Zoogeography

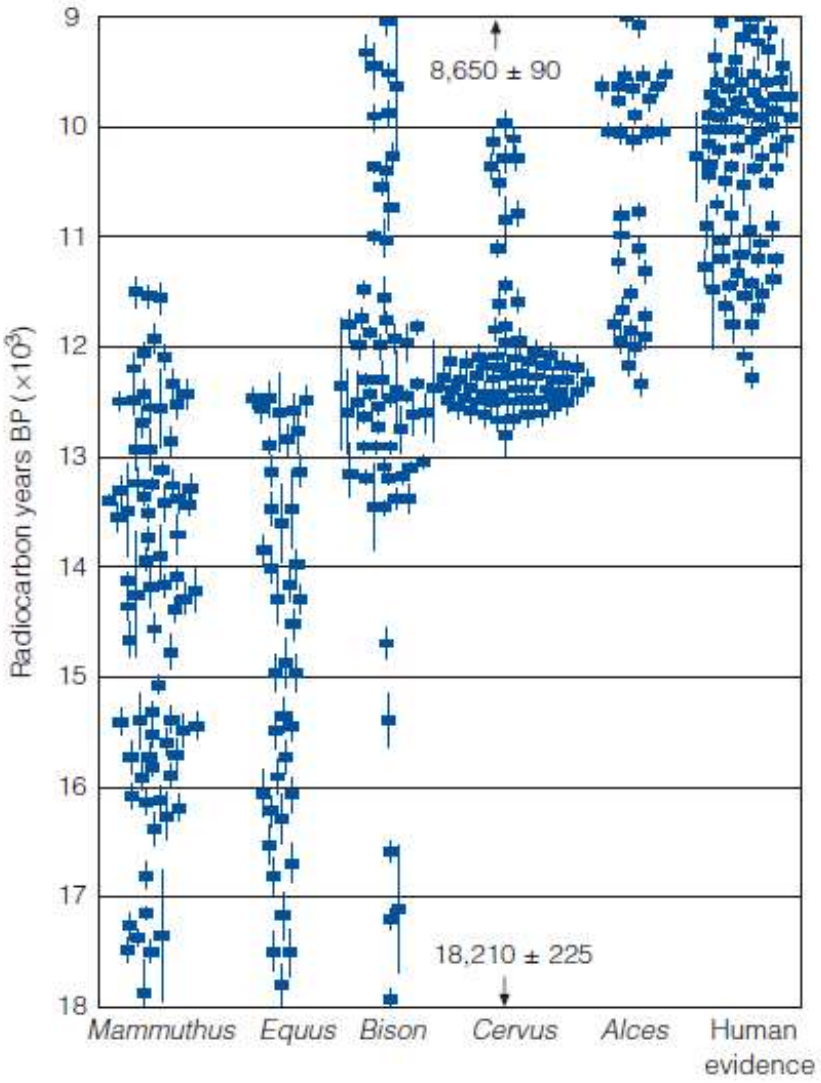
Lesson 22

Modern Humans and the Megafaunal Extinctions

first in Australia, then in Eurasia and finally in North America.

- Hyp 1: extintion of megafauna (large mammal spp) caused by climatic changes.

- Hyp 2: Humans play somehow a role in the megafauna extintion events (by American anthropologist Paul Martin).



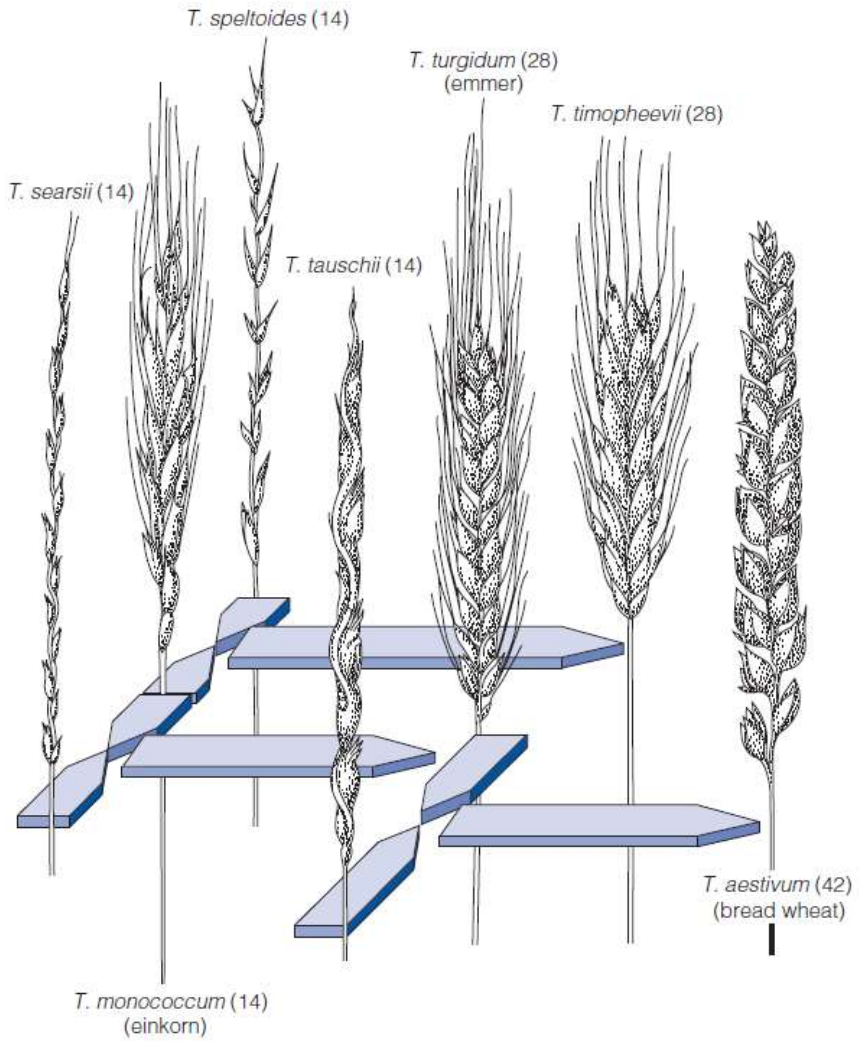


Figure 13.6 The evolution of modern bread wheat. This reconstruction is tentative, but it represents the probable course of crossings among the wild wheat species that led to the early domesticated forms of the genus *Triticum*, and the subsequent crossings of domesticated wheats with wild species and chromosome doubling that led to bread wheat. Figures in parentheses after names represent

scarce, humans readily turned to

ome human groups in South Africa had resorted to
ain food supply, harvesting shellfish and other

period, people living in Palestine and Syria were
supplies: using annual grasses with edible seeds,
nd barley.

Recognizing the value of these plants, successive generations of people must have encouraged the growth of such useful plants by removing shade-casting trees and shrubs, and disturbing soils so that their seeds germinated more effectively.

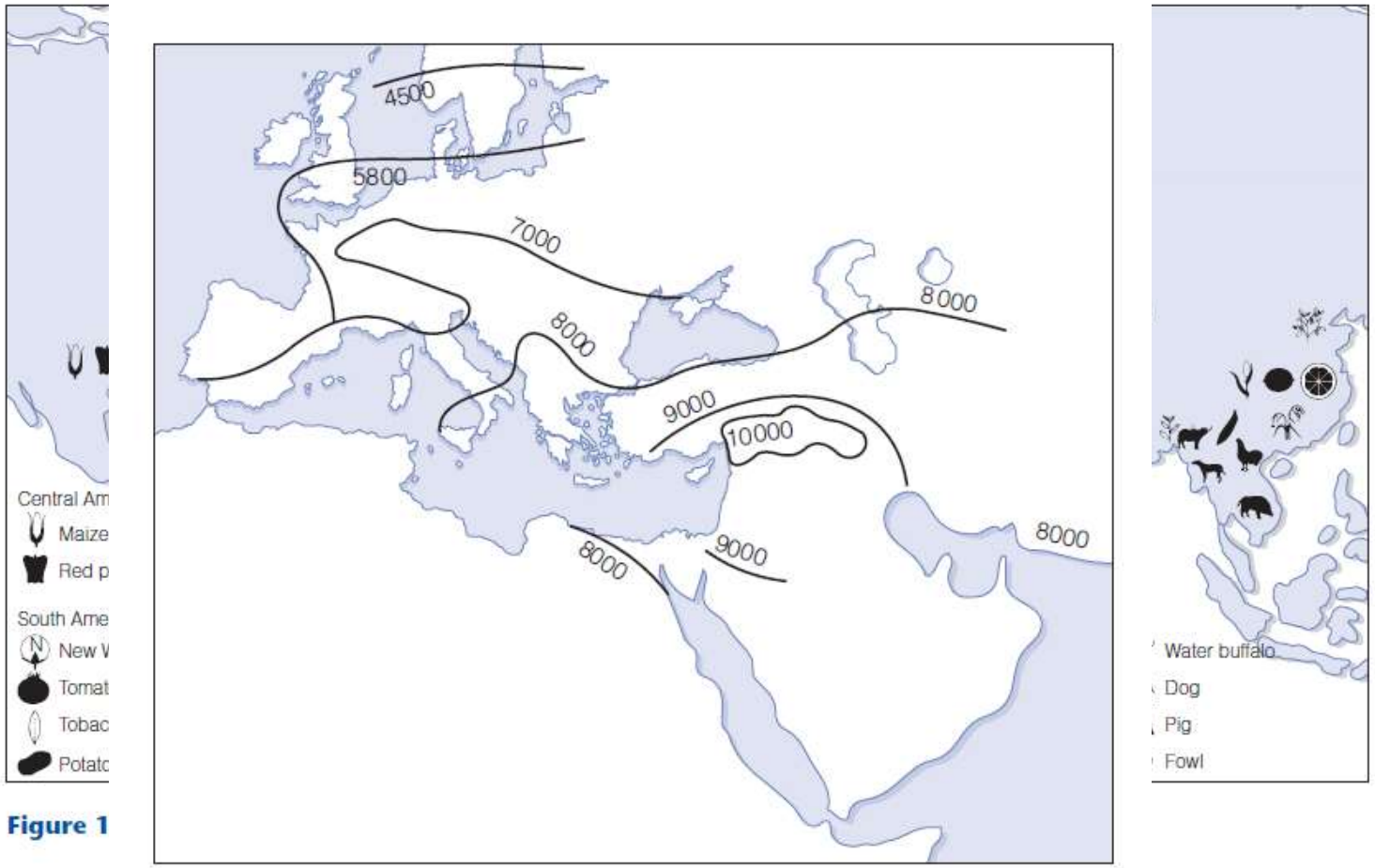


Figure 13.8 Map of Europe showing the spread of agriculture from the area of the Fertile Crescent. Dates are in radiocarbon years before present. Radiocarbon timescales diverge increasingly from calendar or solar timescales as one moves further into the past. A radiocarbon date of 10 000 years ago is approximately equivalent to 11 500 calendar years ago (9500 BC). The pattern is greatly simplified here, and there are problems concerning the precise time and direction of agricultural spread in such regions as the Balkans. From Willis and Bennett [51].

East across the

d plants from their

Animal Domestication

- The domestication of some animals may have preceded that of plants.
- It is likely that wolf was of considerable use in driving and tracking game and hunting down wounded prey,
- but determining when the dog was domesticated has proved very difficult using conventional archaeological techniques.

Bones of dog/wolf associated with human settlements (found as far back as 400 000 years) could merely be a result of people eating the animal, rather than domesticating it.

- Mitochondrial DNA analyses of samples from 162 wolves and 140 dogs (representing 67 different breeds) support the idea that the dog evolved from the wolf,
- but the differences between the two groups suggest that the evolutionary separation (presumably associated with domestication and isolation of dogs from wolves) took place about 100 000 years ago,
- later work suggests it could be as little as 30 000 years ago.

As in the case of plant domestication, however, the combined processes of selection and backcrossing with wild races have probably confused the genetic record.

- The first traces of domesticated sheep come from Palestine around 8000 radiocarbon years ago.
- These may have originated from one of the three European and Asiatic sheep, or may have resulted from interbreeding among these species.
- sheep and goats, were domesticated during the Early Neolithic period and soon after the first cultivation of plants.

Ovis musimon

Ovis orientalis

i.e. The Soay sheep that has survived in Scotland almost certainly originated from the mouflon, either the European *Ovis musimon* or the Asiatic *Ovis orientalis*.

Domestication of these animals may have resulted from the adoption of young animals orphaned as a consequence of hunting activity.

Soay sheep

i.e. Cattle domestication

- the milking of cattle was being practiced in the Near East about 9000 years a

Milk evolved in mammals as a means of increasing the growth rate of the very young. Its major constituent is the **carbohydrate lactose.**

In the young mammal, this is digested by the **enzyme lactase**, but the gene controlling the production of this enzyme is normally switched off in humans as they are weaned.

European races of humans are exceptional in that lactase production continues through the life of the adult, so they can still digest milk. The same is true of many **East African** peoples, but not of those in **West Africa**.

Diversification of *Homo sapiens*

- As humans spread around the world and developed their own cultures and food resources, they continued to diversify in response to the new environmental pressures placed on them.

- Some modifications derived from their choice of food (i.e. the persistence of lactase production in populations that consumed milk).
- The A and B blood groups are totally absent in Native Americans, yet are relatively common among Caucasians.
- Skin colour.

The Biogeography of Human Parasitic Diseases

- our early African ancestors were probably already liable to such widespread infections as roundworms (Ascaris), hookworms (Necator) and amoebic dysentery (*Entamoeba histolytica*).



All of these have infective stages that are passed out with the faeces of the infected individual and then wait in the soil or water until ingested by the next individual

- As hunter-gatherers on the plains of Africa, however, our ancestors probably suffered less from such diseases than do the people who live there today in more sedentary settlements.

  Their habit of continually moving on from temporary campsites would have ensured that they did not remain for long near their own faeces, which might otherwise have acted as infective agents for the eggs or larvae of parasites

- the members of each small, independent group would have been closely related to one another, and therefore all would have had a similar amount of immunity to any viral or bacterial infections.

  A group might rapidly lead to the death of most of the individuals in a particular group, any survivors would be immune to future infections. Our ancestors would not have suffered from epidemics that spread from group to group.

- Studies of the distribution patterns of parasitic diseases have shown a strong **latitudinal gradient** in the frequency of the diseases associated with protozoan parasites, with higher concentrations of such diseases in the tropics.

- The distribution pattern of any parasitic disease that requires an intermediate host is naturally limited by the environmental needs of both the final host and the vector.

- The year-round warmth of the tropics and subtropics provides a genial environment for all of them, and so it is not surprising that such diseases are prevalent there.

- It is also worth noting that the tropics contain more species of bird and mammal, which therefore provide a varied reservoir of organisms that share our warm-blooded physiology and from which a transfer of host by 'spillover'.

- In time, people changed their way of life from nomadic hunter-gathering into more permanent settlements, surrounded by the animals and plants that they had domesticated → their new closeness to animals brought with it a greater variety of disease exposure.

i.e. 1- The tapeworm Taenia finds its intermediate host in cattle and pigs,

i.e. 2- The human diseases smallpox, tuberculosis and measles are all closely related to similar diseases of cattle.

- At the same time, the irrigation systems that early farmers constructed in the Fertile Crescent of the Middle East may, by placing water courses permanently near their villages, have made it more likely that they would be infected by diseases transmitted by mosquitoes (whose larvae live in water).

- At the same time, homes and storehouses would have provided shelter and food for rats, from which they could have caught typhus.

- the higher population densities that accompanied all these changes would have made these early human communities more vulnerable to epidemics of disease.

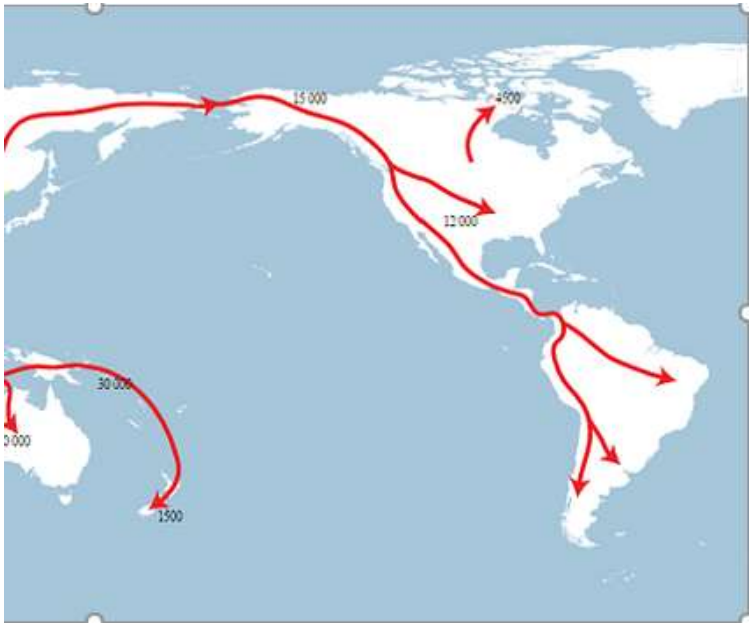
So there were certainly drawbacks, as well as advantages, to the development of domestication.

- The bacterium *Helicobacter pylori* is present in approximately 50% of all human stomachs, where it can cause peptic ulcers and may even be a causative agent of stomach cancer.

An extensive genetic survey has shown that its genetic diversity decreases with distance from East Africa, suggesting that this was the original centre of infection and evolutionary development.

1) When the first people migrated through the colder lands of northern Asia and across the Bering Straits into the New World, they left behind their domesticated animals and, with them, their associated diseases. Perhaps the only parasite that is found naturally in both the Old World and the New World is the hookworm Ancylostoma.

2) Another factor that reduced the prevalence of disease in the pre-Columbian peoples of North America was that they did not succeed in domesticating the large mammals of that continent.



Situation in the new world

- Old World:

- Huge domestication activity with numerous mammal species → high amount of pathogens and thus diseases.

↓

- New World:

- Humans left in Eurasia their animals, failde to domesticate local mammals → less amount of diseases

they had no immunological defences when they were confronted by the spread of the peoples of the Old World.
So the diseases that Eurasians had caught from their domesticated animals (smallpox, measles, influenza and typhus) ravaged the pre-Columbian Native Americans of the New World, killing **95% of those of North America** and **50% of the Aztecs of Mexico and of the Incas of Peru**.

Pathogens evolution

- However, in South America a New World version of leishmaniasis evolved independently of that of the Old World.
- It is caused by a different species of the parasite and carried by a different sandfly.
- South America is also the home of Chagas disease, caused by a species of Trypanosoma related to that which causes sleeping sickness in Africa; it is present in South American mummies dating from 2000 BC.

- So geography, climate and mammalian evolution have all played important roles in controlling the variety and incidence of the diseases that plague our species.

the incidence of some of these diseases has been affected by the increasing environmental impact of humanity and its activities.

For example, human operations such as mining, deforestation and road building have led to increases in the predominance of *P. falciparum* (the more virulent species of malaria, which causes cerebral malaria), at the expense of *Plasmodium vivax*, which causes a less serious variant of the disease.

This has also been aided by the evolution of drug-resistant strains of *P. falciparum* and by the construction of dams and large-scale irrigation projects.

→increase the area of water in which the mosquitoes can breed,
→Placing the water close to areas in which people live

DIFFERENT SCENARIOS

- Human activities, have also increased the size and widespread distribution of human populations available as hosts to *Leishmania* and *Trypanosoma* (pathogens).

- Increasing aridity in parts of southern Africa has caused the movement of tsetse flies and Simulium blackflies into new areas, leading to increases in sleeping sickness and river blindness.

- On the other hand, the loss of forest in some parts of Africa has led to the loss of these vectors and a consequent reduction in these illnesses.

Environmental degradation, as well as human population pressures, resource exhaustion and disease, can thus combine to cause the collapse of human societies

- When societies do collapse, the environment often recovers remarkably rapidly.

- Black Death pandemic in Europe (1347–1352).
- When this plague spread into Europe from Asia, it resulted in 30–60% mortality among the human population.

Analysis of contemporaneous pollen profiles from lakes has shown that:

-when arable farming was abandoned, and
-pastoral activity was greatly reduced → regrowth of many forest areas that had previously been cleared for agriculture