Meteorites

Chondrites 86% („Primitive" meteorites)

Carbonaceous Chondrites 3.5%

[Olivine, pyroxene, iron (iron $\frac{\text{oxide}}{\text{sulfide}}$)]

Achondrites 8%

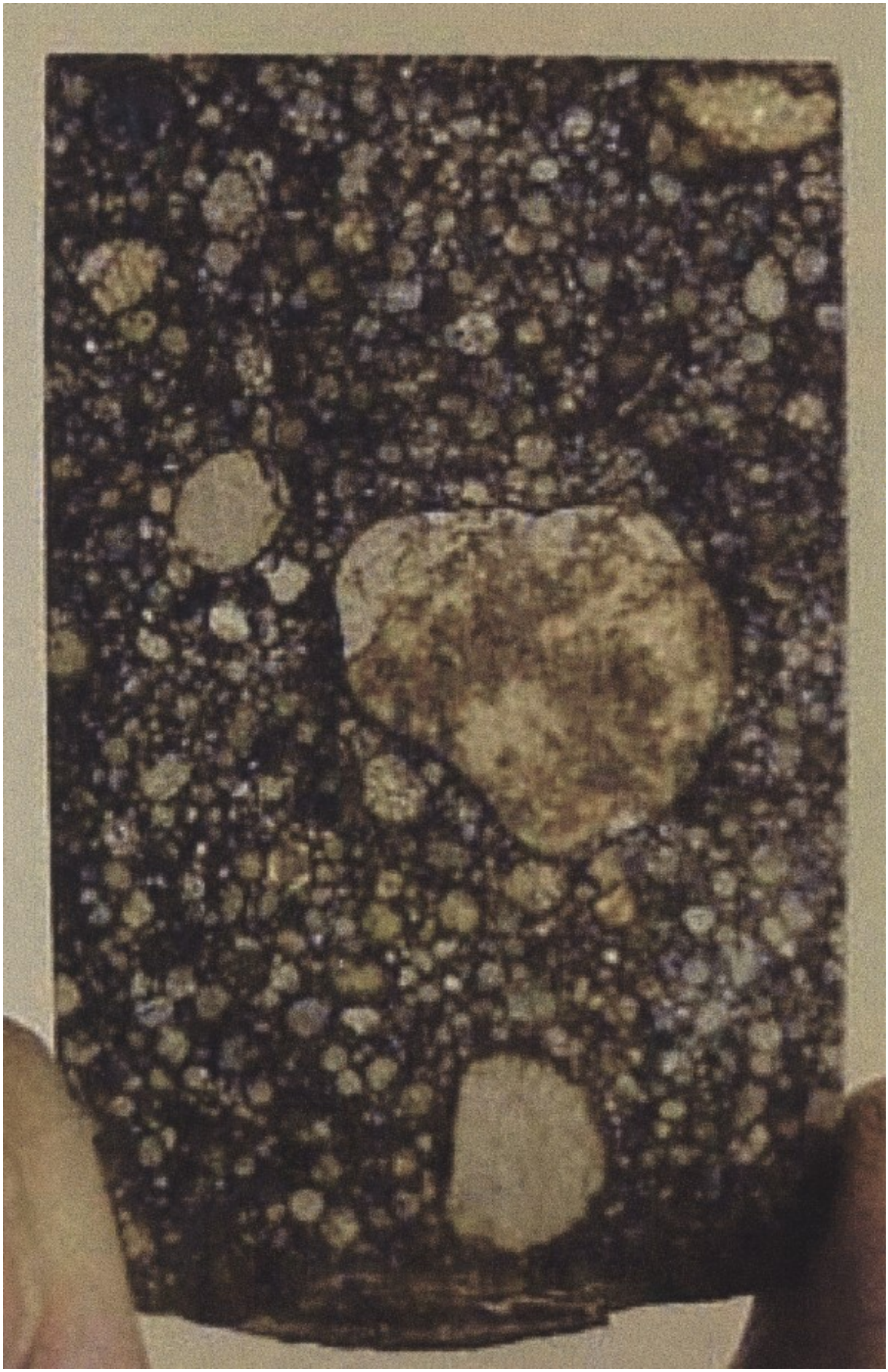
Basaltic meteorites : SNC (Mars)
EHD (Vesta)

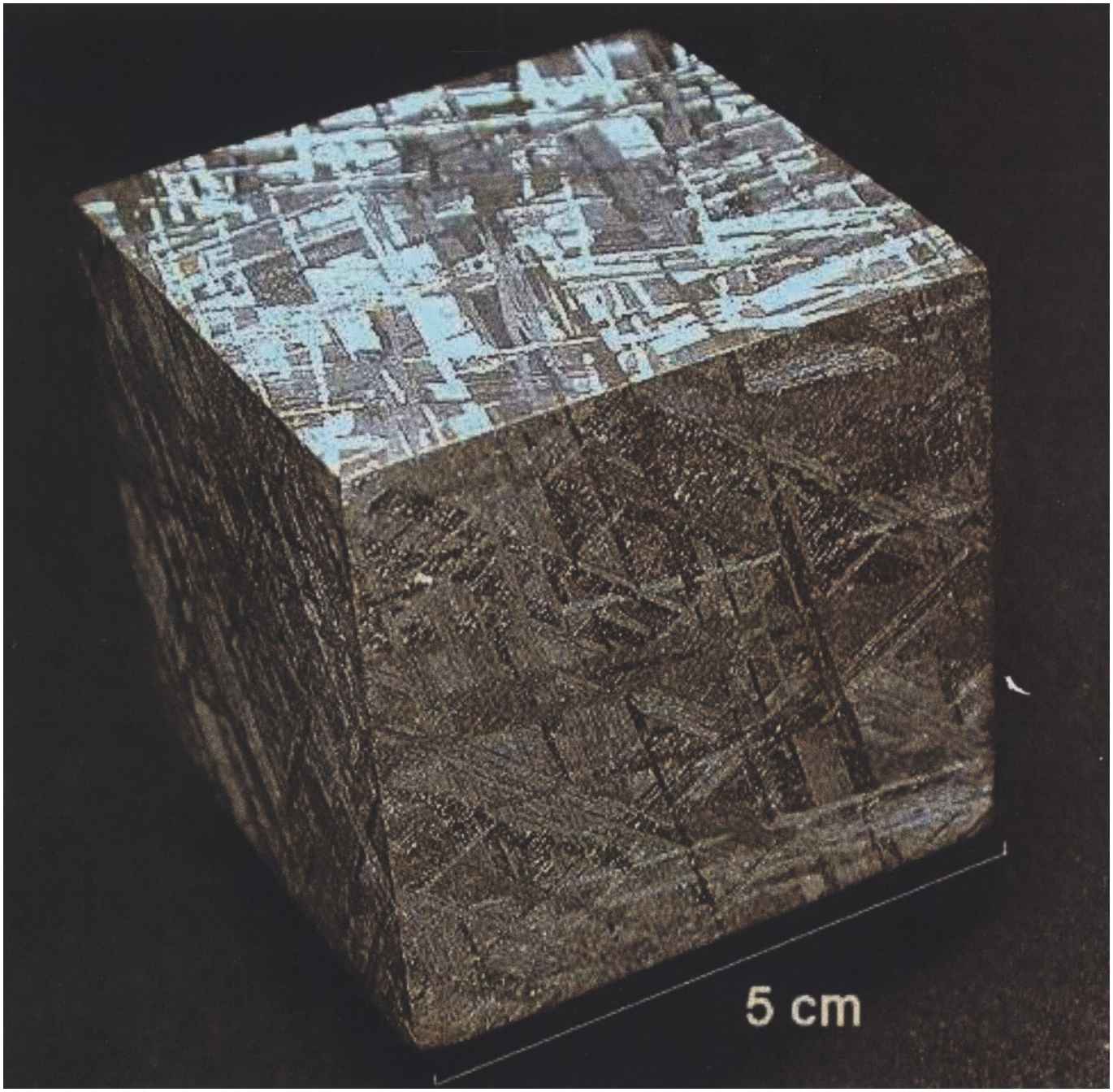
Anorthositic meteorites : (Moon)

Irons 5%

Fe, Ni (5-25%)

Stony irons 1%




5 cm

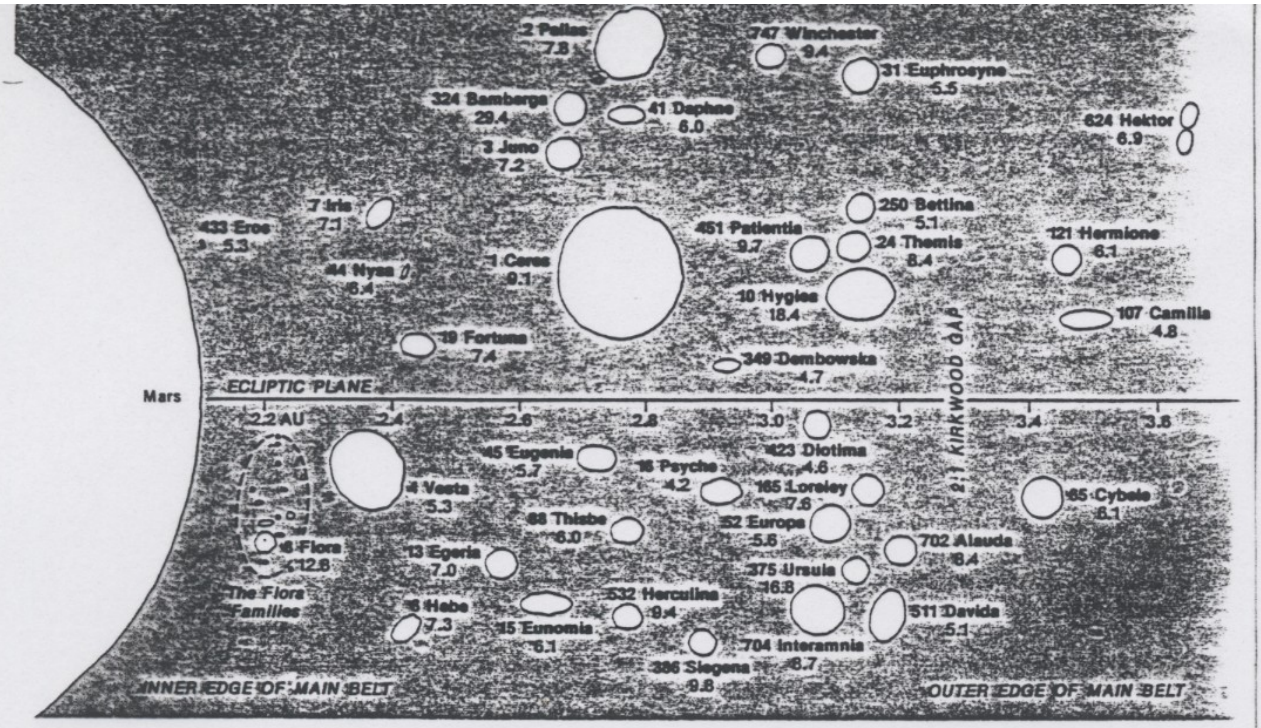


Figure 3. This representation of the physical properties of interesting asteroids includes most of the asteroids larger than about 200 km in diameter. They are portrayed in their correct relative sizes and shapes (the limb of Mars is shown for comparison); colors and albedos are also indicated. The bodies are positioned at their correct relative distances from the Sun. Asteroids located near the top or bottom of the diagram occupy relatively eccentric or inclined orbits (or both), while those shown near the ecliptic plane move in relatively circular, noninclined orbits. Rotation periods, in hours, are given in the lower panel. Among the special smaller asteroids indicated are members of the Flora families larger than 15 km in diameter, but this illustration would be hopelessly cluttered if all asteroids of comparable size were shown – an estimated 1,150 asteroids in the main belt alone have diameters larger than 30 km, yet only five Flora family asteroids attain that size. Note the contact-binary Trojan asteroid 624 Hektor.

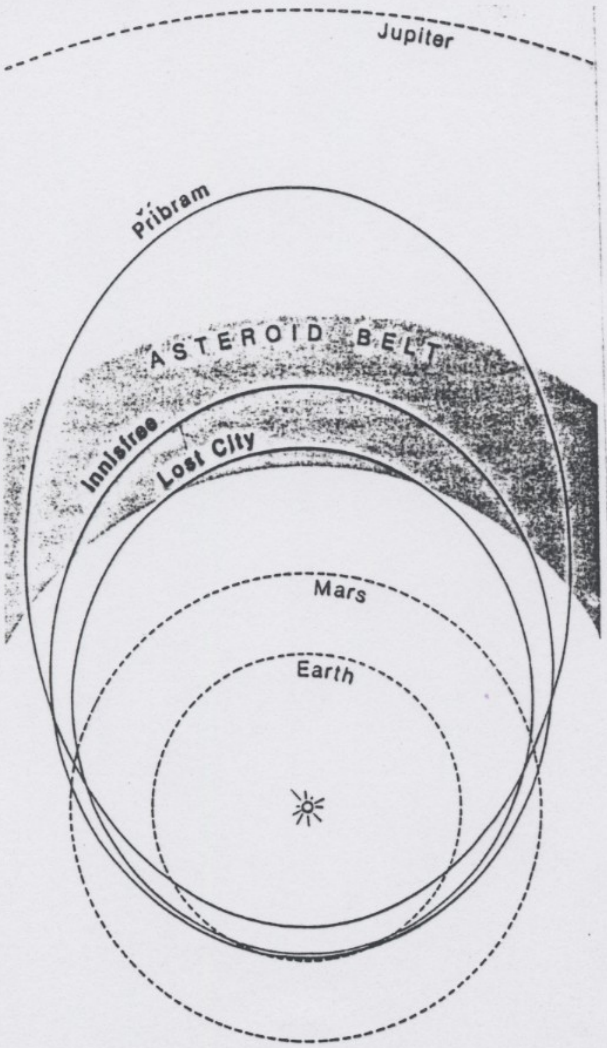
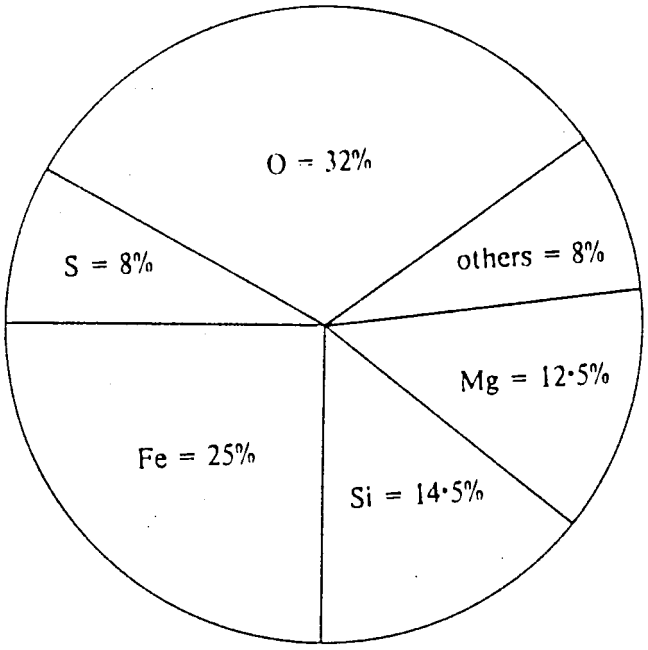
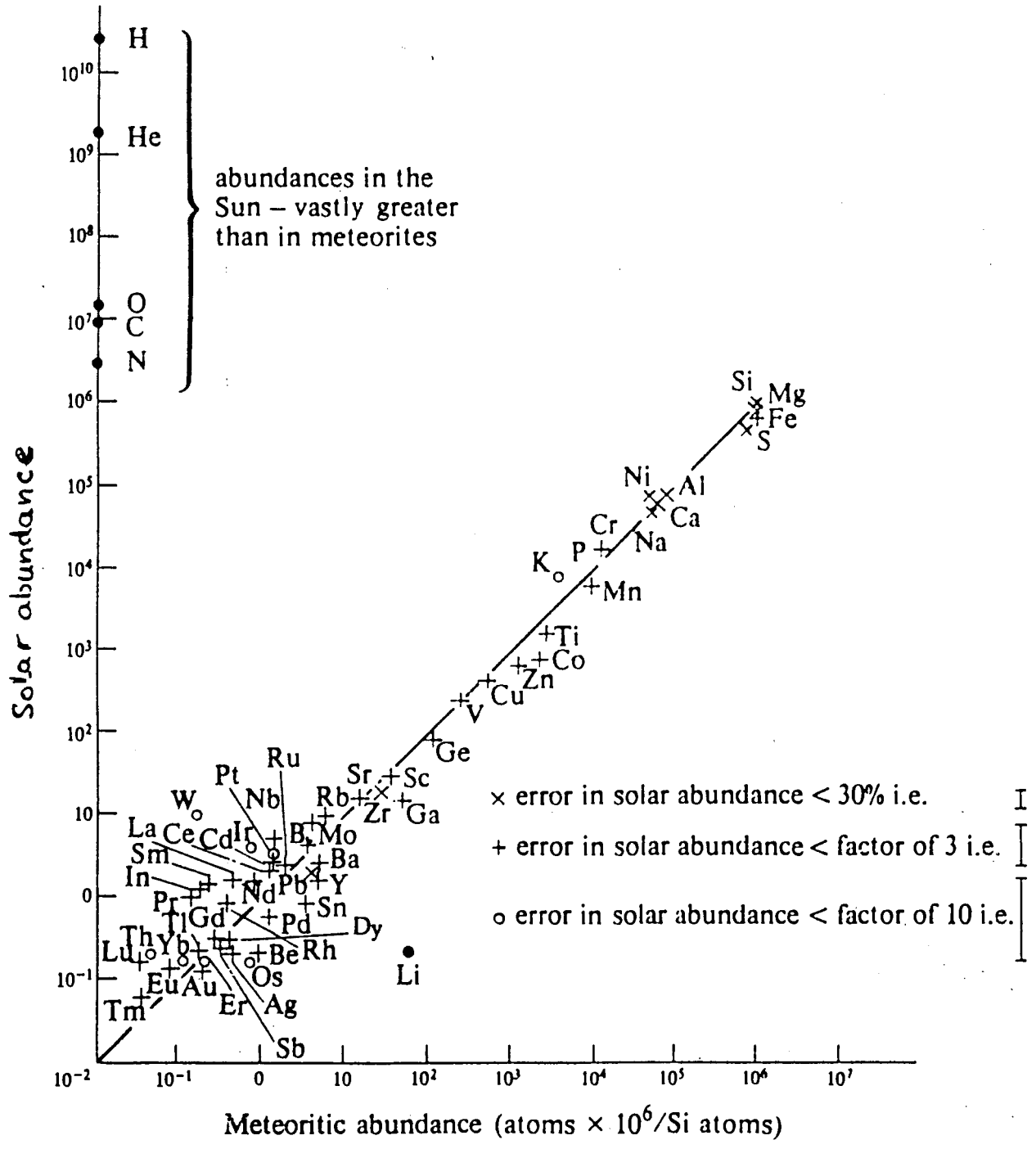


Figure 15. Pre-impact orbits of three meteorites that were photographed during atmospheric entry.



Hauptelemente
in kohligen Chondriten

Carbonaceous Chondrites



Cosmochemical classification of elements

Refractory : condenses at high temperature from solar nebula

Examples : Ca, AL, Si, Fe, Mg ...

Moderately volatile : Condenses at ~ 1000 K

Examples : K, Na, Zn

Volatile : Condenses at 500 - 900 K

Examples : S, C, Pb, Cl

Highly volatile : Condenses < 500 K

Examples : N, H

Lithophile : Prefers silicate phase : Ca, Al, Zn...

Siderophile : Prefers metal phase : Co, Ni, P, ...

Chalcophile : Prefers sulfide phase : Cu, Pb ....

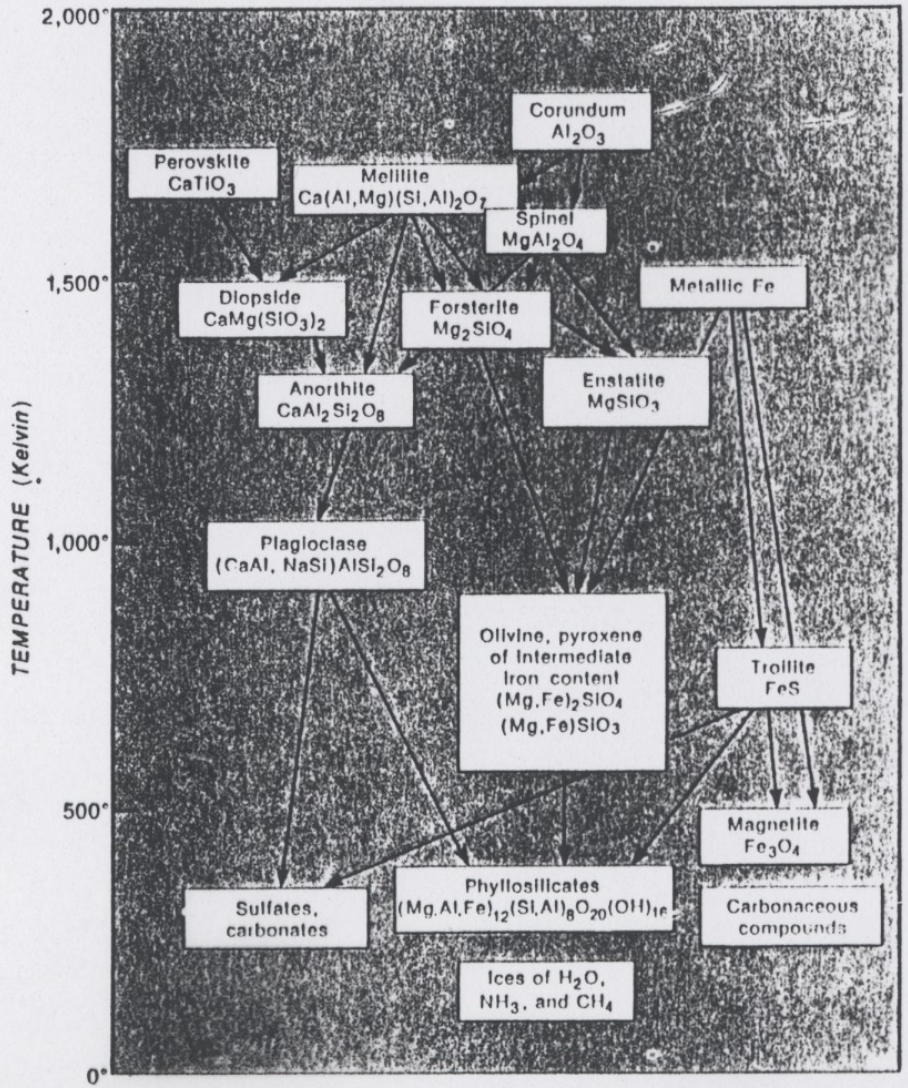
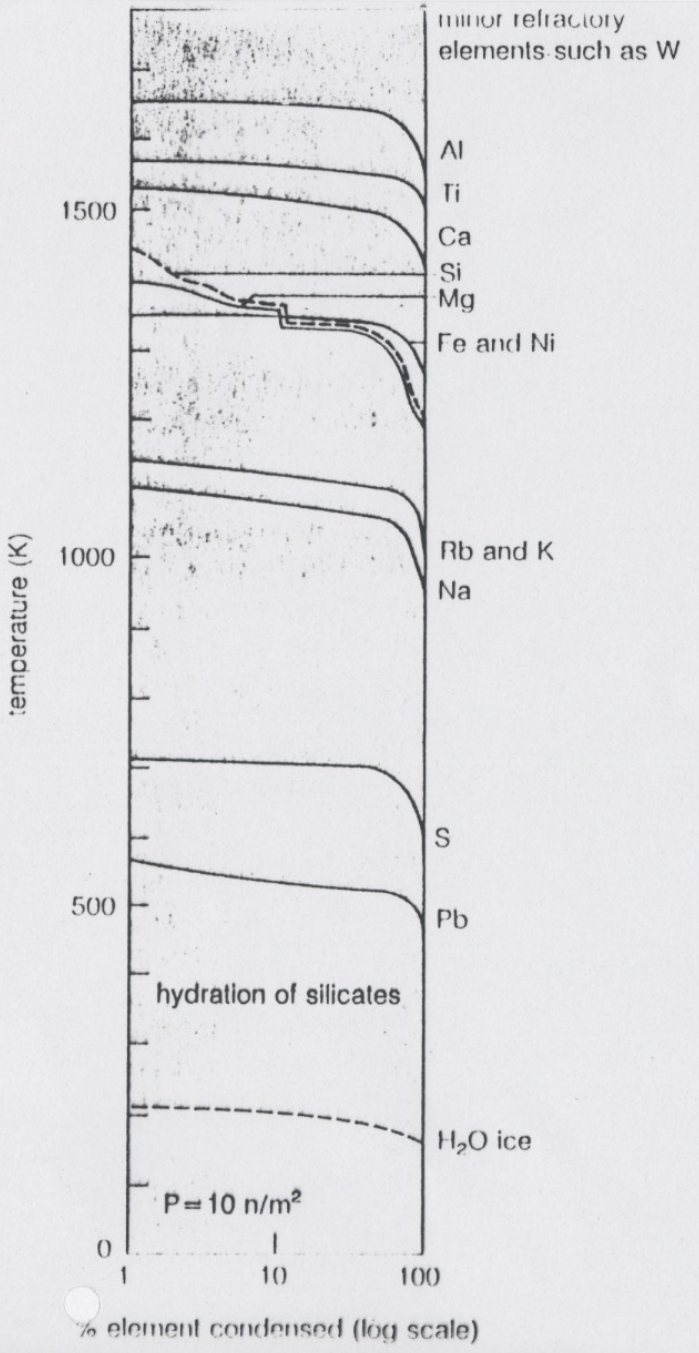
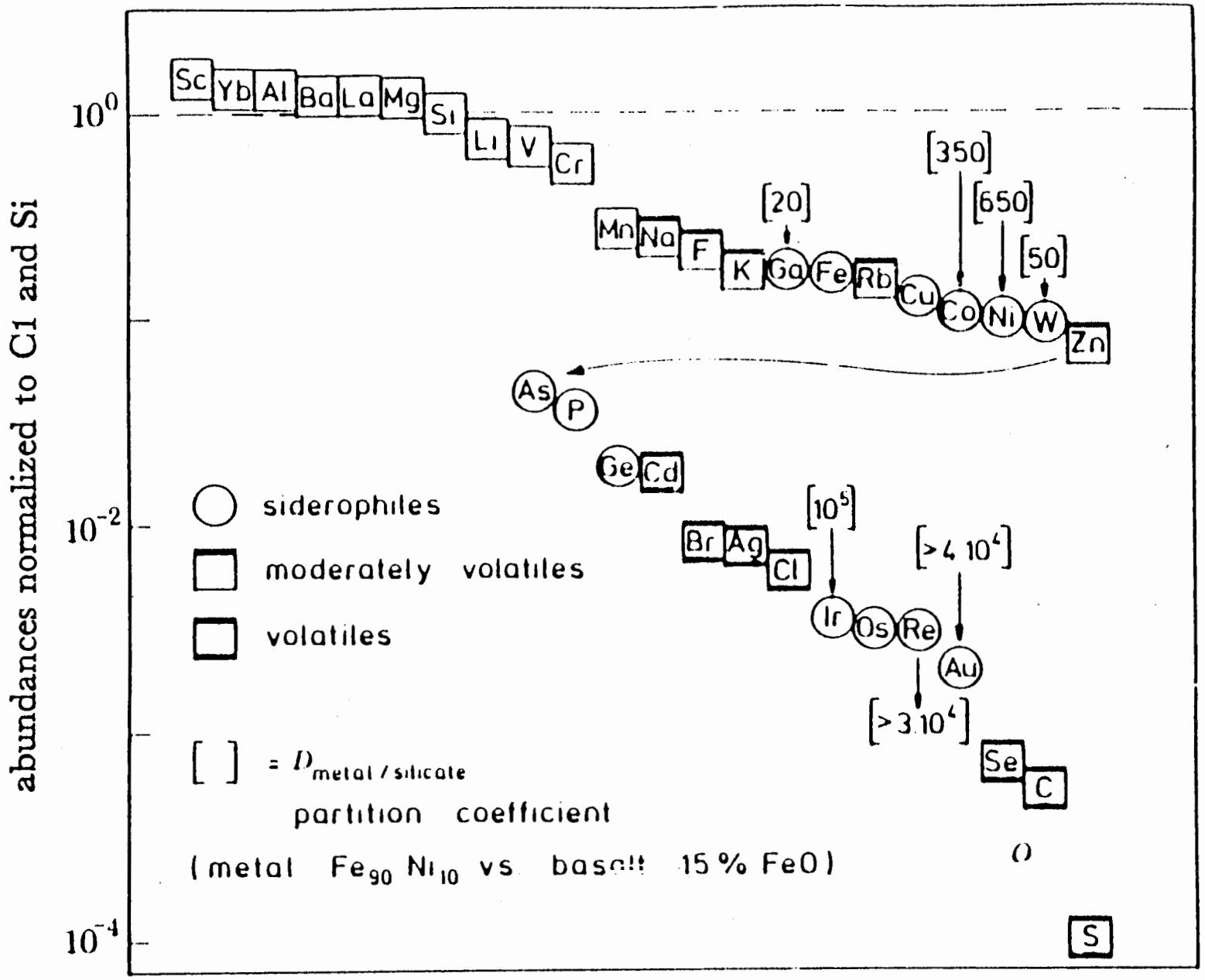
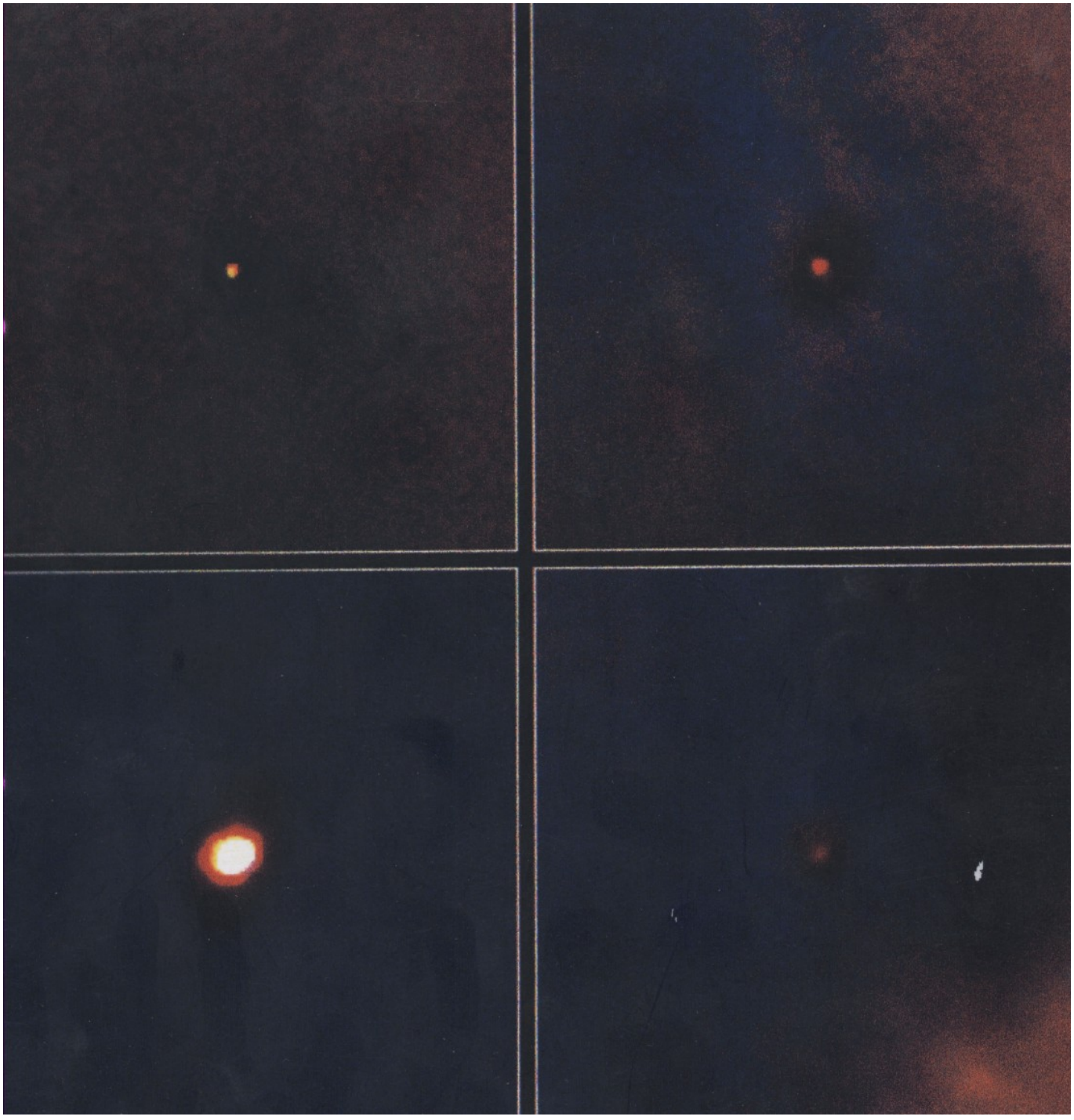


Figure 7. **A simplified depiction of the sequence in which minerals would condense from a cooling gas of solar composition. Arrows signify that continuing reaction with cooling residual gases would transform minerals from the upper boxes into those minerals beneath them. Rapid cooling would prevent complete transformations, accounting for the preservation of the spinel, melilite, perovskite, and so on in Allende CAI's.**





Composition of the Earth's mantle normalized to C1 and Si derived from analyses of primitive spinel-lherzolites (Jagoutz *et al.* 19',) and unpublished data of th. Mainz laboratory).



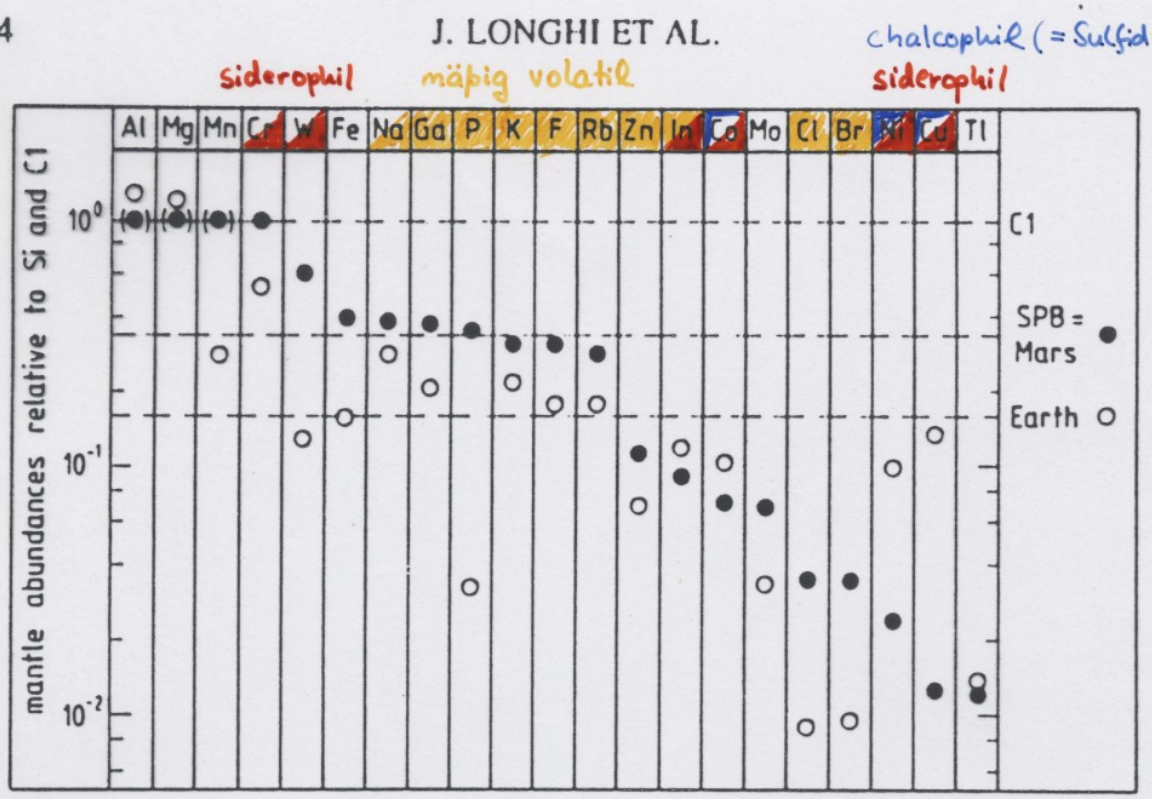
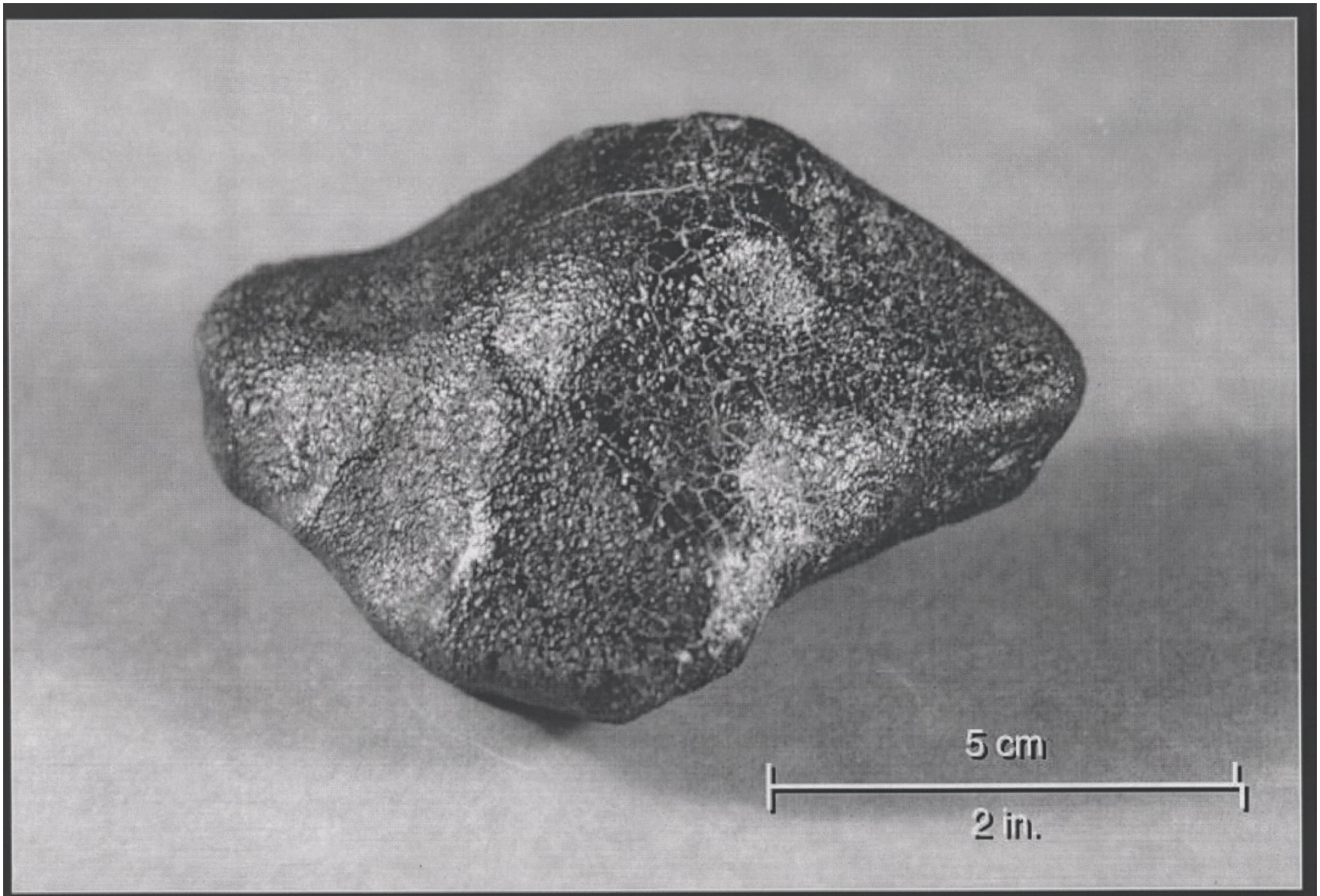


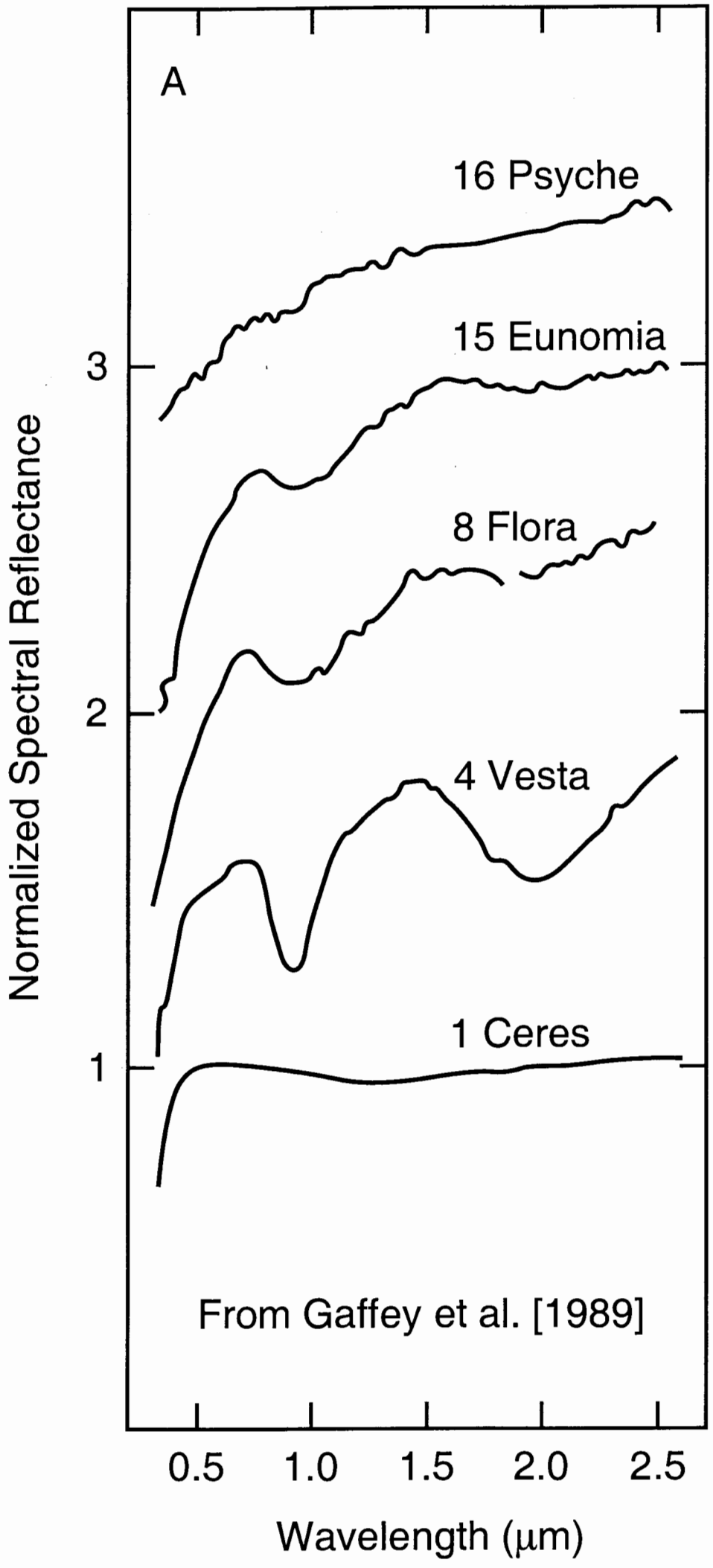
Fig. 3. Comparison of major and trace elements in the silicate portions of the Earth and Mars normalized to chondritic abundances (figure after Dreibus and Wänke 1985).



Meteroite · Fragment of Vesta

Lab Photograph · Russel Kempton, New England Meteoritical Services

PRC95-20B · ST ScI OPO · April 19[illegible]995 · B. Zellner (GA Southern Un[illegible]), NASA


A
16 Psyche
15 Eunomia
8 Flora
4 Vesta
1 Ceres
From Gaffey et al. [1989]
Normalized Spectral Reflectance
3
2
1
0.5
1.0
1.5
2.0
2.5
Wavelength (μm)