Biology of Reproduction
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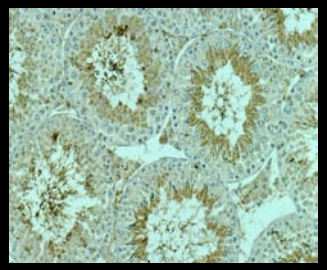
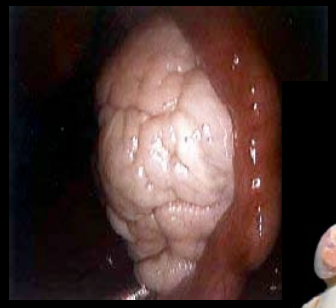
Guillette laboratory

- 22nd year at UF
- Research focus on reproductive biology
- Teaching: general biology - graduate studies

The World of Reproductive Biology





Molecular

seconds

Cellular

minutes

Tissue

hours

Organ

Laboratory-based Studies

Biosphere

eons

Ecosystem

centuries

Community

decades

Population

Field-based Studies

Organism

years

Lab or Field-based Studies

Thanks to John Moran and Rex Hess
for use of photos presented here.

Evolution: Darwin's main ideas

1) Natural selection is "**differential success in reproduction**"

   a) Unequal ability of individuals to survive and reproduce

Reproduction

- central to biology and evolution
  - "differential reproduction"
- involves production, growth and differentiation of new individuals
- interdisciplinary in scope

Evolution: Darwin's main ideas

2) interaction between the **environment** and the **variability** inherent among individuals making up a population

Evolution: Darwin's main ideas

3) adaptation of populations of organisms to their environment

insecticide resistance in insects

Insects with chromosome for resistance differentially reproduce

Figure 22.12 Evolution of insecticide resistance in insect populations

Model Systems

- 90% of the recent research in mammals is focused on 10 species
  - 0.02% of present day vertebrate species!
- these 'models' have "pointed the way" but do not clearly represent the diversity present

Terms You Should Know

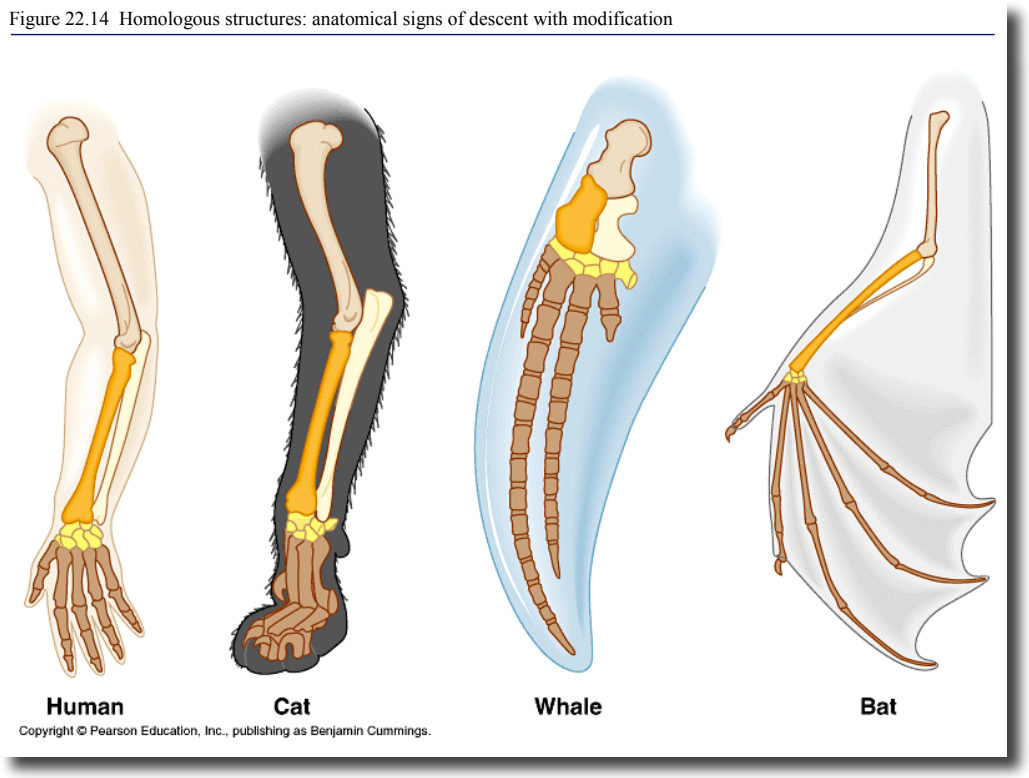
- **PLESIOMORPHIC** - primitive
- **APOMORPHIC** - derived

- **HOMOLOGY**- characters share similar design and common evolutionary origin
- **ANALOGY** - independent evolutionary origin of structures that have similar form or function

Homology

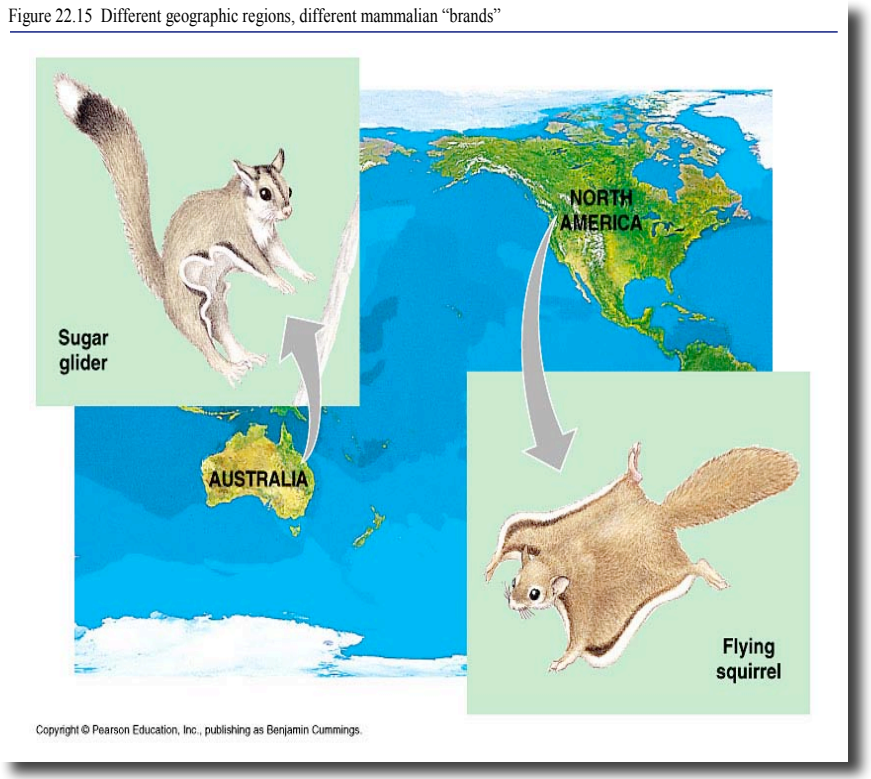
- **characters share similar design and common evolutionary origin**
  - bird wing and mammal limb
  - sexual homologies - mammalian external genitalia

Figure 22.14 Homologous structures: anatomical signs of descent with modification

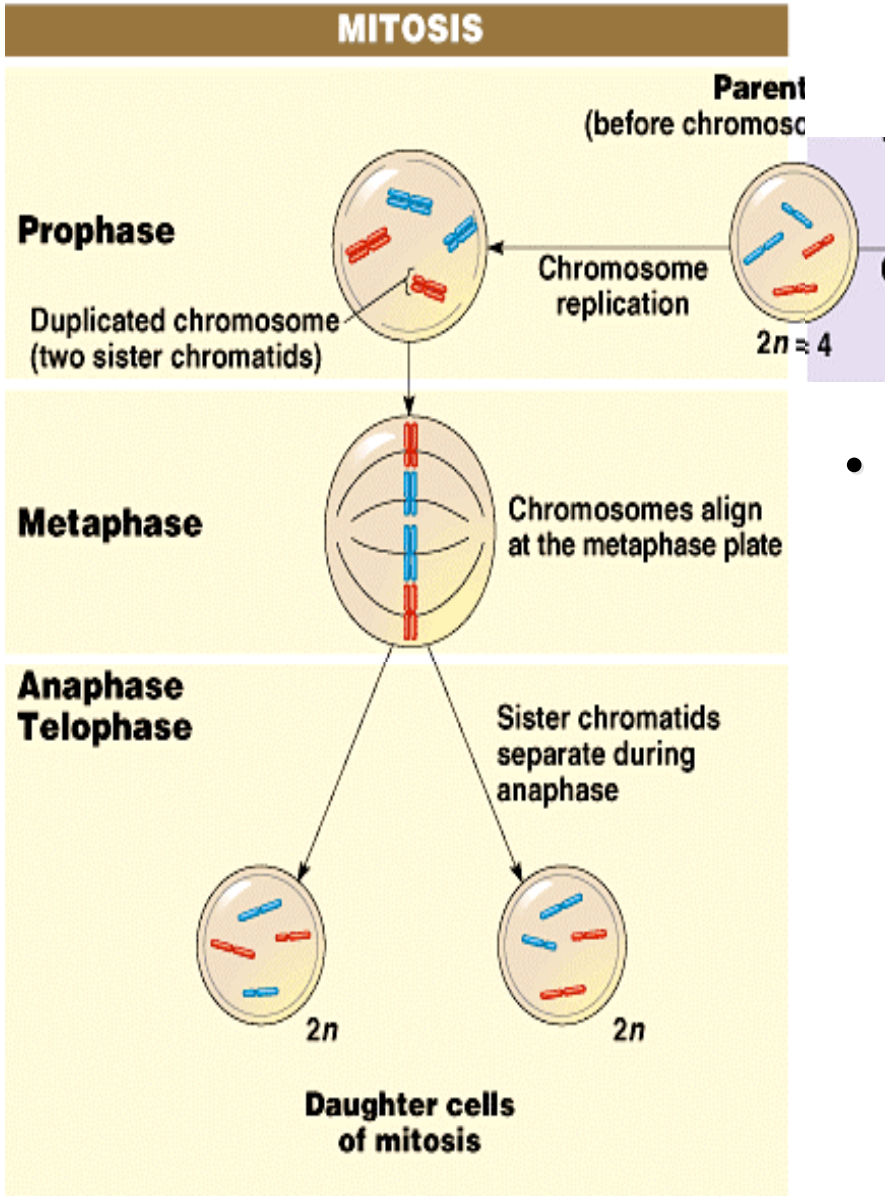


Analogy

- **Independent evolutionary origin of structures that have similar form or function**
  - wings of birds and bees
  - convergent evolution



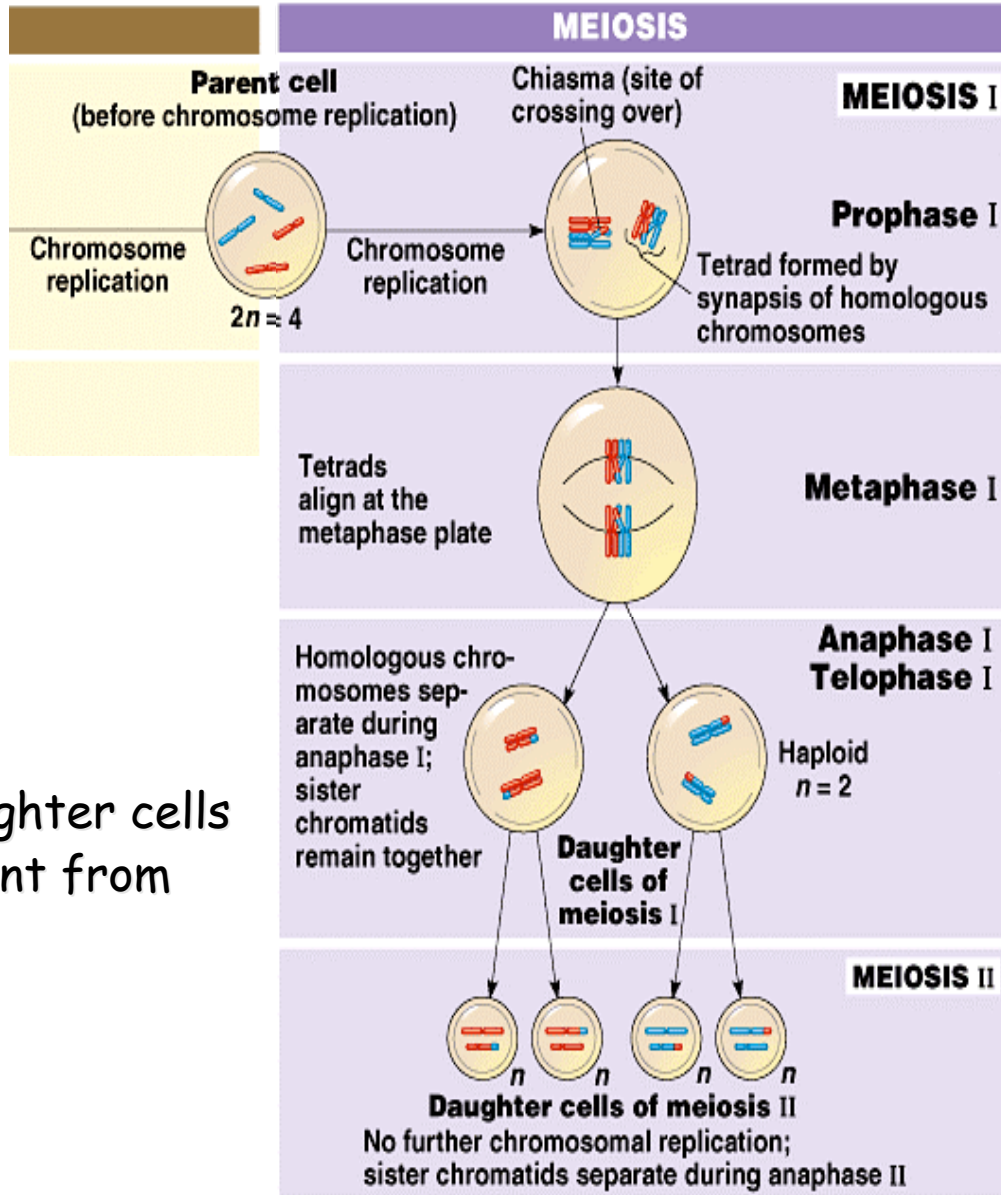
Mitosis and Meiosis



- Mitosis
  - 2 daughter cells/division
  - Equal chromosomal separation - diploid daughter cells
  - Daughter cells identical to parent cell

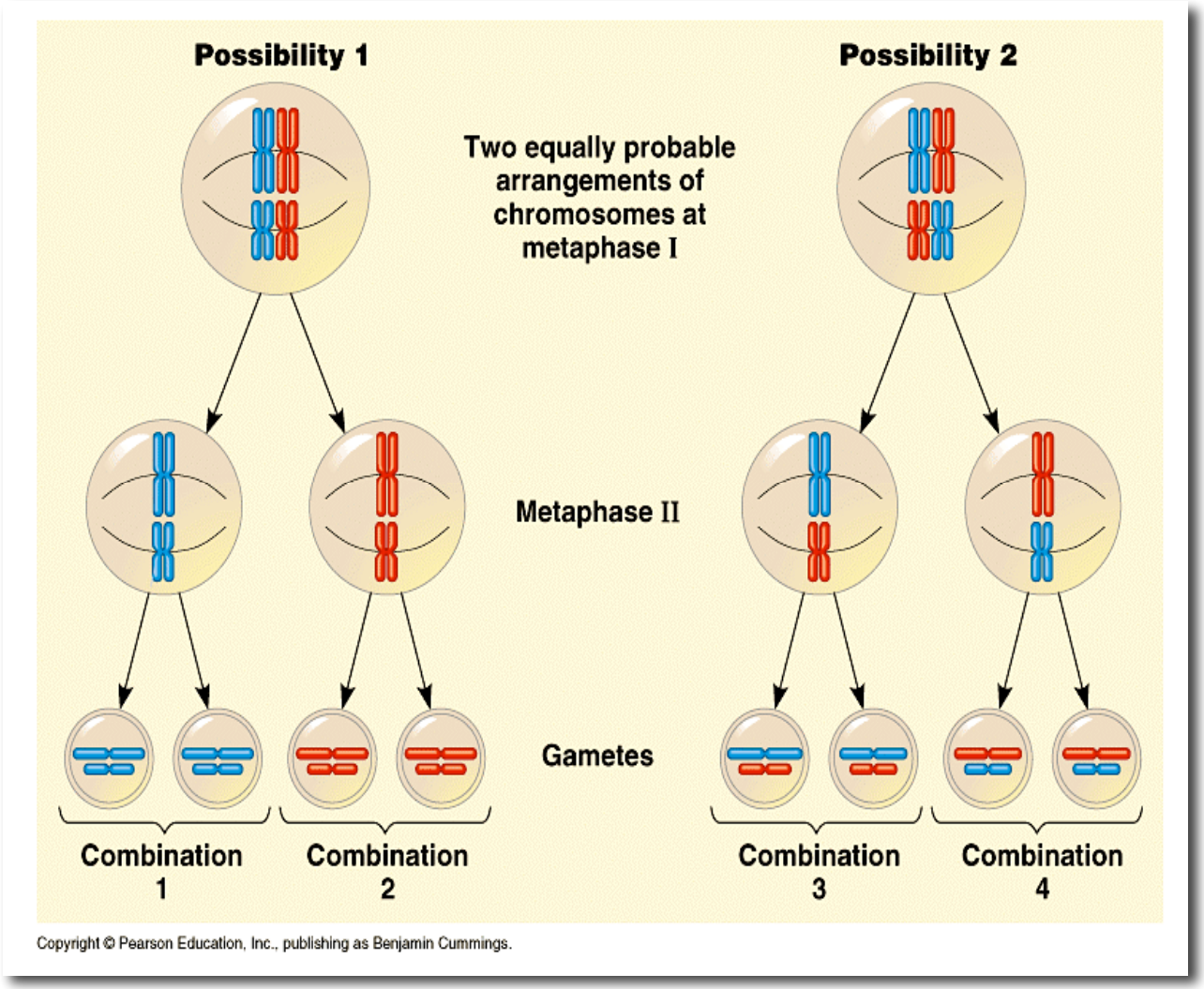
Mitosis and Meiosis

- Meiosis
  - Male 4 cells/division
  - Female 1 cell/division
    - 2 polar bodies
  - Unequal division - haploid daughter cells
  - Daughter cells can be different from parent cell



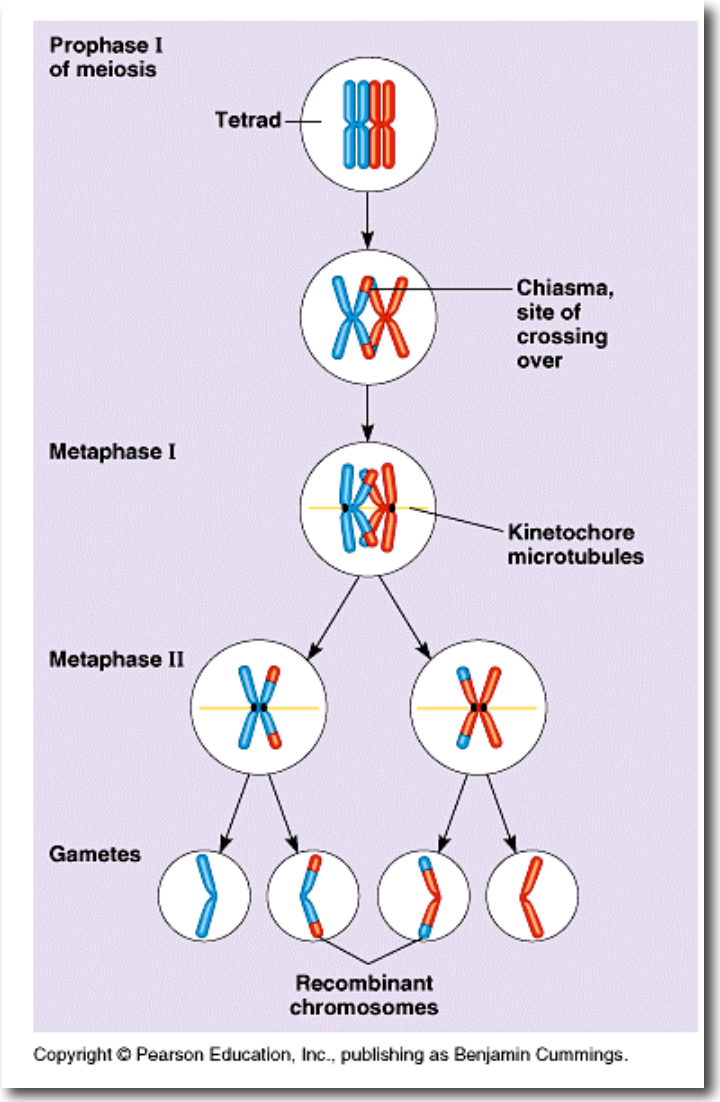
Meiosis generates variability

alternative arrangements of homologous chromosome pairs

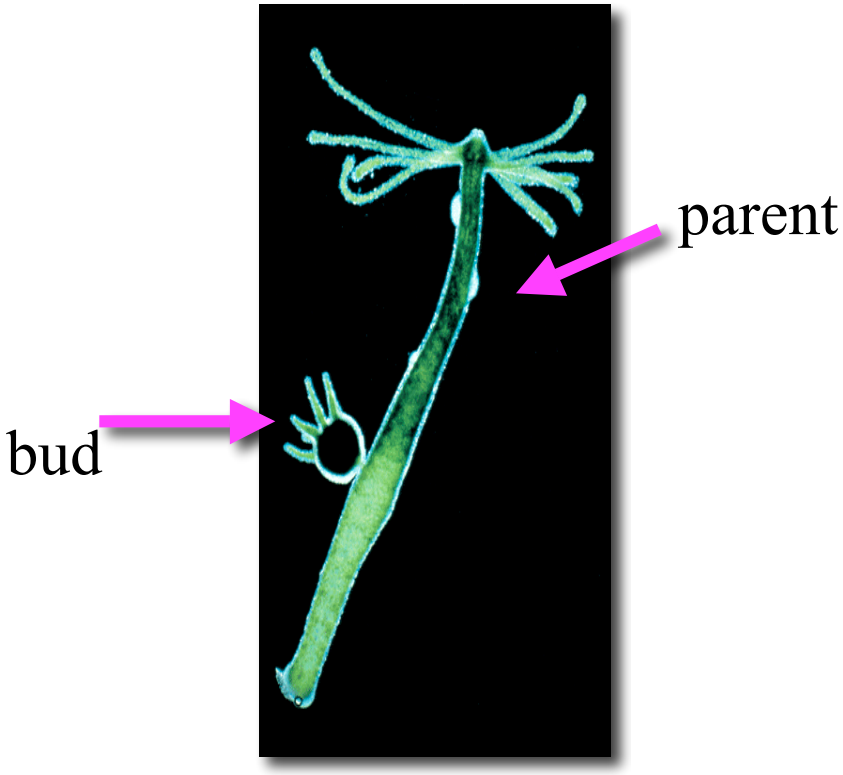


Meiosis generates variability

As a result of crossing over



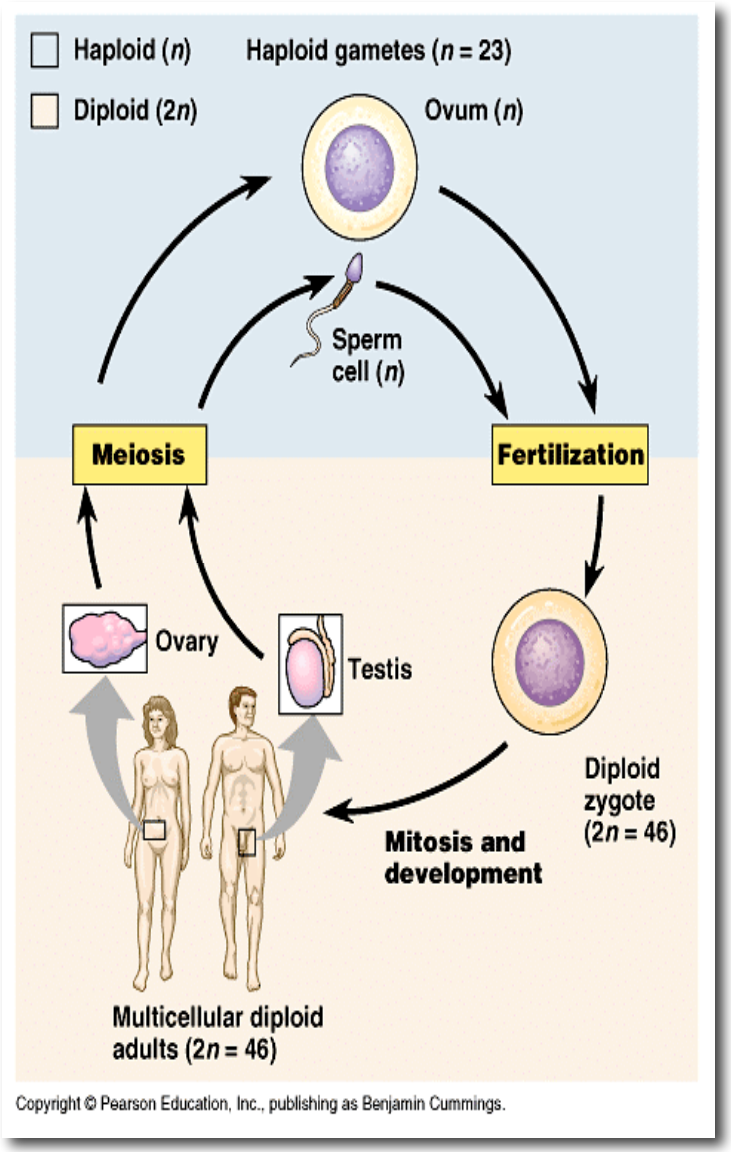
Asexual Reproduction



- all genes from one parent
- **fission** - a separation of a parent into two or more individuals of about equal size (mitosis)
- **budding** - new individuals split off parent

Sexual Reproduction

- genes from two parent
- fusion of haploid gametes = diploid zygote
- male gamete = sperm
  - usually smaller than oocyte
- female gamete = ovum
  - egg/oocyte
  - usually larger than sperm
- gamete also called germ cell



External Fertilization

- requires shedding of eggs and sperm
- usually in moist environment
  - prevent egg desiccation
  - allow sperm transport
- environmental factors can initiate release
  - temperature, rainfall, salinity, lunar cycle, pheromones, behavior

Internal Fertilization

- cooperative mating
- behavior important
  - courtship
  - mate choice

Sex Ratio

- **Primary** - male:female at fertilization
  - only those with genetic basis for sex determination
- **Secondary** - at end of parental/incubation period
- **Tertiary** - male: female adults in population