

Human Adaptations

ESP 30 Lecture 4

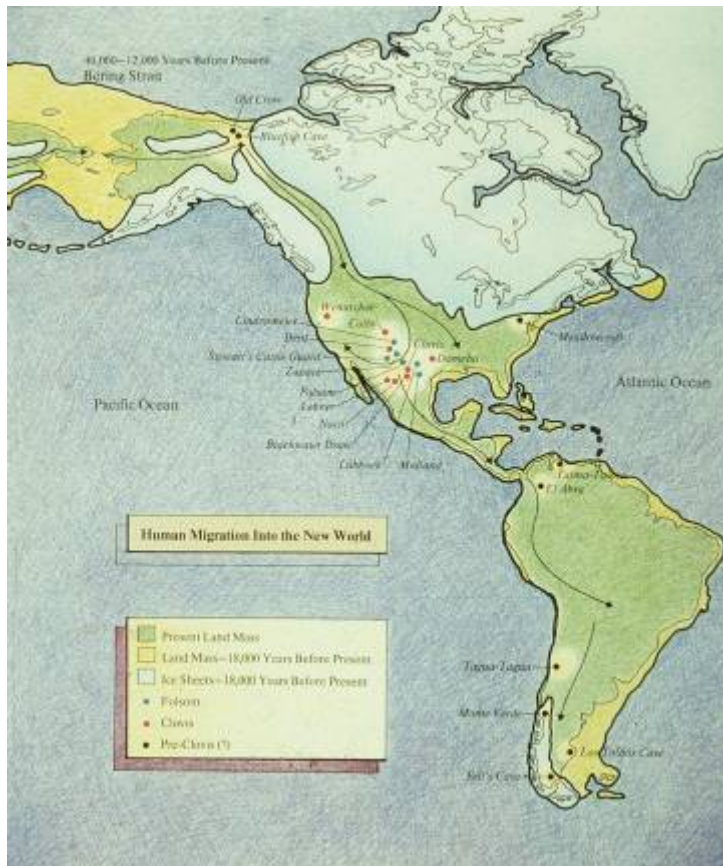
Evolution of Human Adaptations

- Humans face basically the same adaptive challenges as all organisms
- **But** humans are unique in having most of their adaptations transmitted culturally
 - Culture has a biological basis: imitiveness, sociability, inventiveness
 - Cultural adaptations built up incrementally over a long time spans of time
 - Other social animals have simple cultural adaptations, but only humans have spectacularly complex ones

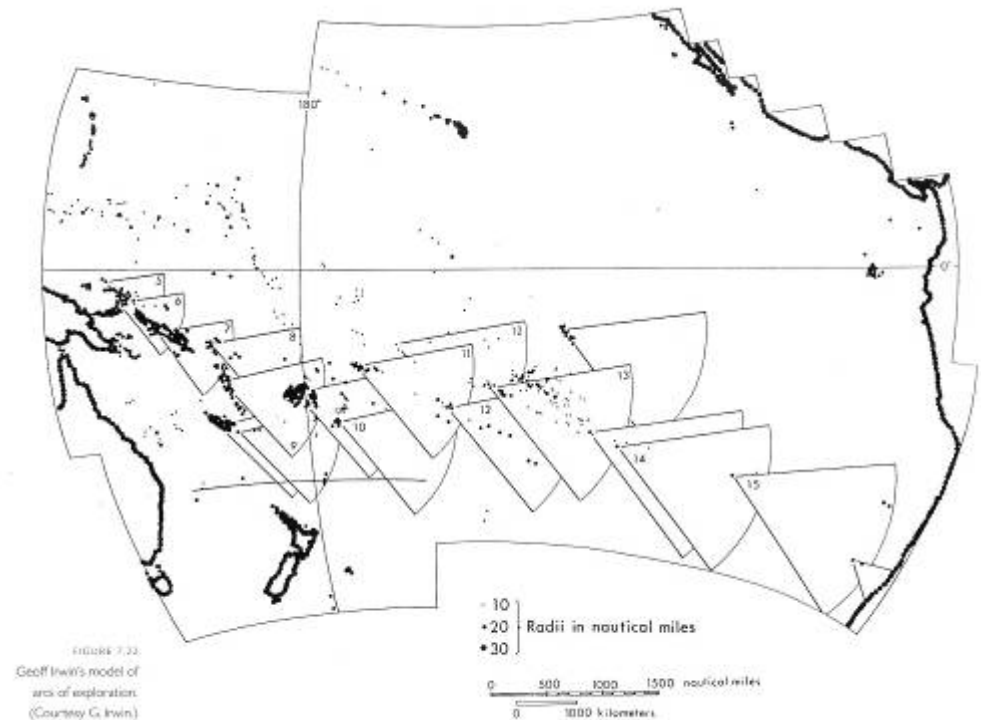


- Because of cultural adaptations, people have adapted to almost all of the earth's terrestrial habitats

Expansion of NE Asian people into the Americas around 14,000 years ago



Polynesian expansion: the last great spread of humans to the undiscovered remote Pacific 200 BC- 1000 AD



- Some human genetic adaptations
 - Body form adapted to climate as in other animals
 - Tropical people tall and lean to lose heat
 - Arctic and mountain people short and wide to conserve heat
 - Pale skin adapted to vitamin D photosynthesis in dim climates

Neanderthals lived during the ice age West Eurasia and had very thick body form



Peruvian
Highlanders



First modern human immigrants to
Eurasia brought taller leaner African
Physique



- Many gene-culture coadaptations

- Disease resistance genes

- Malaria
- Plague

- Diet related genes

- Adult lactose absorption and dairying
- Alcohol metabolism and grains and grapes for alcoholic beverages



How does culture evolve: A Darwinian view

- Random variation
- Natural selection
- **Decision-making forces** (Only humans do this on a large scale)
 - Individual learning + teaching and imitation
 - Biased teaching
 - Biased imitation
 - Perceived quality of variants
 - Perceived quality of person (“opinion leaders”)
 - Public opinion

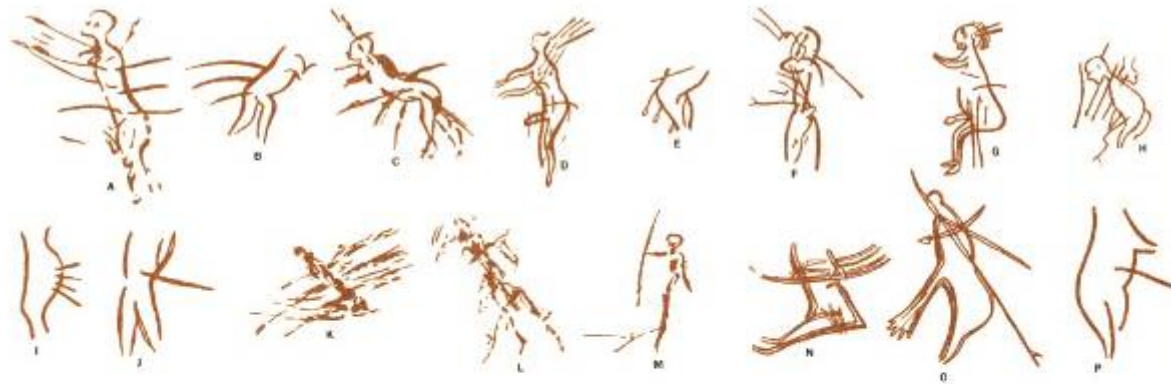
Natural selection on culture

- Today fertility in most human populations is falling and is below replacement in many areas
- Analogous to a disease
- Amish (and a few other groups) are sealed off from modern culture by their religion
- Amish have very traditional family roles
- Women gain all of their status from raising a family and so mostly do men
- Amish have natural fertility (average ~ 7 kids per family)
- Amish population is growing very rapidly



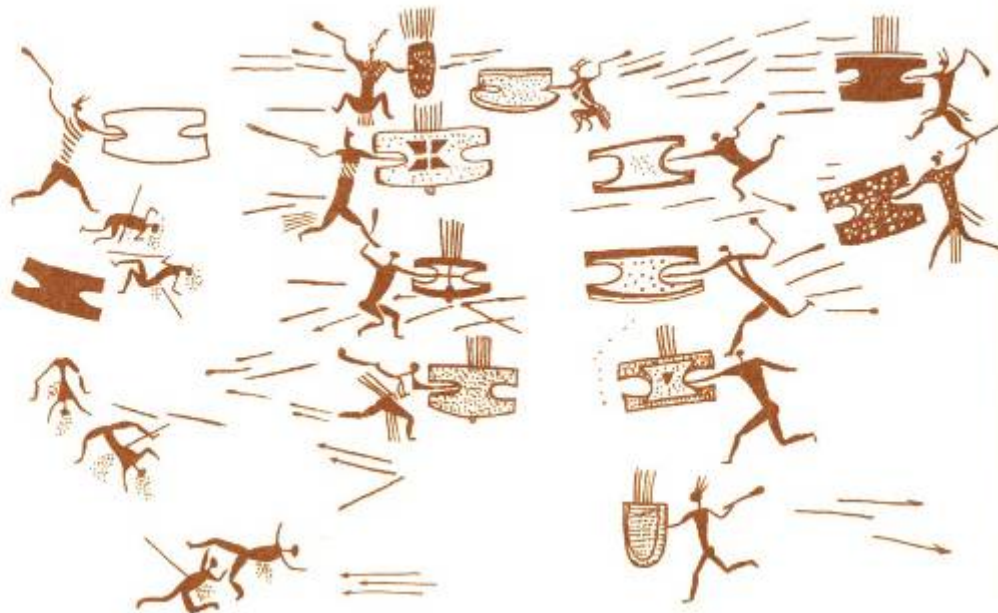
Role of history

- Humans may have been in ~ equilibrium with the prevailing environment from 40,000 BP to 15,000 BP in Eurasia
- No detectable progress after moderns replaced Neanderthals until the ice began to melt
- Dale Guthrie in a recent book argues that the cave art of the ice was very strange: very naturalistic, no supernatural images, no war
- Since the ice, humans have evolved toward greater social and technical complexity, albeit at different rates in different places



Unlike the scene below, Paleolithic art has no scenes of war or group violence. This is in remarkable contrast to tribal art, in which such scenes are common. There are, however, at least sixteen single Paleolithic images that might be speared humans, mortally wounded or corpses. **A** and **N**, Pech Merle, Fr. **B - C**, Cougnac, Fr. **D**, Sous Grand Lac, Fr. **E**, Goudari, Fr. **F**, Paglicci, It. **G**, Saint-Cirq, Fr. **H**, Bédoulet, Fr. **I**, Cibrantes, Sp. **J**, Gabillou, Fr. **K**, Nerja, Sp. **L**, Grajas, So. **M**, Pileta, Sp. **O**, Cosquec, Fr. **P**, Patatal, Sp. Multiple wounds on many of these suggest an attack by more than one person. Is this fossilized hate? One can imagine a too belligerent, very uncooperative, or demagogic person finally getting it. There were no police, no courts, no jails. You had to get along or else. These are probably pictures of "or else." Since the person was probably someone you knew as a neighbor or even a relative, the killing would be a serious event.

Shields, throwing sticks, axes, spears—lots of valor, death, blood, and destruction. A Bushman's view, from later prehistoric art, of two Bantu groups fighting, Brakkfontein Range, R.S.A. There is nothing like this in Paleolithic art.

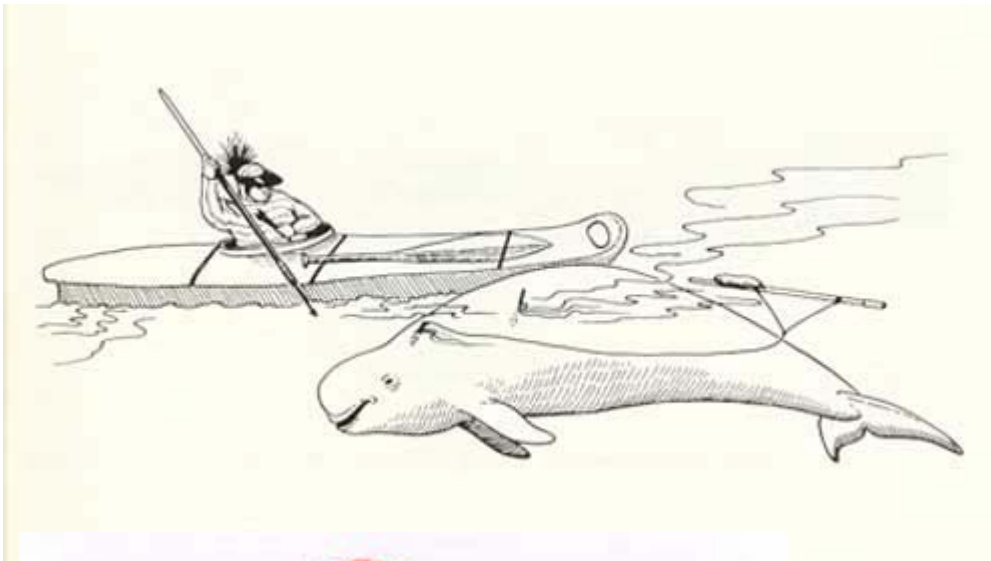


Human subsistence systems

- Humans are tied to the environment by the way they gain their subsistence
- Subsistence systems are often highly adapted to local conditions

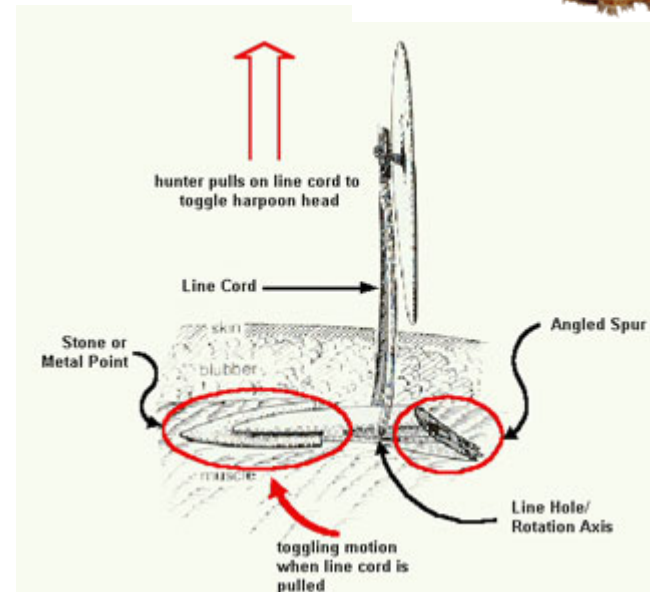
- Broad types
 - Hunting and gathering
 - Big animal intensive
 - Plant intensive
 - Fishing
 - Food production
 - Horticulture (gardening, hand tools)
 - Agrarian production (use of plows and other labor saving tools)
 - Pastoralism (specialization on raising livestock)
 - Industrial (industrially produced machines drastically lower use of labor on farms)

Inuit (Eskimo) marine hunters and fishers



Harpoon Tip Holder
(Female Socket)

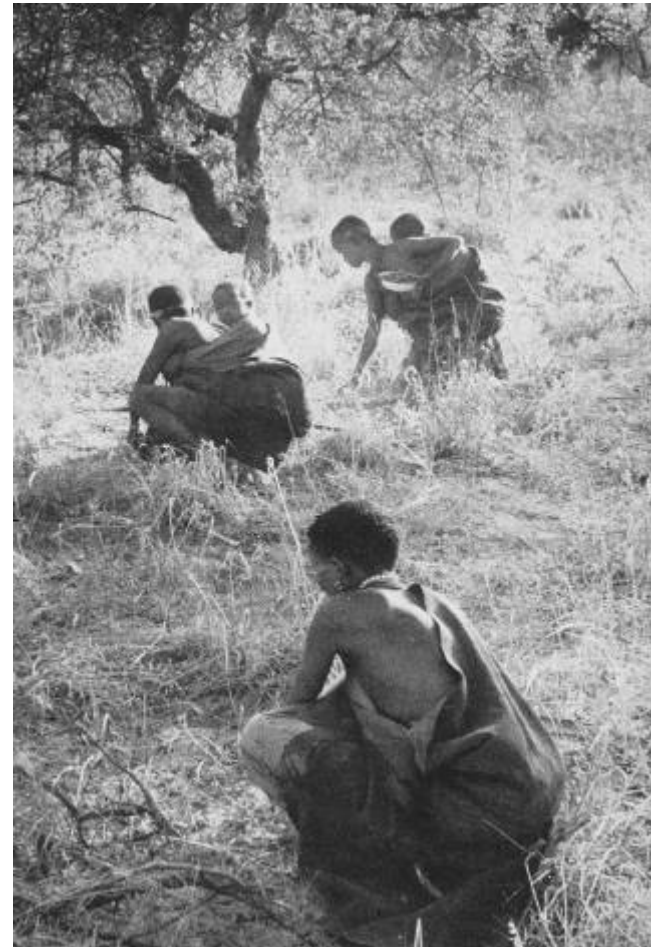
Hunter-gatherers illustrate the “craftiness” of Anatomically Modern people. A small selection of the gear made by Inuit and their neighbors. The parka illustrated is a summer raincoat made of tanned fish skin. High arctic people took thousands of years to evolve this toolkit.



Kalahari San plant intensive foragers



FIGURE 4-7
Three African Bushmen about to kill a large antelope
(gumboki). (Courtesy of Margarete Sjöström and Anders
Pihls, Cambridge, Mass.)



The San are every bit as “crafty” as the Inuit, though they don’t need fancy clothes or boats. Men use tiny bows and arrows to kill large animals using poisons. Women have clever ways of rendering low quality plant foods edible. Archaeology suggests that this specific set of strategies is also only a few thousand years old (as with the Eskimo) and is very different from the strategies used by more ancient hunter-gatherers.

Origins of food production

Food production arose independently in 6-12 places starting about 11,500 years ago in the Fertile Crescent



Horticulture



Swidden (slash and burn, shifting field) horticulture still widely practiced in evergreen and deciduous tropical forest biomes. Adapted to use the plant nutrients in the ash left after firing. Forest trees store considerable nutrients as they grow and horticulturalists take advantage of this on otherwise very poor soils. However crops can be grown in this way for only 1-3 before letting the forest regrow. On poor soils 50 years or more may be required before the forest can be cut again for a field. Fancier than it looks.

Agrarian production



Peru

Indonesia



The plow is the signature technology of agrarian production. The first plows were developed in Mesopotamia perhaps 6,000 years ago. The plow symptomatic of the ongoing increases in the sophistication of farming that raised the food output per farmer, in this case by supplementing human labor with animal labor. With fewer people needed on the farm, the number of people available for other occupations increased and hence the complexity of human societies increased. In the poorer parts of the world quite complex civilizations are still in the transition to industrial technology. Agrarian-style production is still widely practiced.

Pastoralism



Industrial production



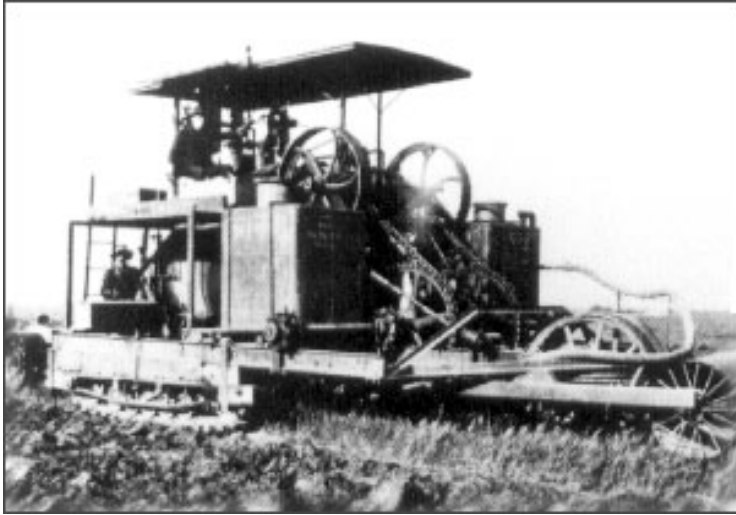
Watt's low pressure steam engine used to pump air into a blast furnace. England, about 1785



Trevithick's $\frac{1}{2}$ scale model to test his high pressure engine for use as a rail locomotive. England about 1800.

The use of water and wind mills for various machine production processes has a long history. Not to mention sailing vessels. The so called industrial revolution was the application of fossil fuel energy to production processes. The English were particularly inventive along these lines in the 18th and 19th Centuries, leading to wholesale changes in every aspect of life. Industrial production techniques spread rapidly to other parts of Europe and to America and their impact was felt in every corner of the globe due to trade and empire-building. Today China and India are industrializing very rapidly.

Industrial farms



Holt tractor. First caterpillar-type tractor. Invented in Central Valley around 1910

Industrial machinery was used on farms as early as McCormack's reaper in the 1830s. But the use of animals for traction lasted until the invention of gasoline and diesel engines. In the US, tractors replaced horses by 1930. Today our whole food system from plowing to delivery to the supermarket is highly mechanized in many countries.



Your professor working as wire pocker on a 4 man hay bailer, 1951. 1930s vintage machine.