

# Anthropology 3533

Week 3

Human Reproduction in Life  
History Perspective

# Review of Material Covered So Far

## Week 1

- Evolutionary theory and the modern synthesis
- Biocultural Perspectives and misconceptions of evolution

## Week 2

- Sexual selection (Fisher and Trivers)
- Evolutionary pressures on women and their strategies (tradeoffs and investment)

## Week 3

- Human Reproduction from Lifespan perspective
- Sexual anatomy and physiology

Basically, we have begun with theory, perspectives on how to organize and interpret information about human reproduction from evolutionary and biocultural theory

This week we integrate those into explaining the human lifespan and then we look at sexual anatomy and physiology, then we will move through the lifespan in more detail through the rest of the term

# Human Growth and Development

Humans begin life as a fertilized ovum

Within interaction of genetic info provided by parents and environment, ovum grows and develops into a fetus, a neonate, an infant, a child, an adolescent, an adult



# Human Growth and Development

Humans comprised of 10,000,000,000,000 cells

Resulting from  $2^{38}$  cell divisions (mitosis)

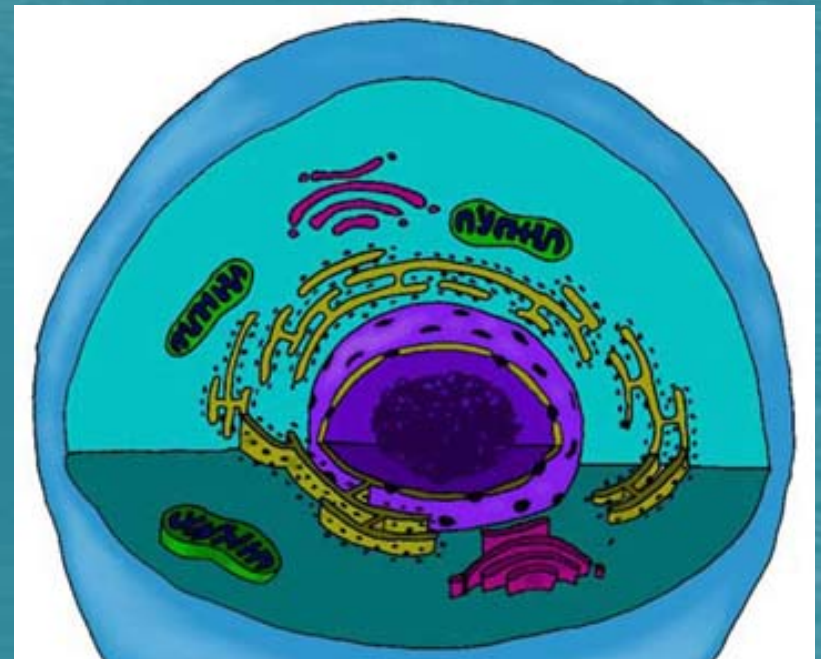
Why undergo cell replication, division, differentiation?

Because all living things die and are replaced

Reproduction requires growth and development

Sex, growth, development,  
and death are the prices of  
multicellularity

Newth (1970)



# Human Growth and Development

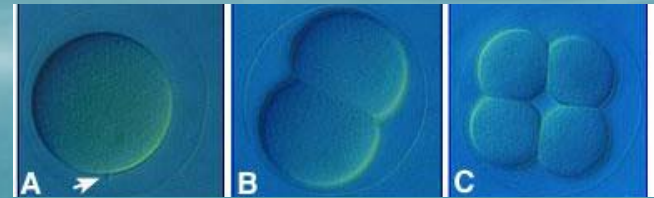
Growth and development are simultaneous but distinct processes

Growth: a quantitative increase in size or mass

- Number of cells
- Height
- Weight

Development: a quantitative or qualitative progression of changes leading from an undifferentiated, immature state to an organized, specialized, mature state

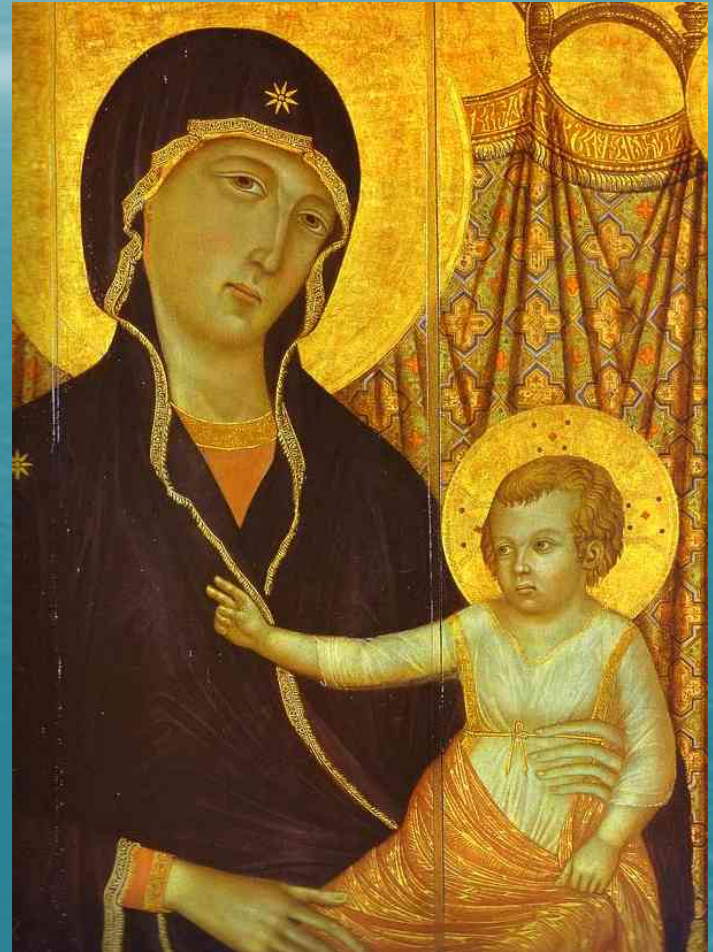
Maturation: functional capacity



# Human Growth and Development

## Medieval period

- Children treated as miniature adults
- Growth and development seen as increase in size and maturity
- 'Plague, pestilence, ignorance, extraordinary poverty, drudgery, starvation, perpetual warfare' were some of the reasons why children lost special status and became small adults (Kaplan 1984)



# Human Growth and Development



Children of Charles I

Van Dyck 1635

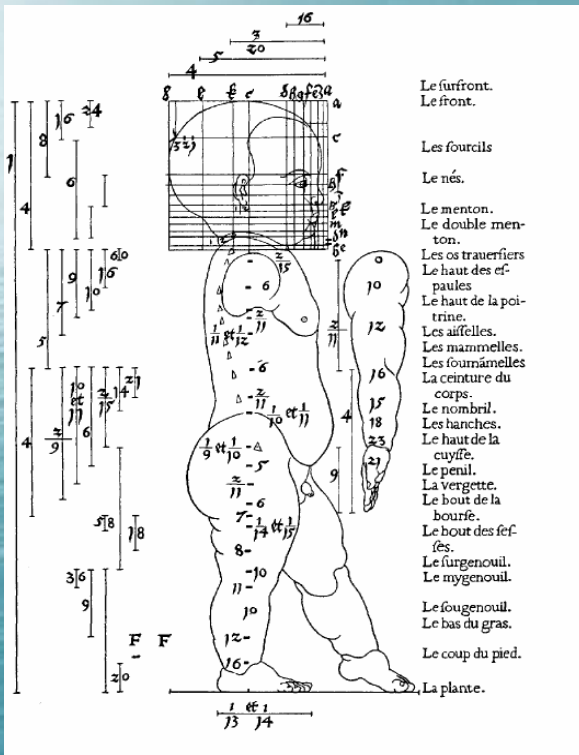


Maids of Honor

Velasquez 1656

# Human Growth and Development

## The Renaissance



Albrecht Durer & da Vinci

## Intro to Human Growth

'We have not in youth the same flesh as in childhood, nor in old age the same as in youth; for we suffer transmutation, whereby we receive a perpetual flow of fresh atoms and those we have received are ever leaving us.'

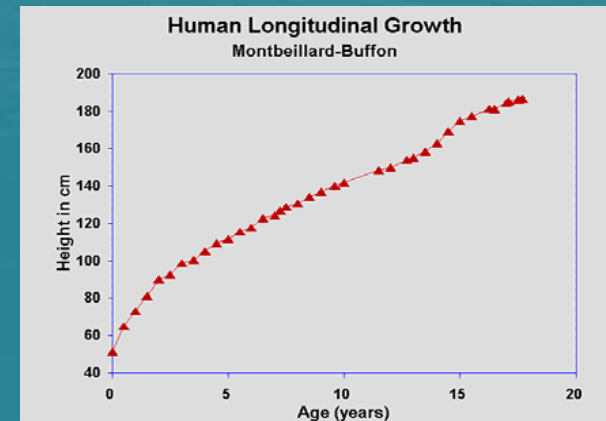
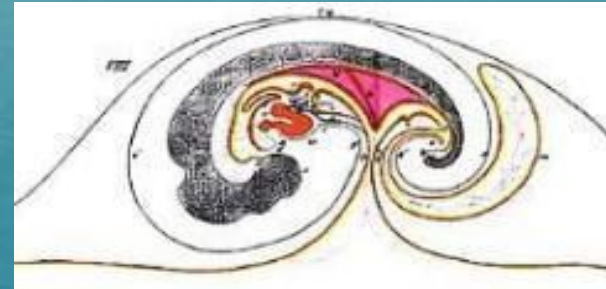
Bruno (1550-1600)



# Human Growth and Development

## Post-Renassaince

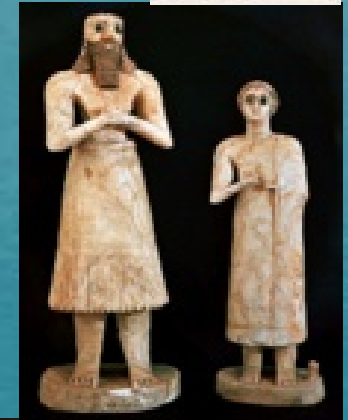
- 1829 Karl Ernst von Baer
  - First scientific study of embryonic development
  - Development of theory of germ layers
  - Replaced theory of 'vital forces'
- 18<sup>th</sup> century concern with child health
  - i.e. Compte de Montbeillard's son
  - Longitudinal research
  - Included in Histoire Naturelle 1777 (Compte de Buffon)
  - Growth distance chart made by Scammon (1927)



# Human Growth and Development

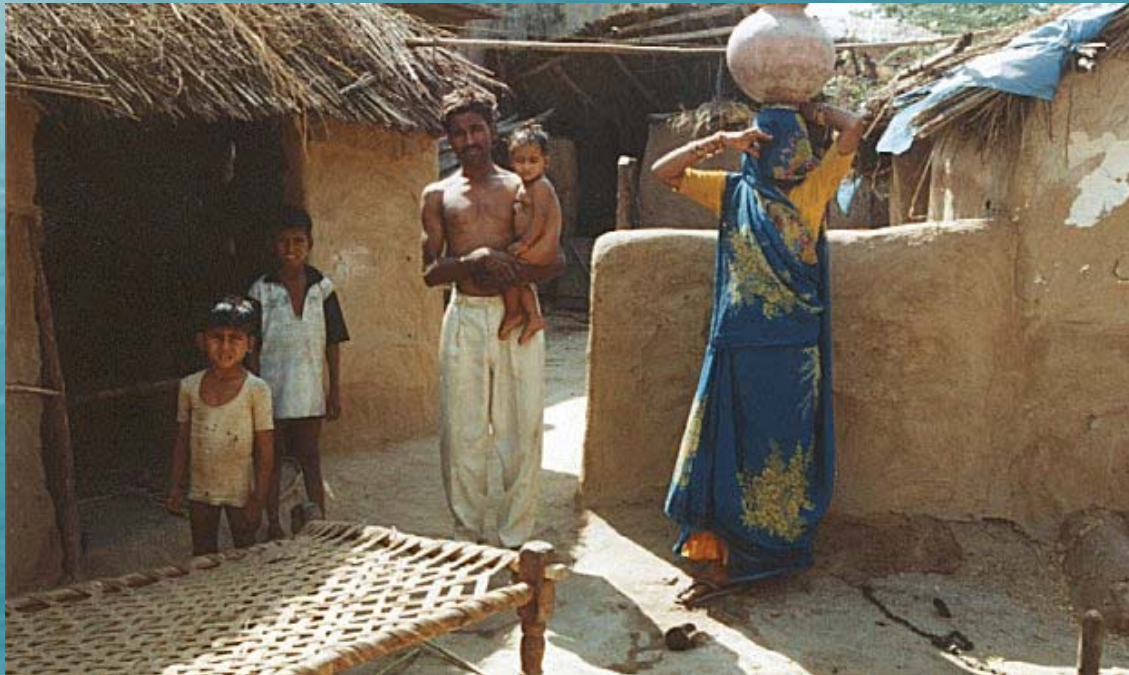
Western science divides human lifespan into stages more similar to Sumerian conceptions of the lifespan

infancy, childhood, youth, adulthood, and old age



# Biocultural Theory

**Biocultural Approach:** the interaction between social belief, cultural values, behavior, and biology in human health, disease, growth, and development



# Evolutionary Theory

- Energy used for one purpose cannot be used for another (follows from thermodynamics)
- Time and energy are both Limited.
- Energy must be spent on growth, maintenance, and reproduction

# Human Growth and Development

**Life History Approach:** the evolution and function of human life stages

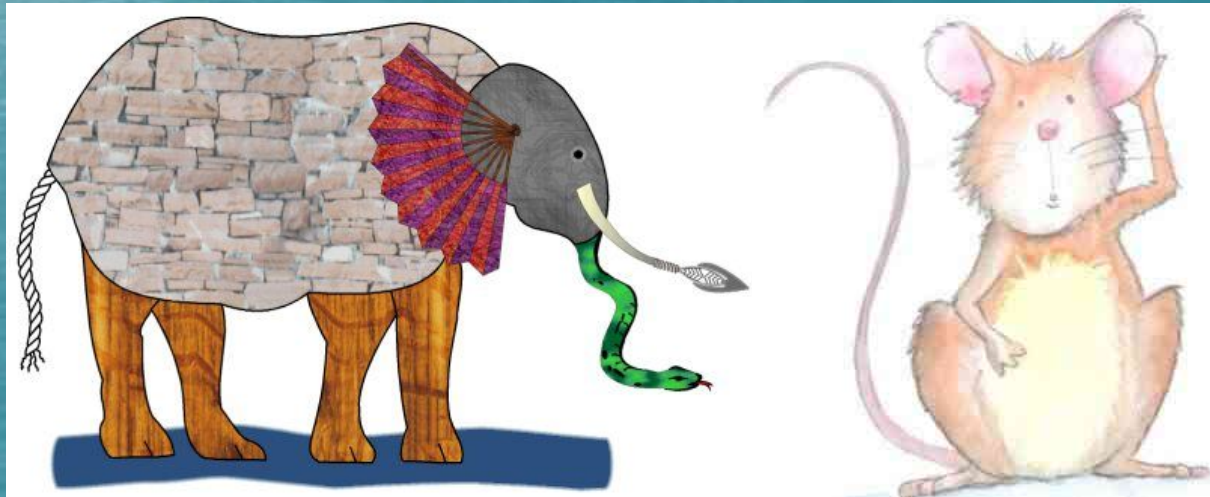
- The strategy an organism uses to allocate energetic resources toward growth, maintenance, reproduction, raising offspring, and avoiding death
- A strategy of when to be born, when to be weaned, how many pre-reproductive stages to pass through, when to reproduce, and when to die
- Humans have a life history that is very adaptive in terms of reproductive success
  - We raise 60% of offspring to adulthood in traditional societies without modern medicine, more in industrialized societies (up to 95%)
  - Compare to 36% for chimps and 12-18% for other social mammals

# Life history theory

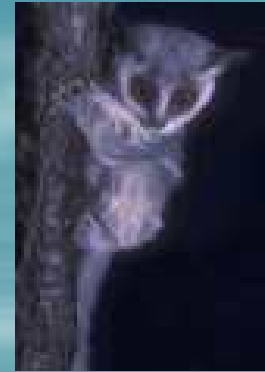
Life History is related to Body Size

Large body size in mammals:

- longer gestation periods, later ages at weaning and reproduction, longer lifespans and smaller number of offspring
- litter sizes decrease
- Primates live life slowly



## Life history theory



Life history is related to habitat

- Tropical rainforest dwellers in W. Africa
  - *G. alleni* has single births, breeds relatively slowly and lives longer. The rain forest is a more stable habitat that favours channelling of resources into more slow developing but more competitive young.
- Wooded savanna dwellers of southern Africa.
  - *G. moholi* has twin births & two breeding seasons per annum. The savanna is less stable with periods of plenty (therefore favours rapid breeding) interspersed with famine (populations crash).
- Large primates tend to be terrestrial, diurnal and herbivorous- long gestation periods, slow post natal development, long lives, low metabolic rates and large brains.

# Demographic Theory

We can also approach human lifespan and reproduction through **demography**

Demography: the study of mortality, fertility, and migration, and their relationship to population growth, family formation, and human ecology

(Gage 2000)

## Interdisciplinary

- History
- Sociology
- Economics
- Political science
- Public health
- Anthropology- biosocial and archaeological characteristics of a human population and their development through time using comparative, evolutionary and holistic approaches

# Demographic Theory

How are reproduction, the lifespan, and demography related?

As we said already... body size effects and evolutionary pressures (natural selection) affect life history, which affects mortality and fertility

- Why does growth vary between individuals, populations, and species?
- Why does mortality vary between individuals, populations, and species?

# Demographic Theory: History

Essay on the Principle of Population, As it Affects the Future Improvement of Society  
(Thomas Malthus 1798)

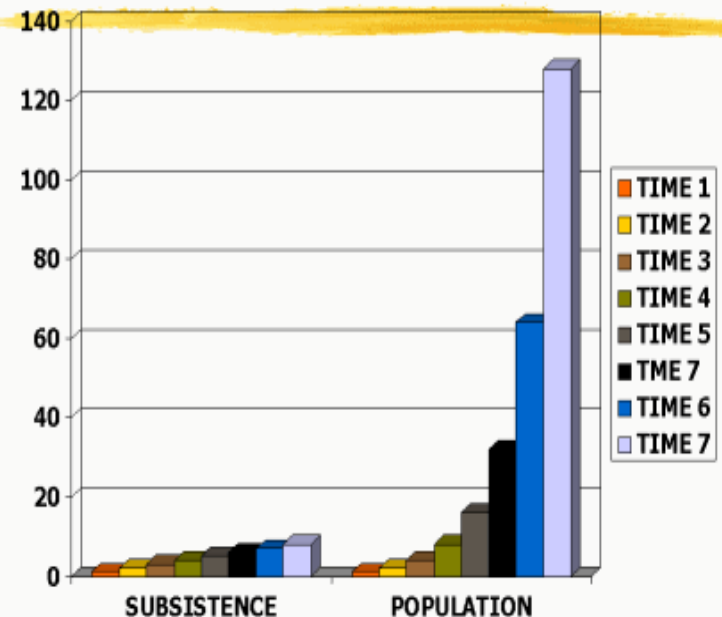
Poverty, misery, disease and war keep human population sizes down to the level of the means of subsistence.

Food supply increases arithmetically  
Population sizes increase exponentially

This struggle for existence was the foundation upon which Darwin built his theory of Natural Selection

Argued by Marxists, who saw Industrialization and capitalism as the root of human suffering and the spread of poverty

## Subsistence Vs. Population



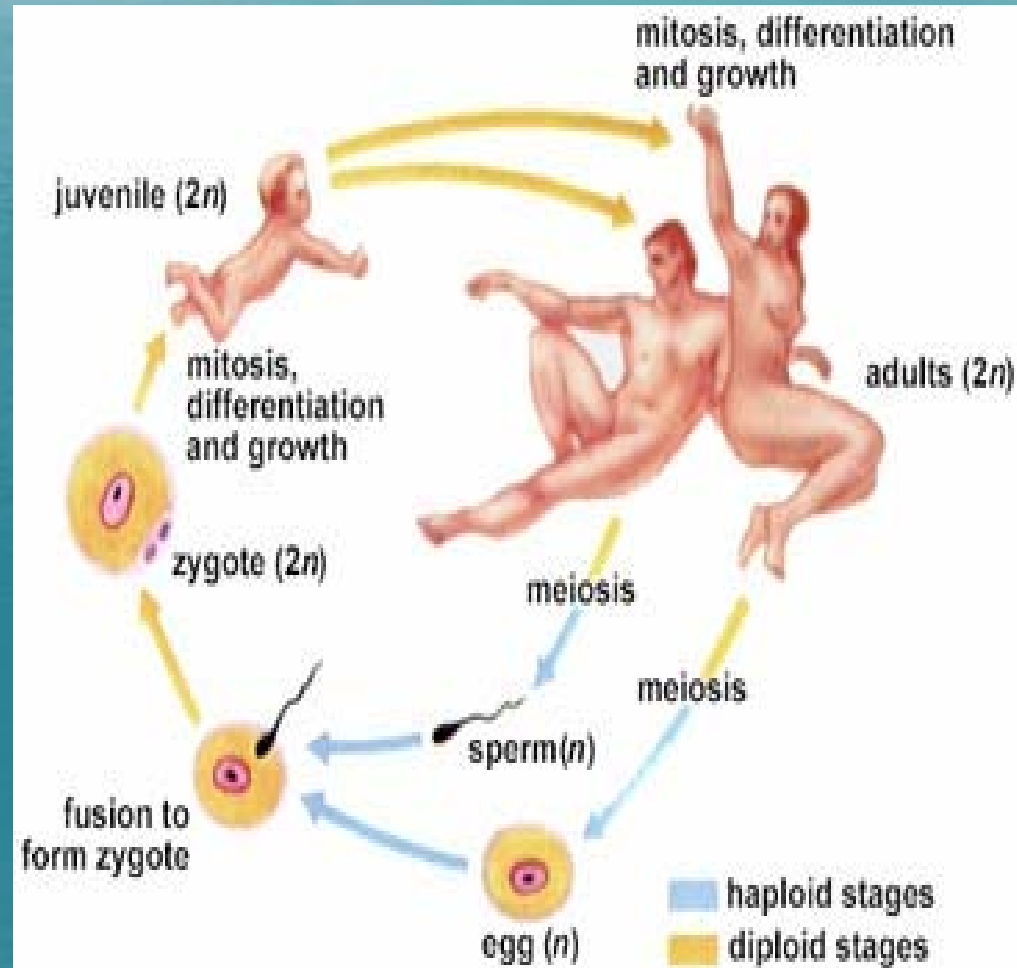
# Demographic Theory: History

- Are War, Pestilence, and Famine really 'natural' checks on human population size or are political, economic, and social systems responsible? Both?
- We still have not exceeded subsistence
- Estimate of 11 billion by 2050
  - 4 billion in India and China alone
- Other checks? Energy (i.e. fossil fuels)? Drinking water? Pollution? Climate change?

# Human Growth, Development, and Reproduction

Considering us within the context of mammals, primates, apes, and within the environmental circumstances in which we evolved...

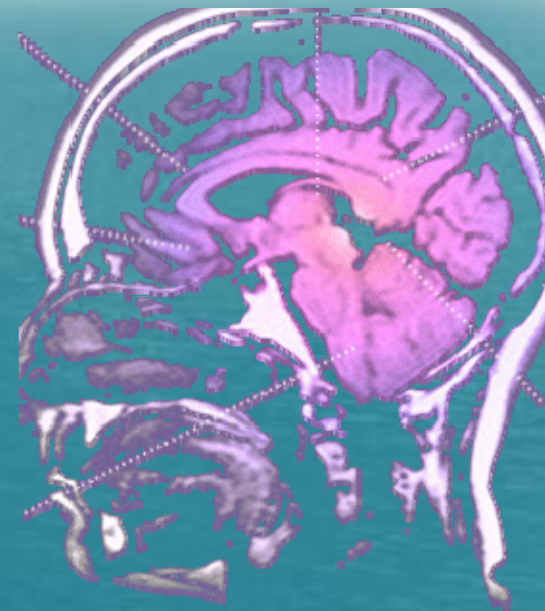
In humans, is it possible to recognise special features of growth and development and explain them in evolutionary terms?



## Life history theory

In comparison with other mammals, primates have

- long gestation periods
- long lifespans
- mature late
- altricial young
- relatively large brains for their body size



# Life History Traits

## Chimpanzee

## Human

### Mortality regime

Wild

35% infants live to age 15

Life expectancy + 15

Foragers

60% infants live to age 15

life expectancy + 39

### Age at 1<sup>st</sup> reproduction

13.1 yr

Faster, shorter growth

19.7 yr

Slower, longer growth

### Brain

400 cc

EQ = 2.3

1000-2000 cc

EQ = 5.3

# Stages of the Human Life Cycle

## Unique Human Life Cycle:

Infant 0-3 yrs

**Childhood 3-7 yrs**

Juvenile (beginning at 7)

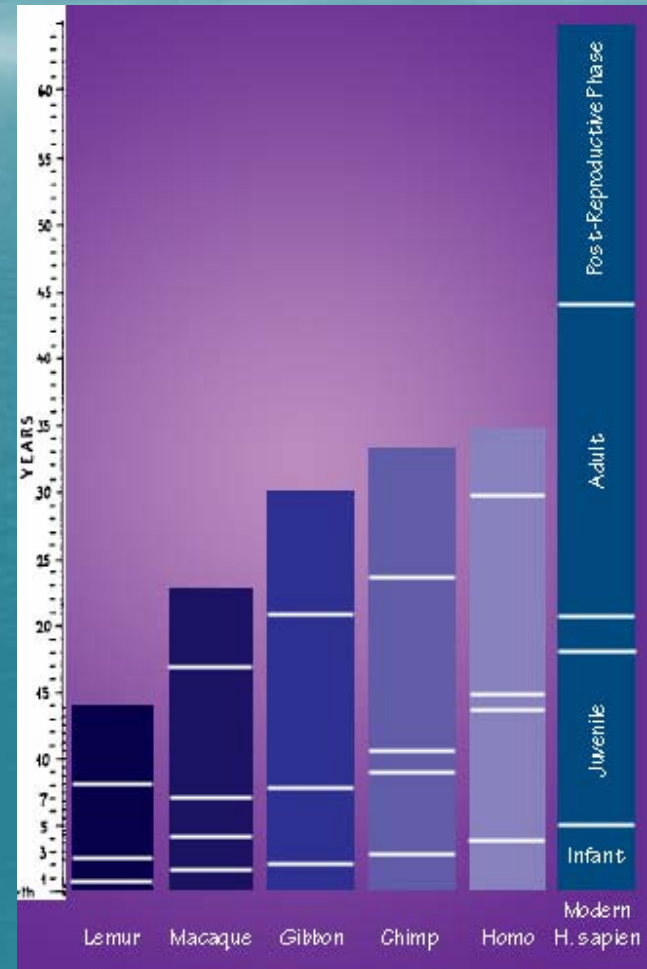
**Adolescence**

10-18 in girls

12-18 in boys

Adulthood (reproductive stage)

**Post-Reproductive Period (older adulthood)**



# Life Stages

Infancy: Birth to three

