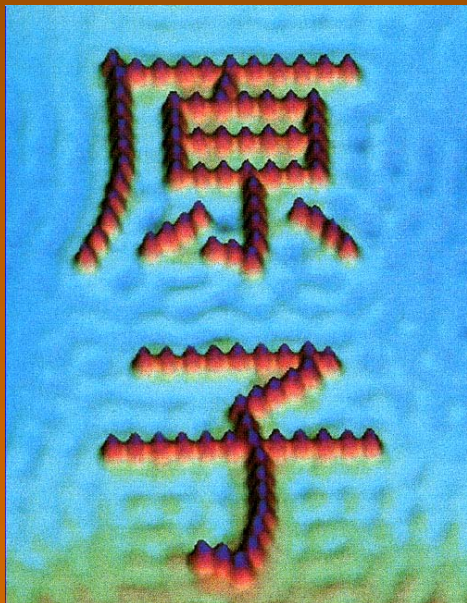
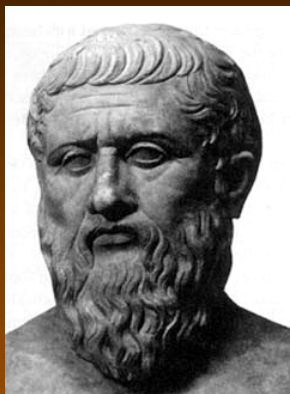
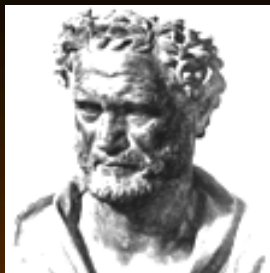


From ATOMS to the UNIVERSE

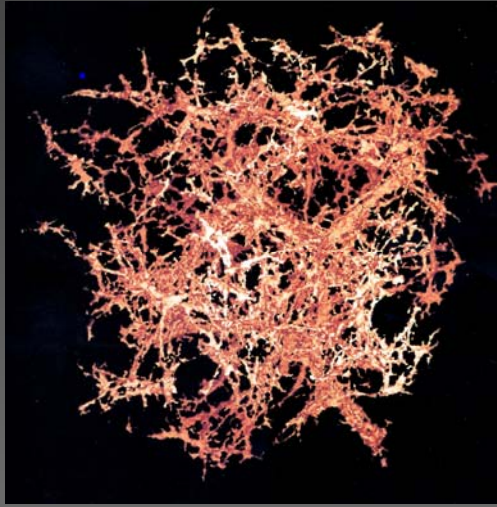
The evolution of philosophical
and scientific understanding of
the physical world- from Plato &
Democritus to Quantum physics

Course P340 (Spring 2011)

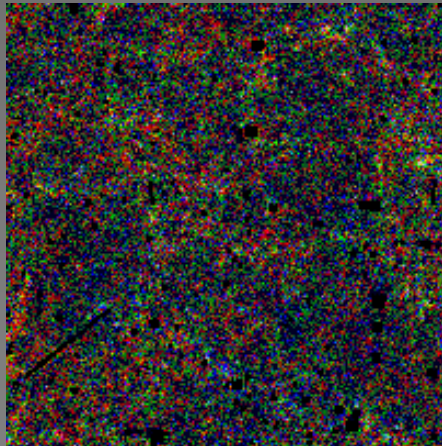


The EARLY UNIVERSE

START HERE
(14.5 billion yrs ago)



The universe as we know it began with the Big Bang, some 14 Gyrs ago- within less than 1 Gyr, structure had appeared on very large scales, resulting in the galaxies, in which stars formed- our sun some 5 Gyrs ago, from self-gravitating gas and dust.



The Prehistoric World



About 480 mYrs ago (Burgess shale)

CENOZOIC ERA: The age dominated increasingly by mammals begins 65.3 Myrs ago. Many species come and go, including very large land mammals. Huge climatic and geographical changes ensue.

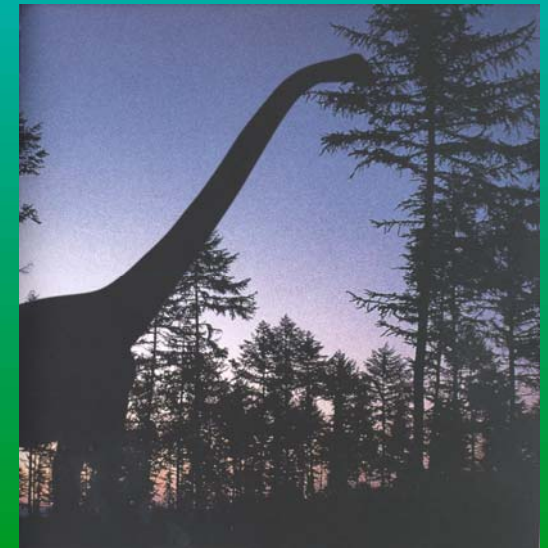
Formation of Sun, Earth: 4.6 Gyrs ago

Life began on Earth: 3 Gyrs ago

First marine animal life: 600 Myrs ago

Life on land: 300 Myrs ago

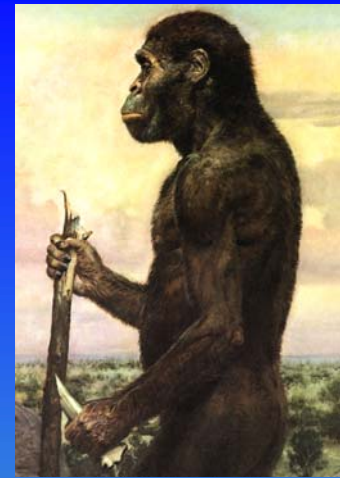
Dinosaurs: 220- 65 Myrs ago



125 Myrs ago (Jurassic)

Early man (I)

The ancestors of modern Humans first appeared some 3 Myrs ago in the African rift valley. They slowly spread across Europe and Asia (but not the Americas or Oceania)



Australopithecus Africanus (1 Myr)

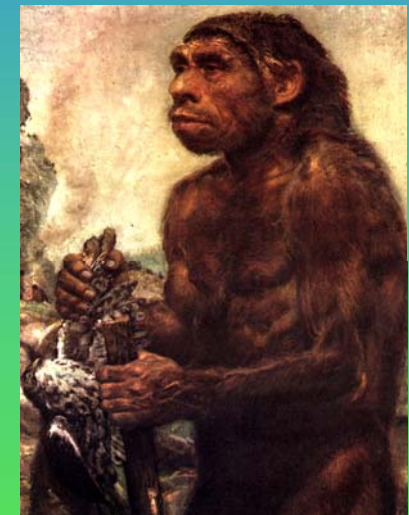


Homo Erectus (500 Kyr)

Smilodon (500 Kyr)



For much of this time life was tough for our ancestors- who were preyed upon by a variety of terrifying birds & mammals. They were omnivores, walked upright and could survive in plain & forest, and slowly evolved tools.



Neanderthal Man (200 Kyr)



Early man (ii)

The last 100 Kyr have been dominated by ice ages & climate fluctuations. In the midst of this turmoil, modern man (*Homo sapiens*) appeared. Some 23 Kyr ago the competition between *Homo Sapiens* & *Homo Neanderthalis* was settled in Europe (although interbreeding took place).

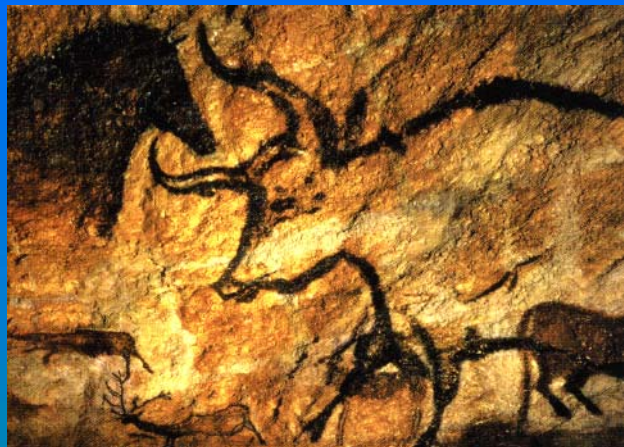


Many of the species most important to prehistoric man have disappeared in the last 20 Kyr.



Old Stone Age
(c. 30,000 yrs ago)

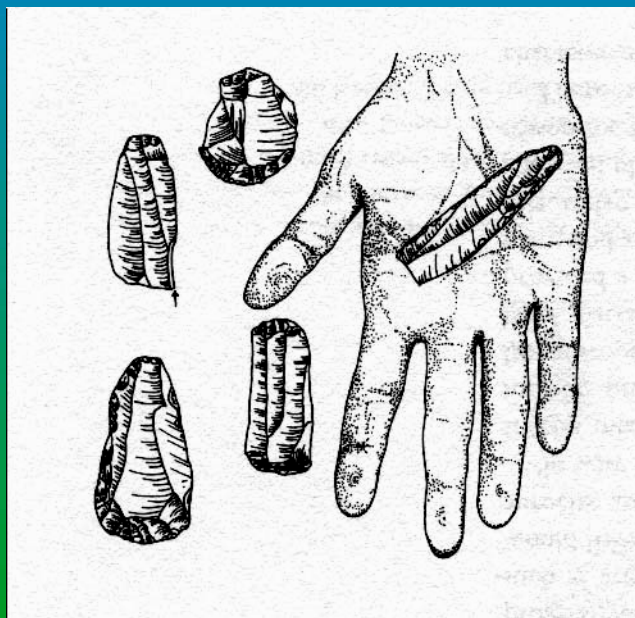
Early man (iii)



In the midst of the ice, prehistoric man was developing tools, and recording in sculpture and paintings what life he was leading.

Caves at Lascaux:
(c. 16 Kyrns)

The stone age tools were made from flint or bone, and shaped by chipping.



Veronice stone carved sculpture
(c. 25 Kyrns)