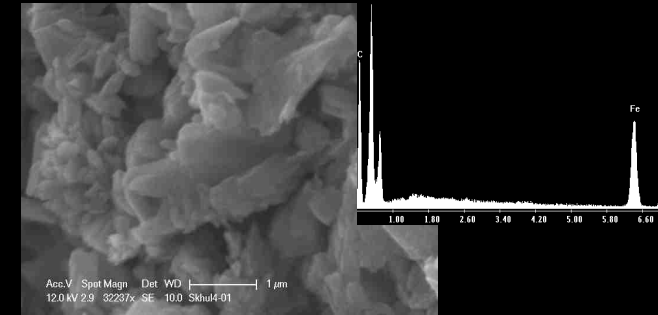
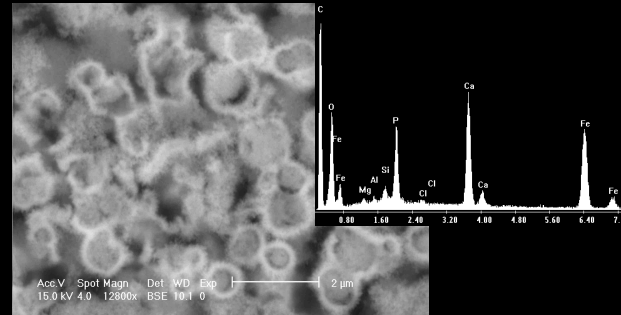
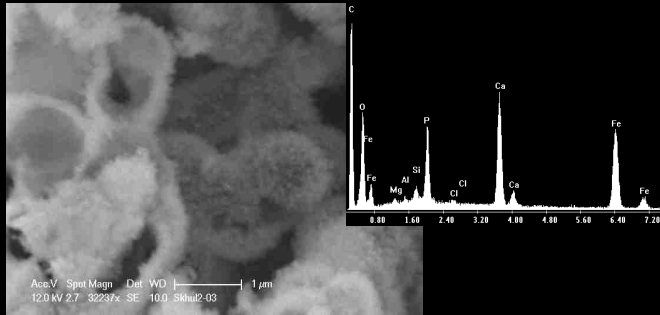
Skh1



Skh2



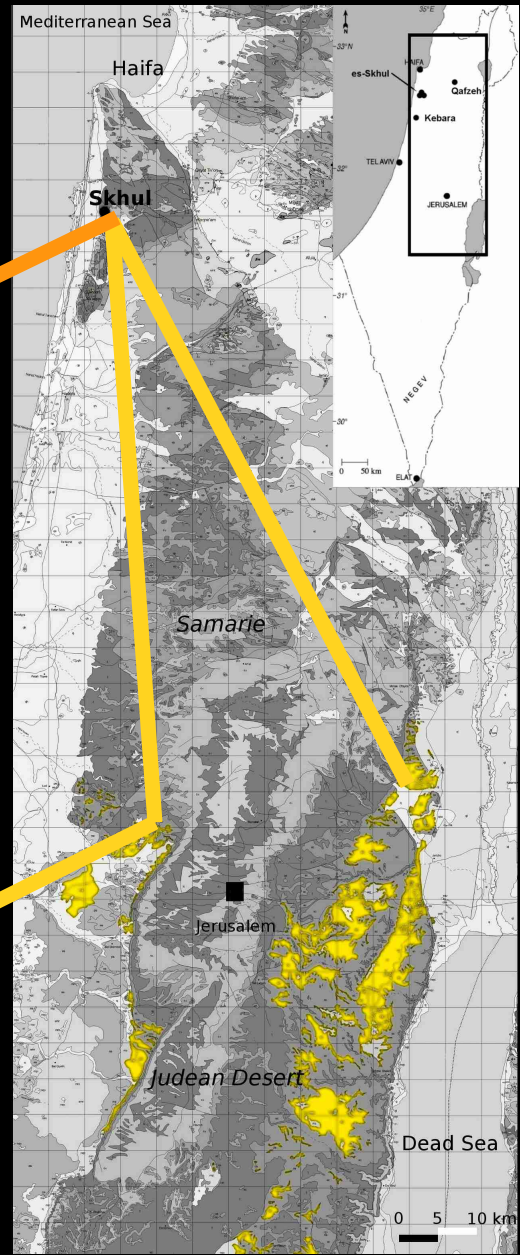
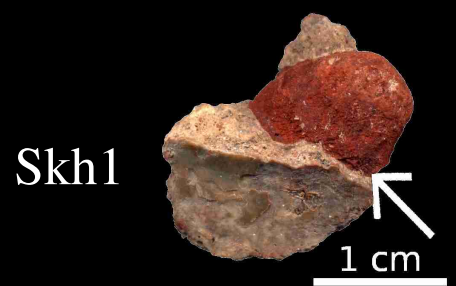
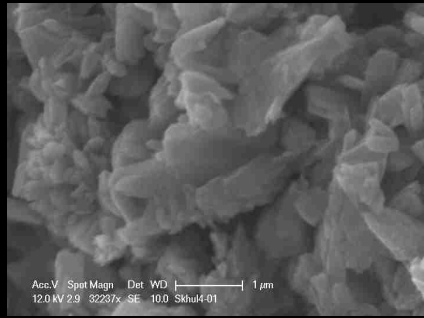
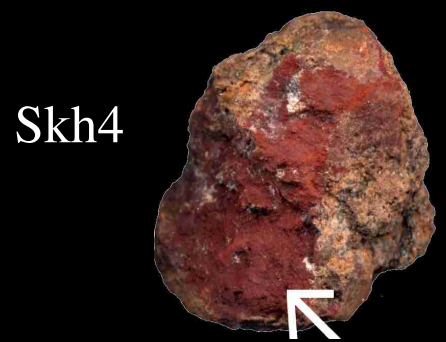
Skh4



Ferruginous phosphorite

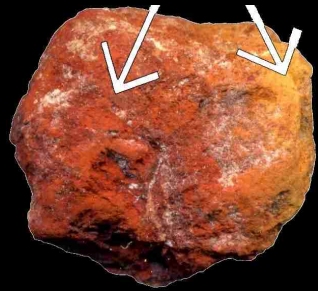
Pure iron oxide

The pigmented materials originate from **near the cave** and from **80 km** from es-Skhul

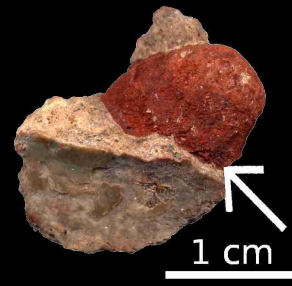


80 km from es-Skhul

# Earliest known **heat treated pigmented** materials



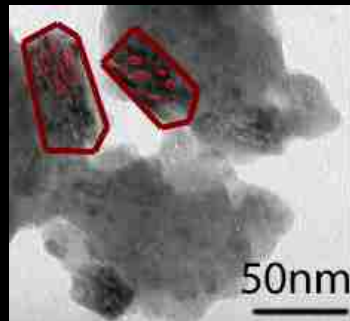
Skh2



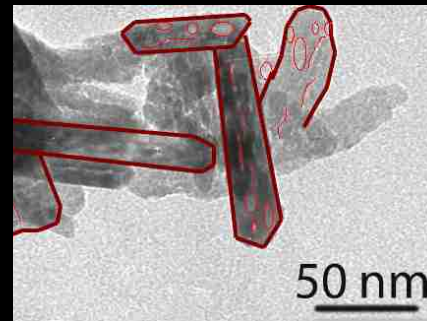
Skh1



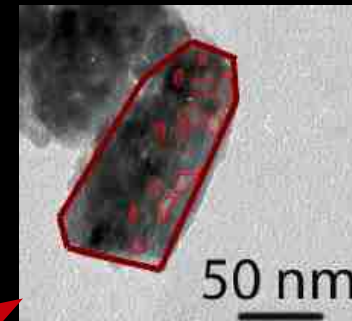
Skh4



300°C



400°C



500°C

Heated products  
Porous haematite

# **Intentional** but **uncontrolled heat-treatment** of goethite meant to produce haematite

**UNCONTROLLED** : Different temperatures and **uncompleted** heating

**INTENTIONAL** : Heating of yellow pigmented materials **extracted** :

- **near** the prehistoric site

- **80 km** from the site

These catchment strategies and heat transformations involve that  
**the red pigmented materials had a high cultural value.**