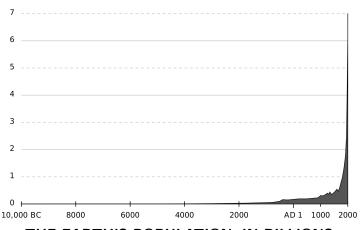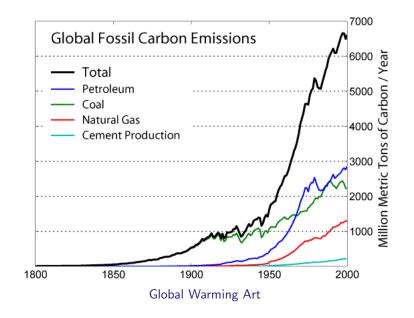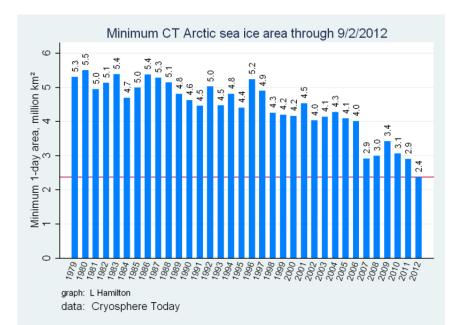# WHAT IS CLIMATE CHANGE?

We have left the Holocene and entered a new epoch, the Anthropocene, when the biosphere is rapidly changing due to human activities. Global warming is just *part* of this process.
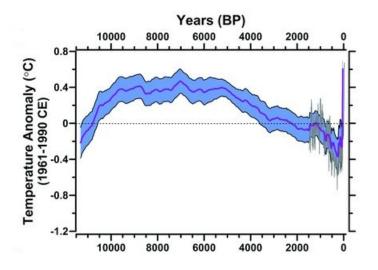

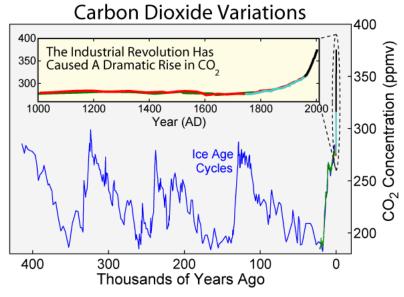**THE EARTH'S POPULATION, IN BILLIONS**

- About 1/4 of all chemical energy produced by plants is now used by humans.
- The rate of species going extinct is 100-1000 times the usual background rate.
- Populations of large ocean fish have declined 90% since 1950.
- Humans now take more nitrogen from the atmosphere and convert it into nitrates than all other processes combined.
- 8-9 times as much phosphorus is flowing into oceans than the natural background rate.
- In oceans, eutrophication has created about 400 dead zones, from 1 to 70,000 km^2 in area.
- Soil erosion from conventionally plowed agricultural fields is 10-100 times the natural background rate.

Global Warming Art

Minimum CT Arctic sea ice area through 9/2/2012

graph: L Hamilton
data: Cryosphere Today

Reconstruction of temperature from 73 different records —
Marcott *et al*.

Carbon Dioxide Variations

The Industrial Revolution Has Caused A Dramatic Rise in CO_2

Ice Age Cycles

Antarctic ice cores and other data — Global Warming Art

Climate change is not an isolated 'problem' of the sort routinely 'solved' by existing human institutions. It is part of a shift from the exponential growth phase of human impact on the biosphere to a new, uncharted phase.

Institutions and attitudes will change dramatically, like it or not:

- *Before*, we could treat 'nature' as distinct from 'civilization'. *Now*, there is no nature separate from civilization.
- *Before*, we might imagine 'economic growth' an almost unalloyed good, with many externalities disregarded. *Now*, many forms of growth have reached the point where they push the biosphere toward tipping points.

In short, climate change is part of a more significant challenge: **adapting to the Anthropocene**.

We can expect this to take at least a few centuries, full of drama and confusion.

Humanity will almost surely survive in some form, though millions of us may suffer and die, and many species will go extinct.