The Red Queen

Lundquist -- 2015

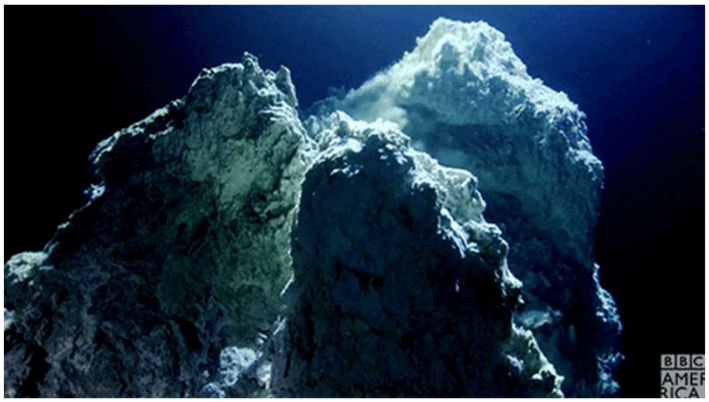
What is the meaning of life

- The purpose of life is to continue

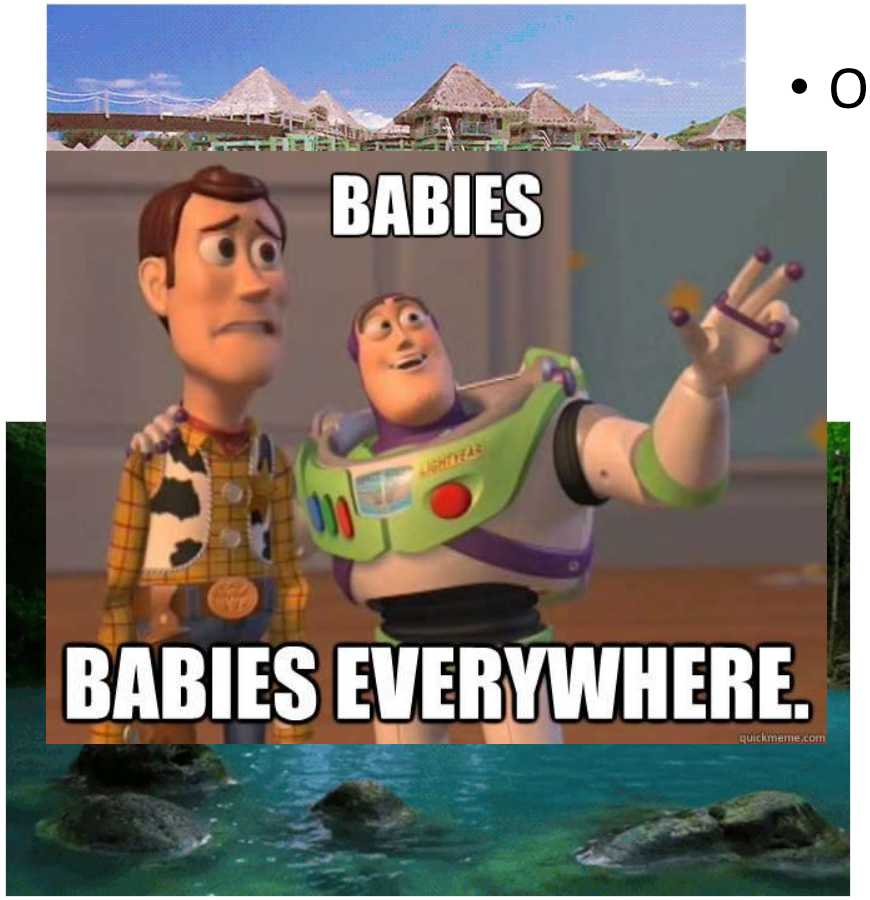
- Organisms take extreme measures to insure survival

In Hostile Environments

- organisms choose immortality as a goal
  - Self-sufficiency
  - Self-sustainability



In Nurturing Environments



- Organisms choose to reproduce
- When they die they pass on their knowledge
- Reproduction as much as possible ensures that knowledge continues
  - There is no such thing as too many

Why?!?

The more you have the greater chance that you will have an offspring survive.

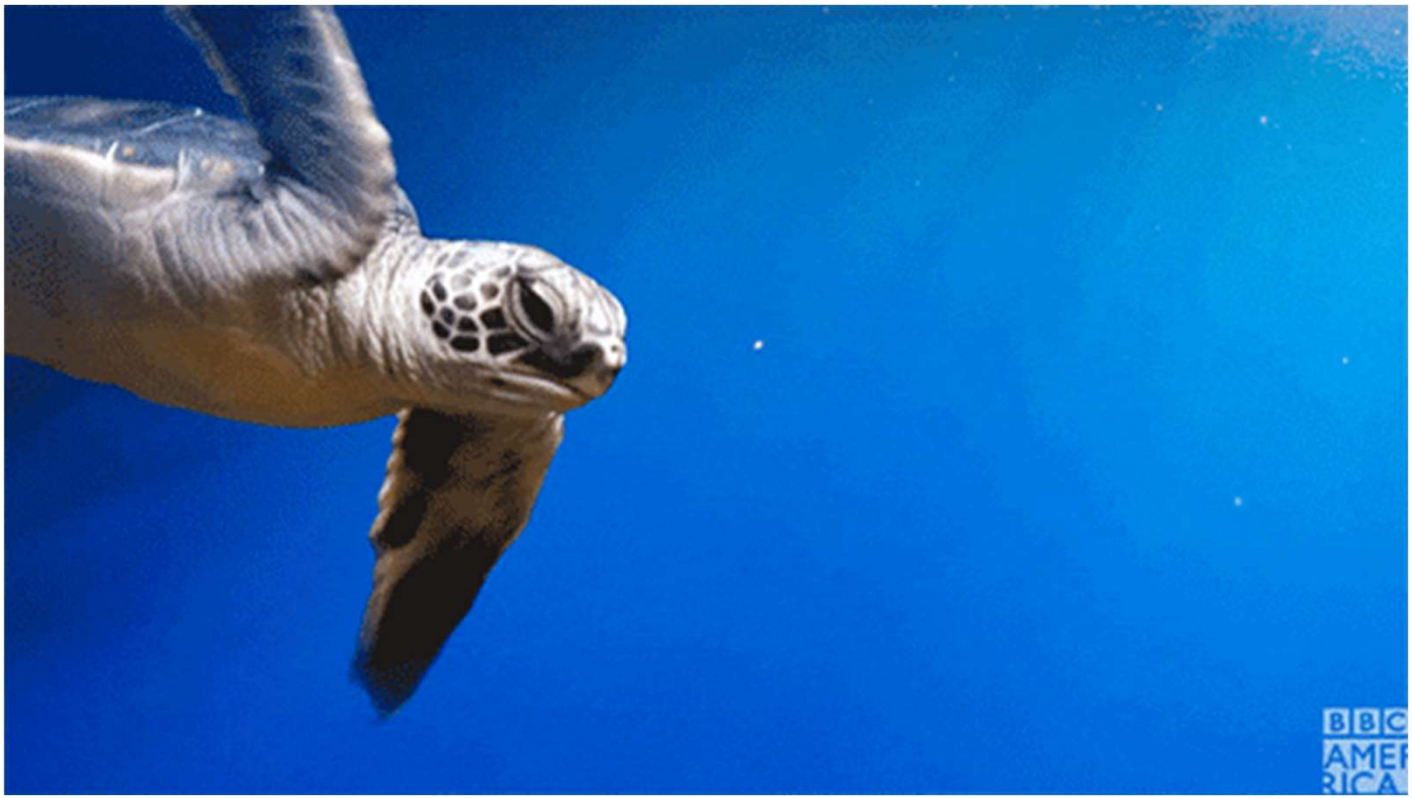
But….

ow

Nobody’s eating us now

Most babies make it

Fine for you smarty pants but what about the sea turtles?



May the odds be ever in your favor

Of all the eggs that hatch only 1% survive to adult hood to reproduce

Wait a minute…

If the whole point if to have as many offspring as possible

Why don't organisms reproduce like crazy?

There are more bacterial cells on your body than human cells

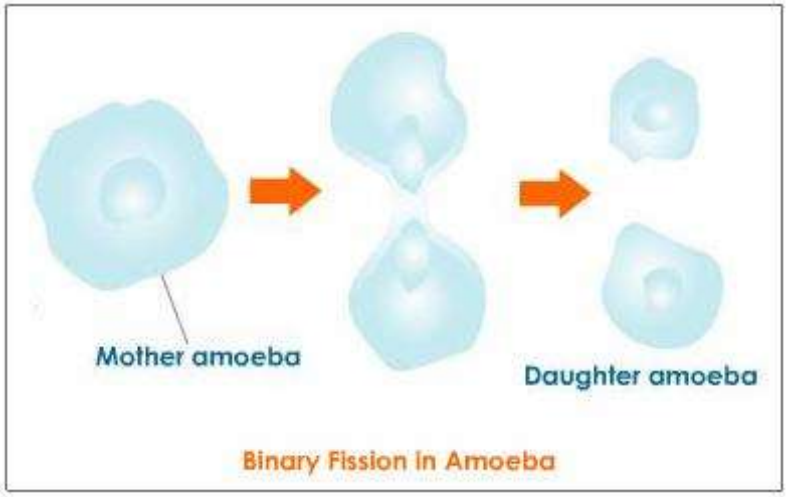
←Todays' random disgusting fact.

Two type of reproduction

sexual

asexual

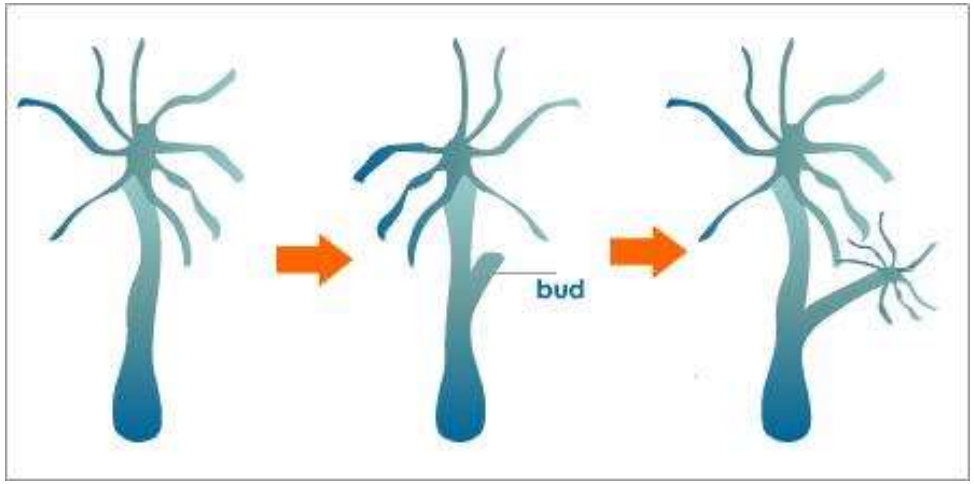
Asexual reproduction



Micro-organisms do it alone

called binary fission

Bacteria, some algae, protozoa

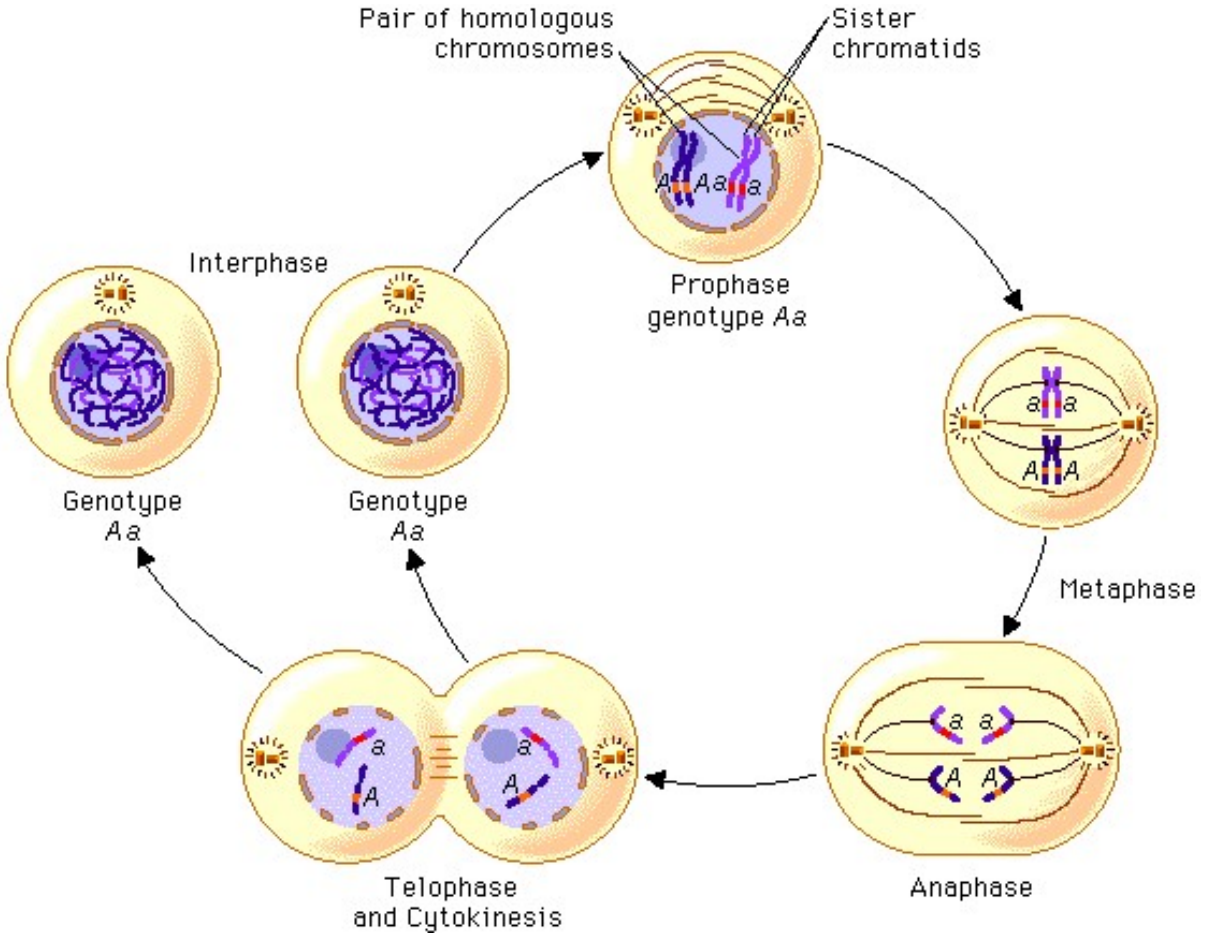


Simple organisms do it with little nubs

called budding

Jellyfish, some plants (called pupping), corals

When your cells do it, it is called mitosis

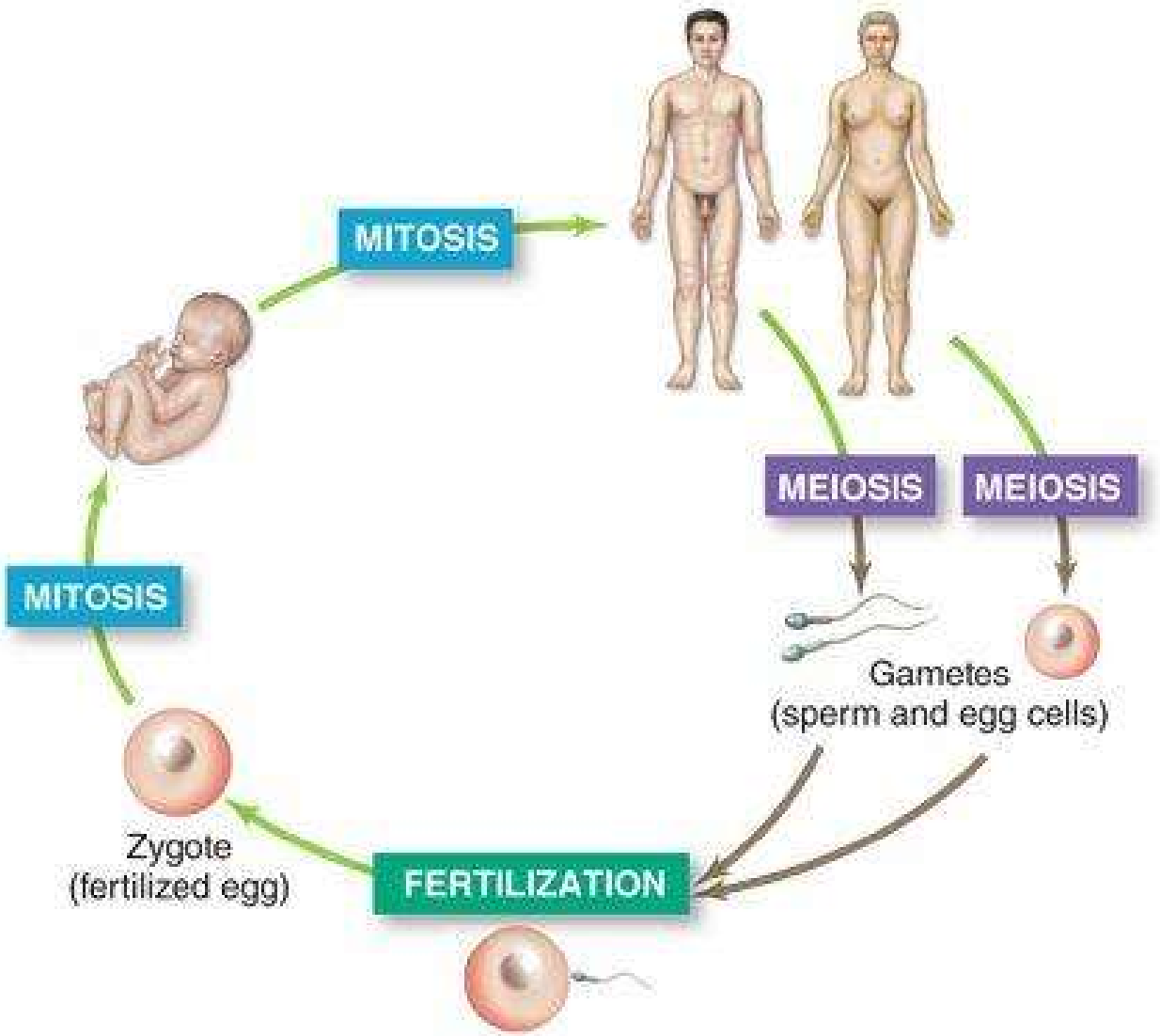


Back to sex.

Sexual reproduction is different

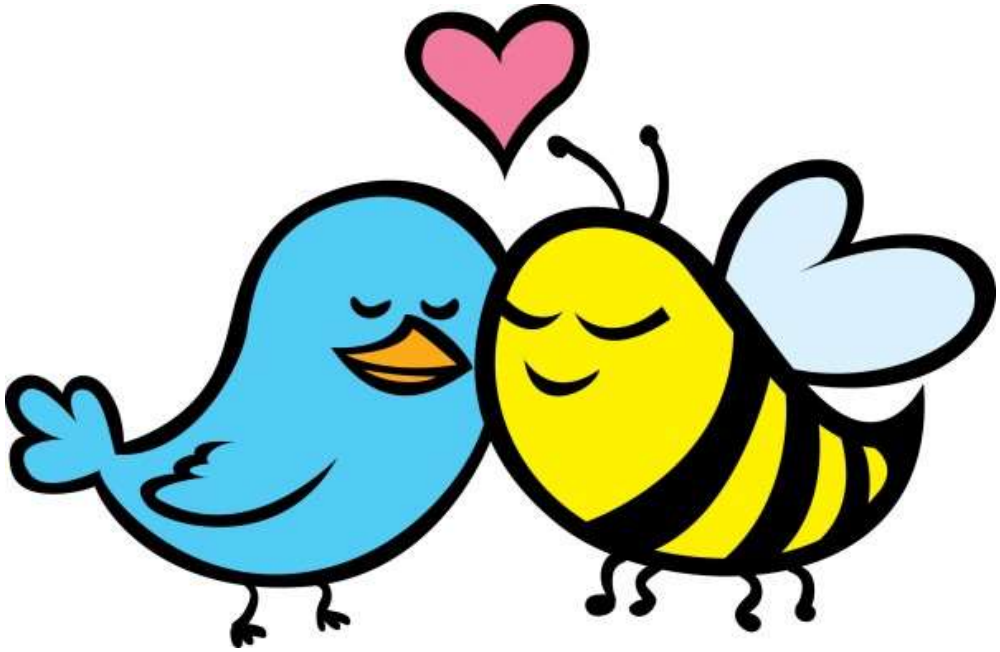
{strange} SEX

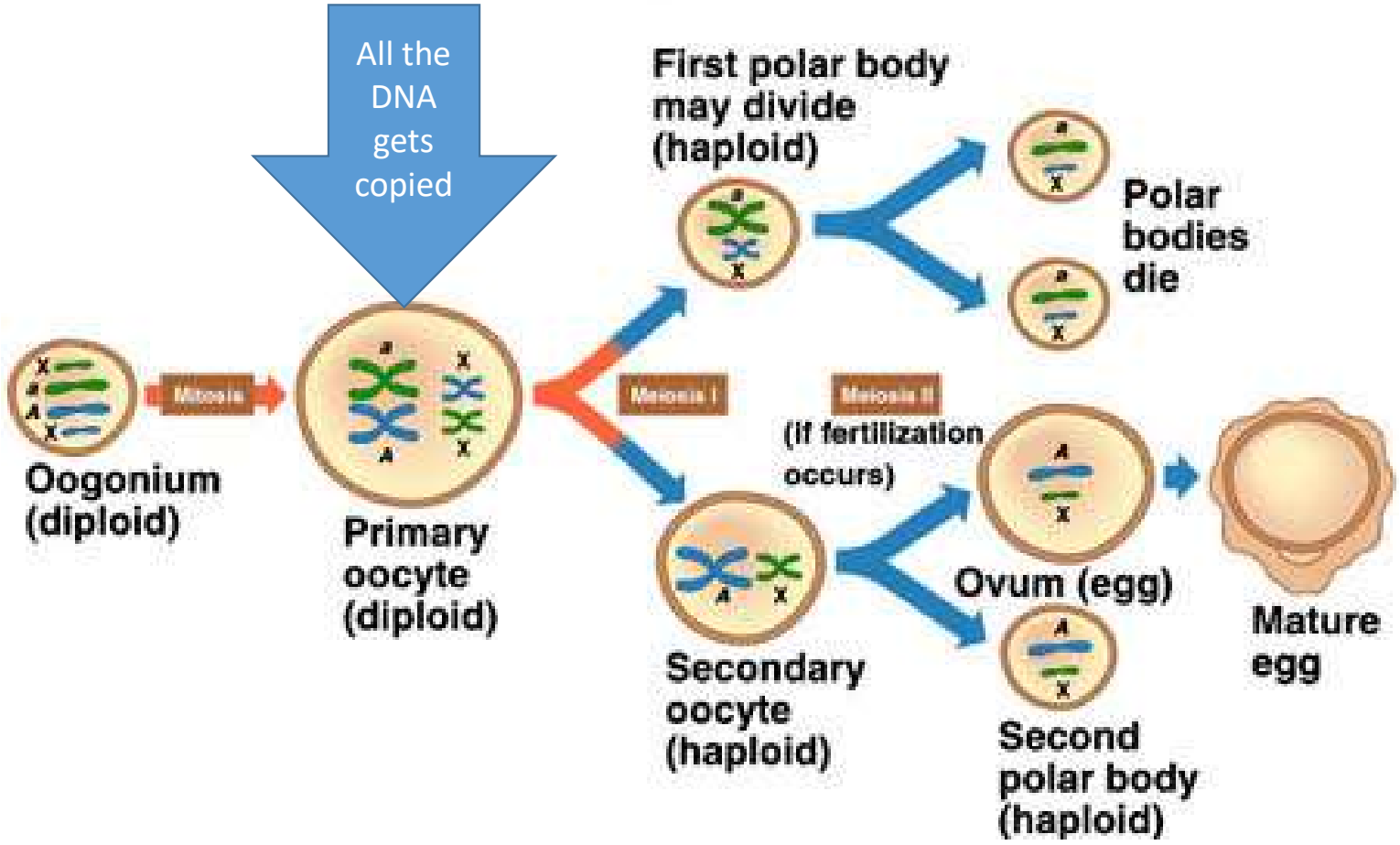
Category: Shows that will give you nightmares

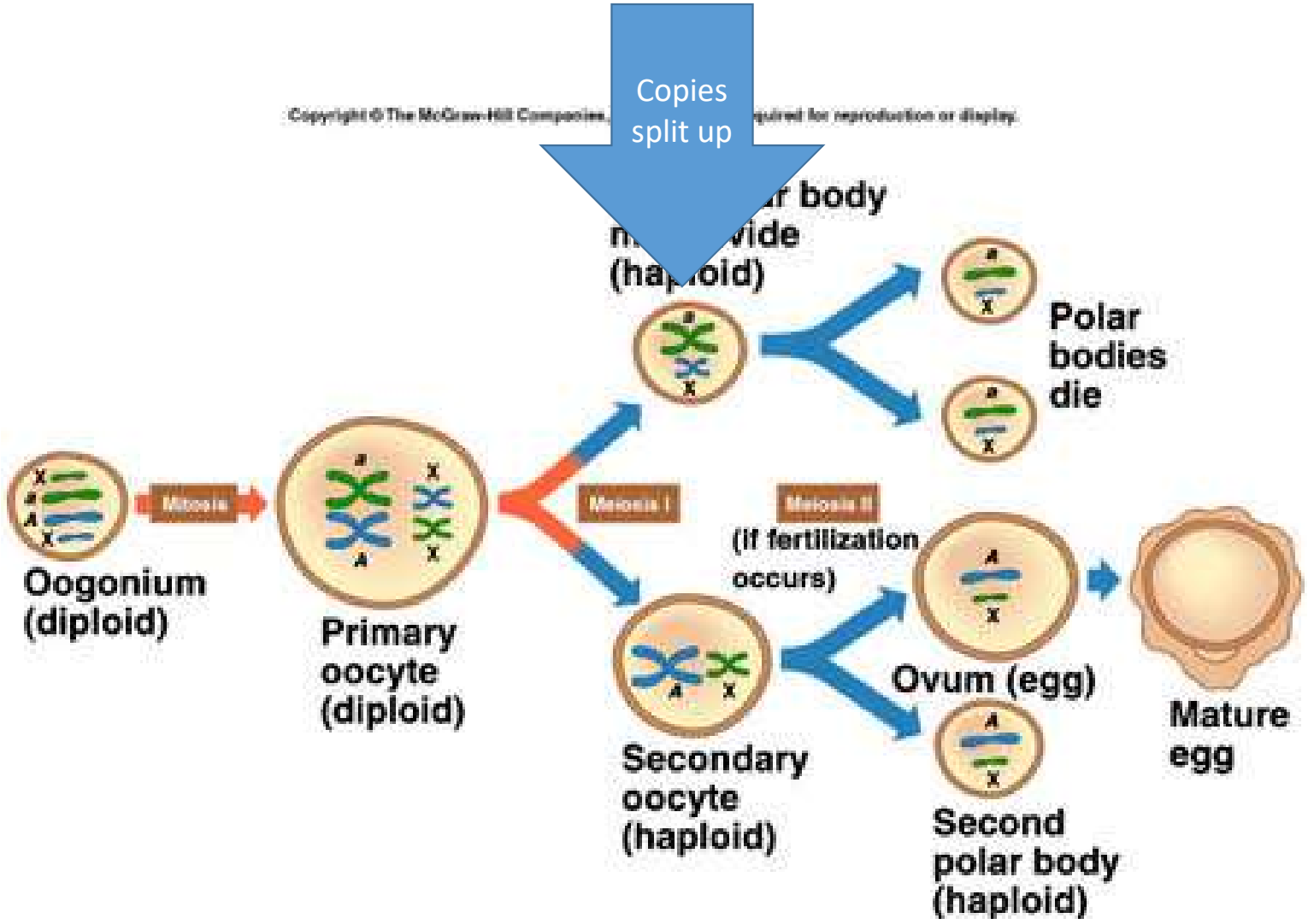

MITOSIS
MEIOSIS
MEIOSIS
MITOSIS
Gametes
(sperm and egg cells)
Zygote
(fertilized egg)
FERTILIZATION

Meiosis

Where babies-making cells
come from

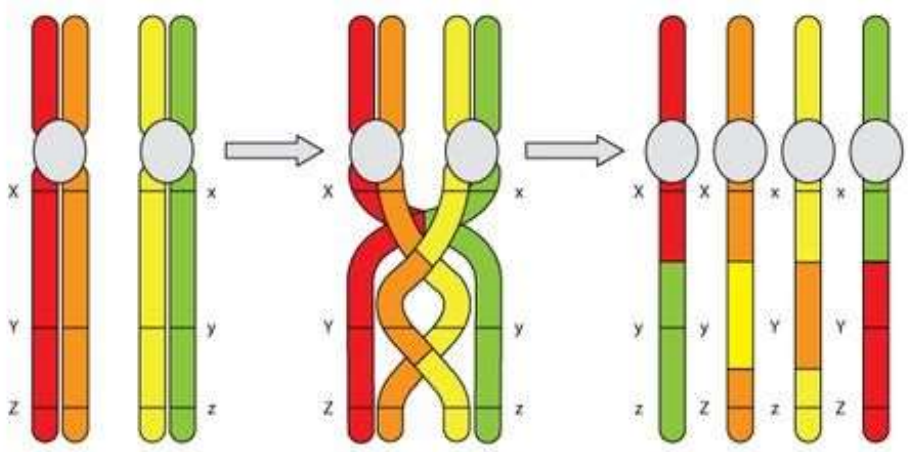




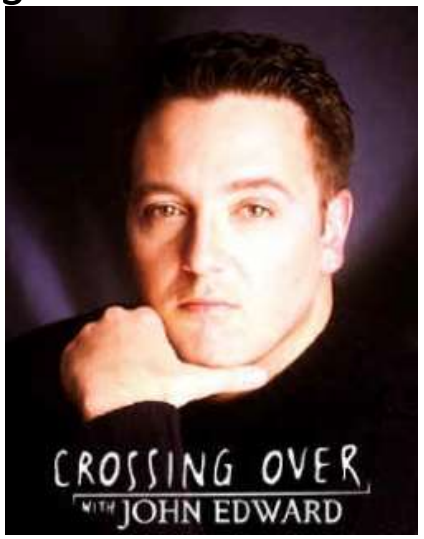


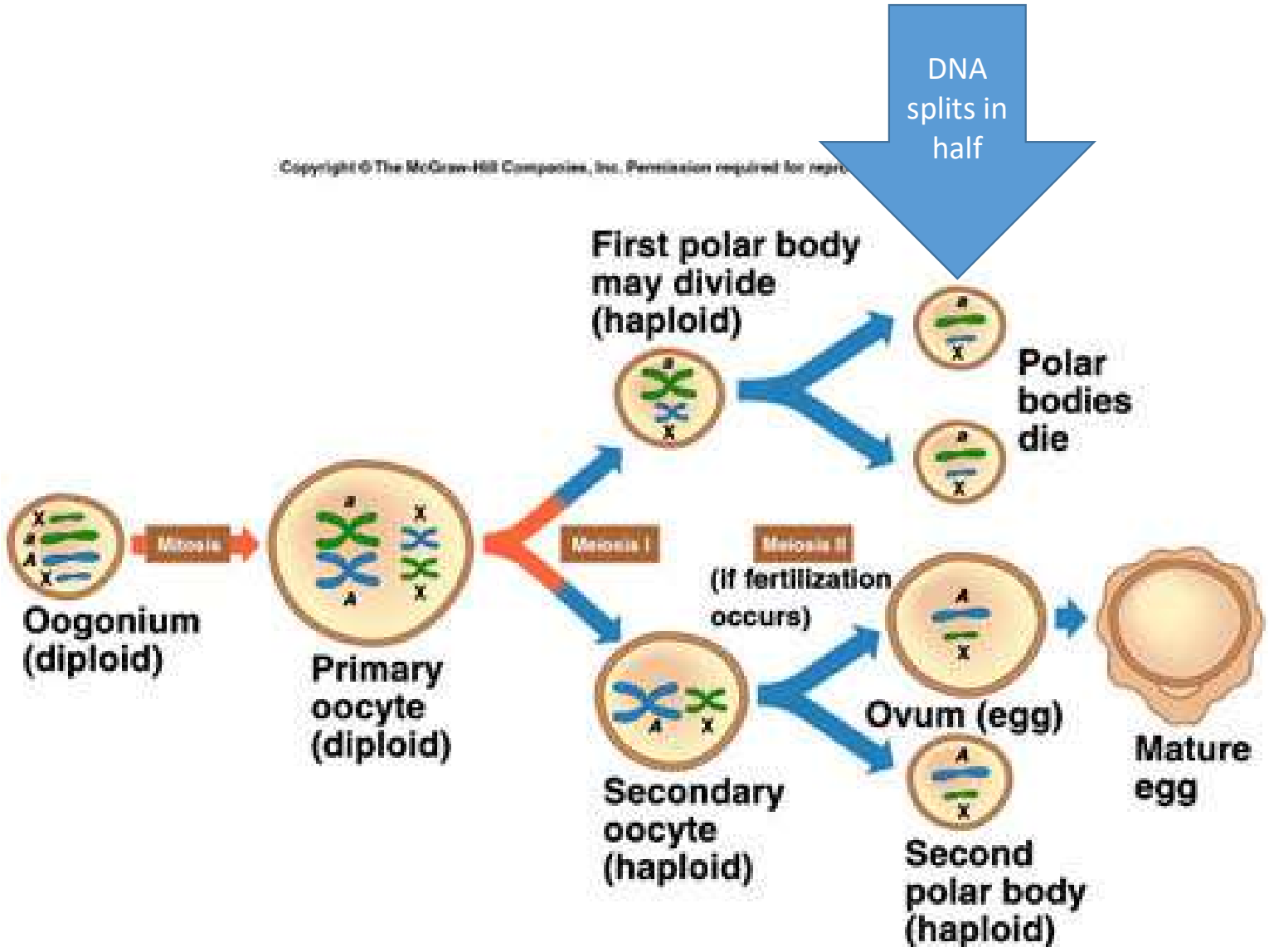
Crossing over with DNA

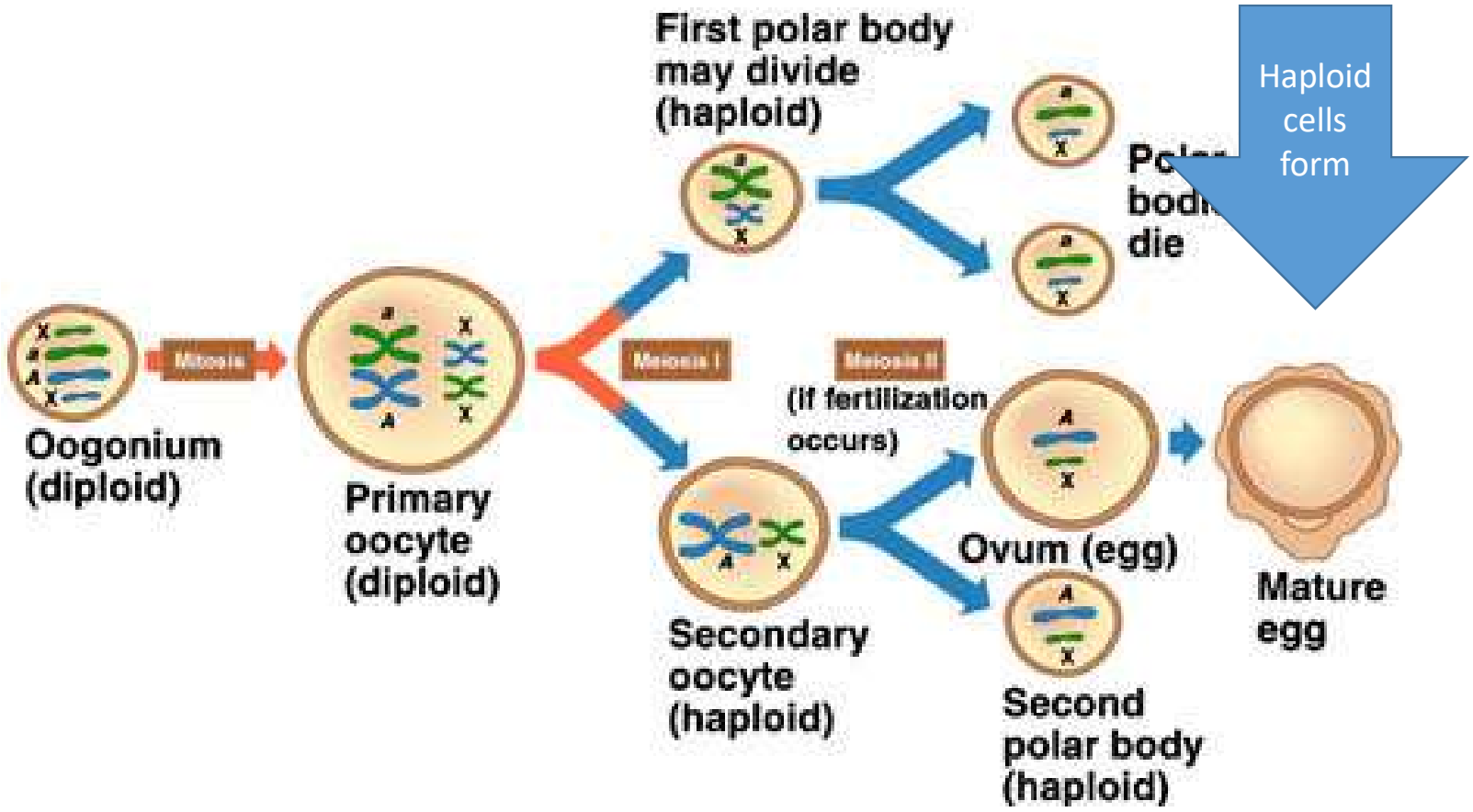
This

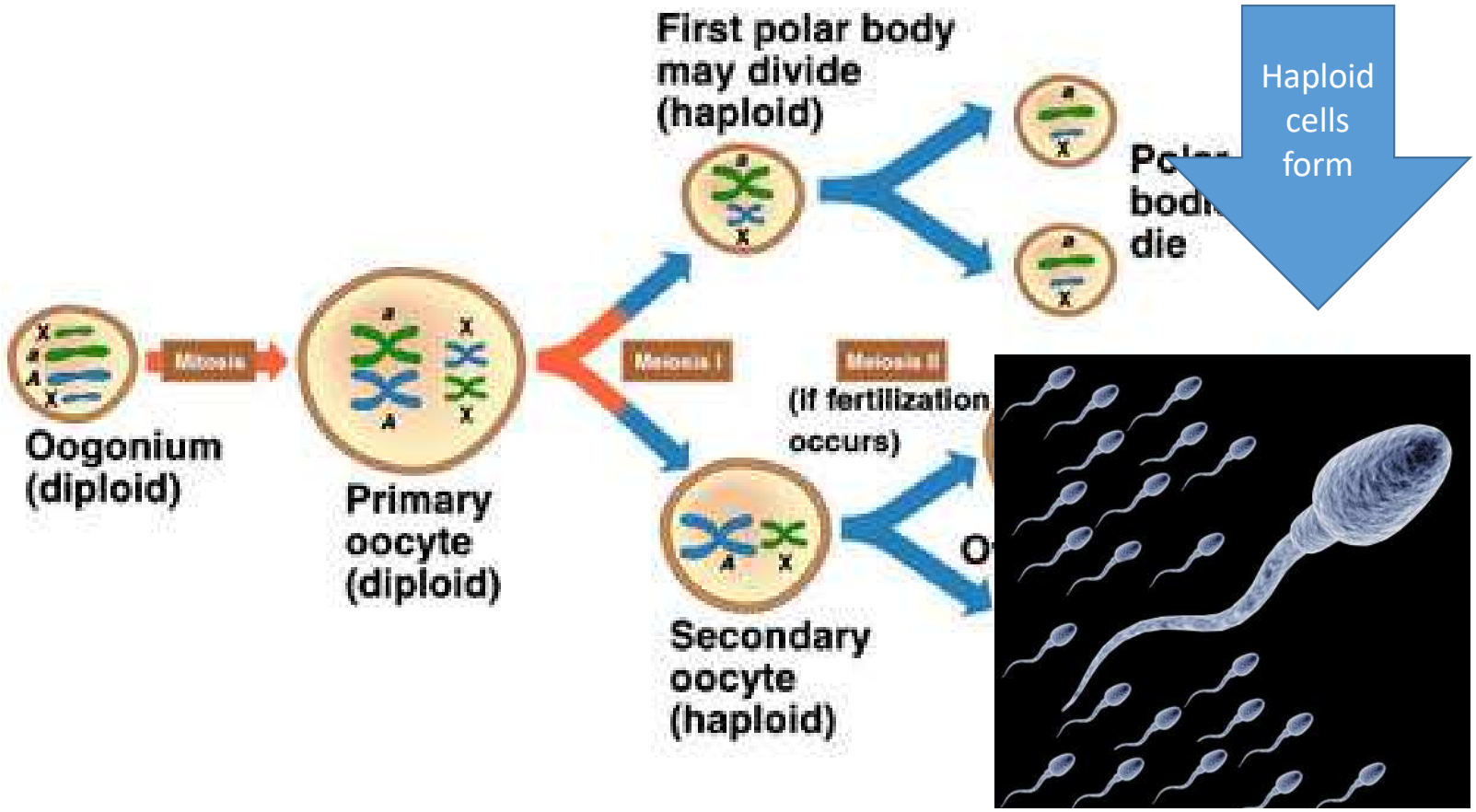


Not this









SO…

Sexual reproduction (Meiosis)

- Two divisions, with 4 genetically unique and incomplete offspring (gametes)
- More energy – find a date, convince them you have a future (lie), fine a place to put on some romantic music (Lets Marvin Gaye…)…
- Gametes converge to make a zygote (diploid)

Asexual reproduction (Mitosis)

- One division, with two offspring genetically the same
- Less energy – get fat, and split

Obvious winner:

- Asexual reproduction
  - Faster, cheaper

- But why do so many organism reproduce sexually?

Cause it feels good

- As far as we can tell only a handful of species derive pleasure from the horizontal mambo.

And try to explain this:

The female praying mantis eats the head of her mate when he ejaculates.

Or this

Snails shoot each other in the head with “love darts”

So why reproduce sexually?

The Red Queen

- At one point in the story, Alice was on the queens chess board.
- To stay in place she had to run as fast as she could.

If you want your babies to survive, you'll need to give them some way to fend off killers

The never ending cold war

- Big baby killers
  - Disease
  - Parasites
  - Predation

A hypothesis:

If every offspring were the same, and never changed, one disease or parasite could infect an entire population with little trouble and lead to that population becoming extinct.

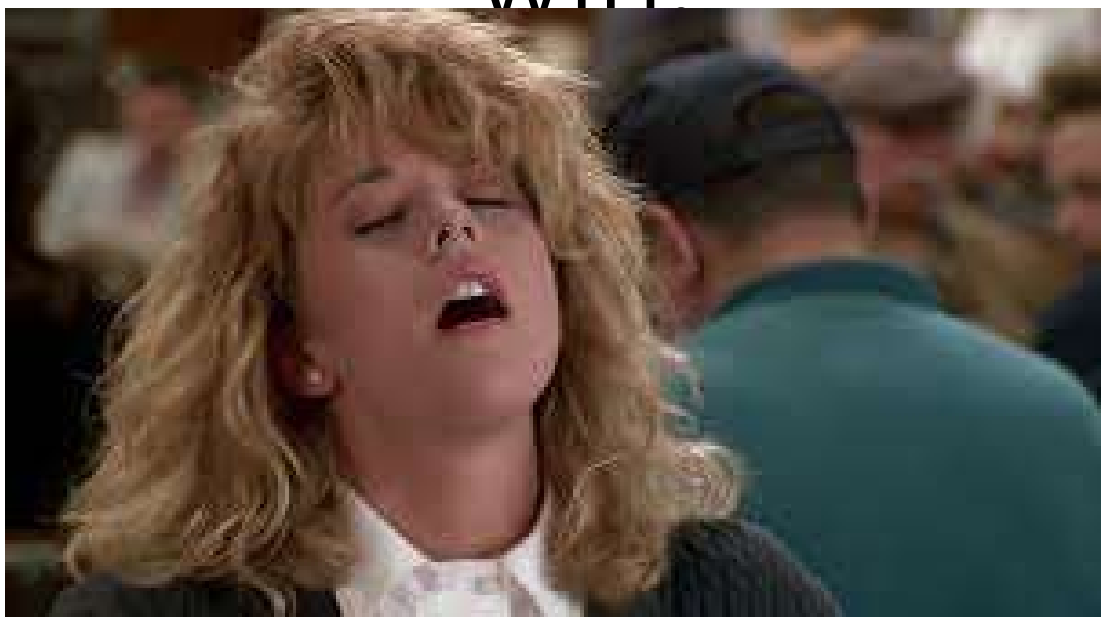
like Alice running on the chess board, a population must reproduce and change as fast as it can to survive the pressures of parasites changing to eradicate them.

Sexual reproduction

- Provides a means of variation in a population
- That variation prevents larger organism from mass extinction
  … at least from disease,
  parasites, and predation

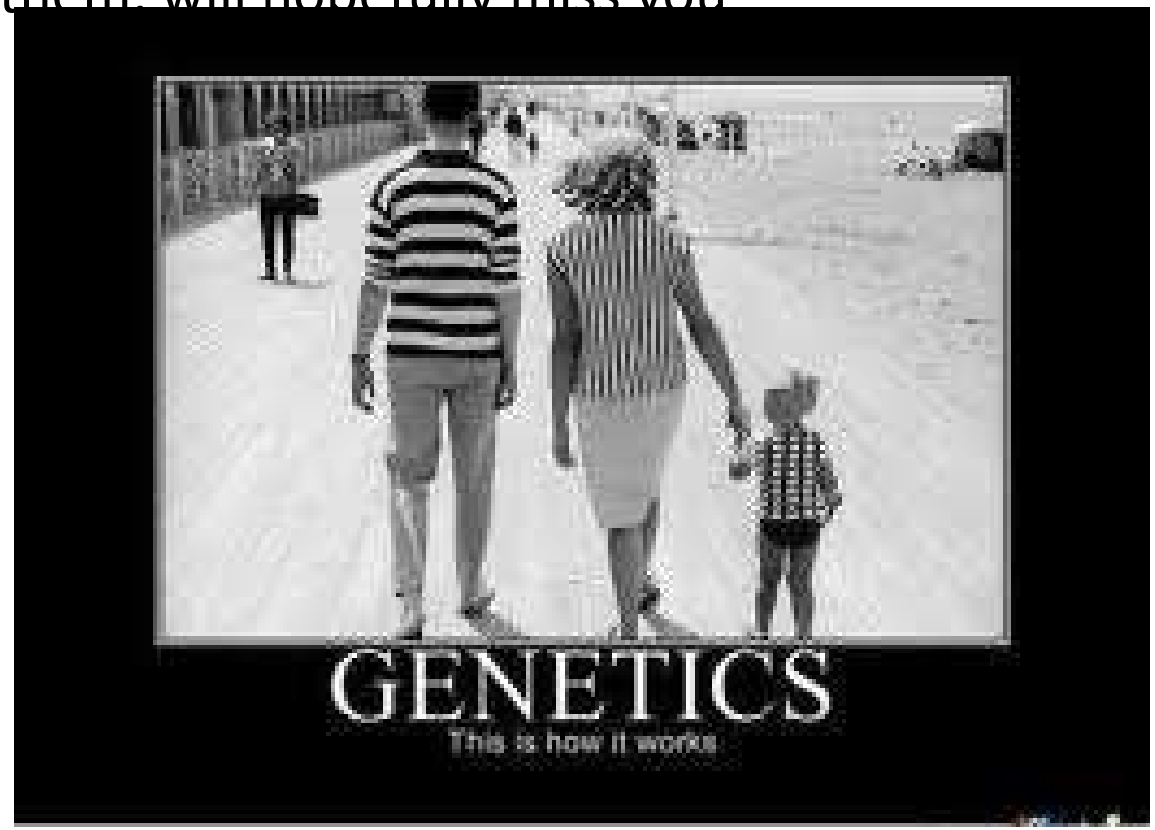
This happens, and your pretty hosed no matter how much sex you had.

Sexual Reproduction for the win



So thank mom and dad

- What kills them, will hopefully miss you



Knowledge?

- The ability to fight this cold war is stored in your genes
- The study of genes is called Genetics

Genetics

- Gregor Mendel
  - Father of genetics
  - Experiments
    - Well documented
    - Good design
    - Lots of data

Today I think I'll give birth to genetics. Yea, that sounds like a good idea.

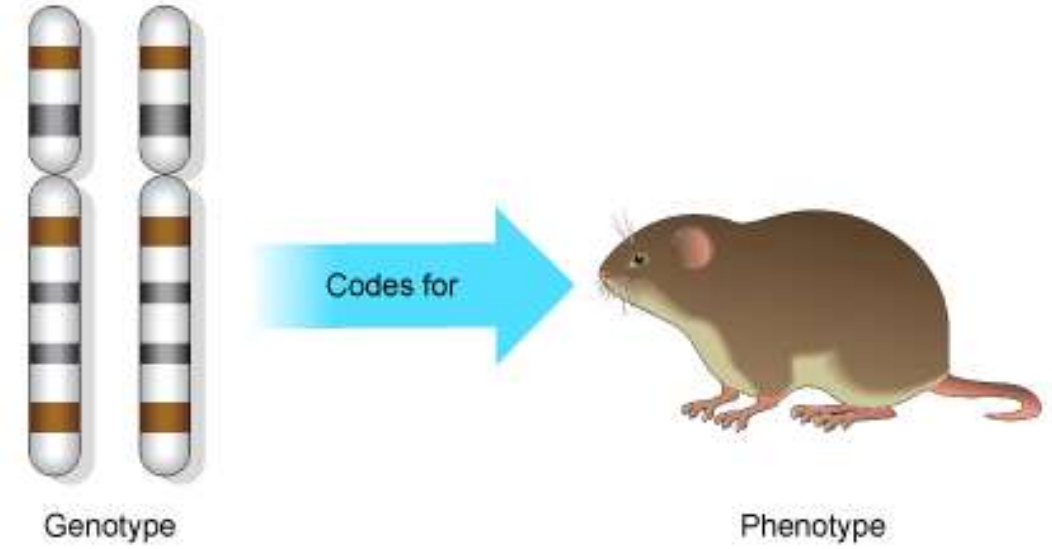
Terms to know

Genotype

- The specific alleles that make up that trait

Phenotype

- How something looks



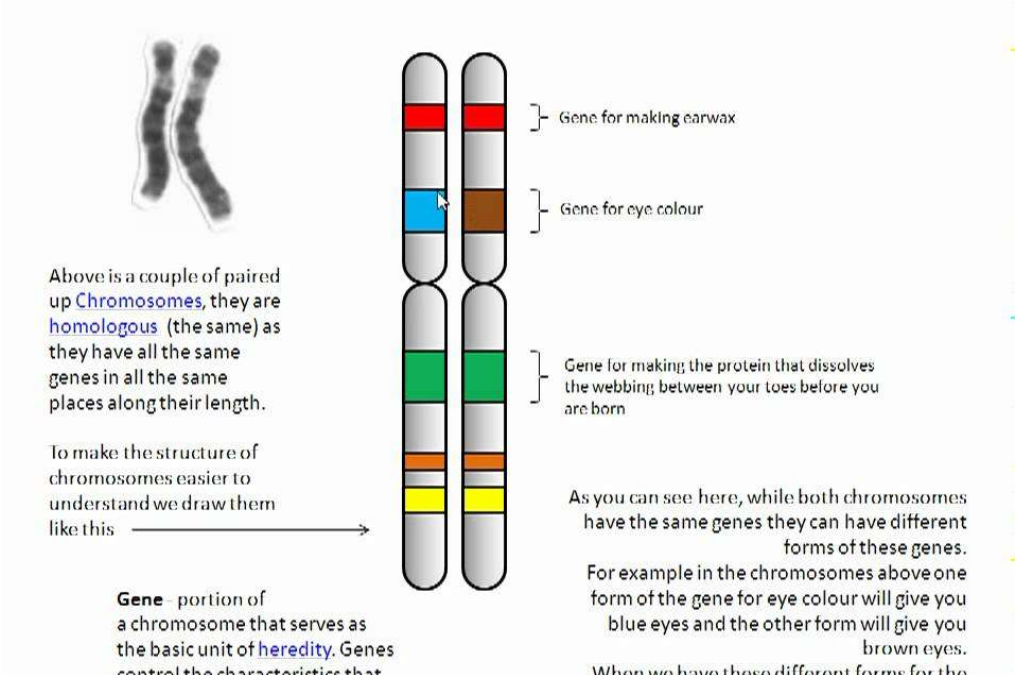
Terms to know

Gene

- The specific code for a trait

Allele

- The different versions of that



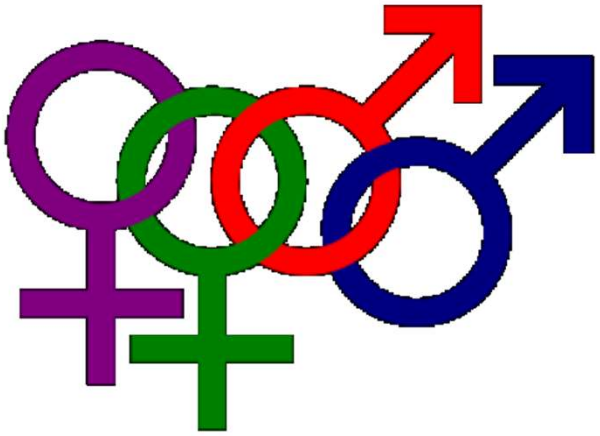
Terms to know

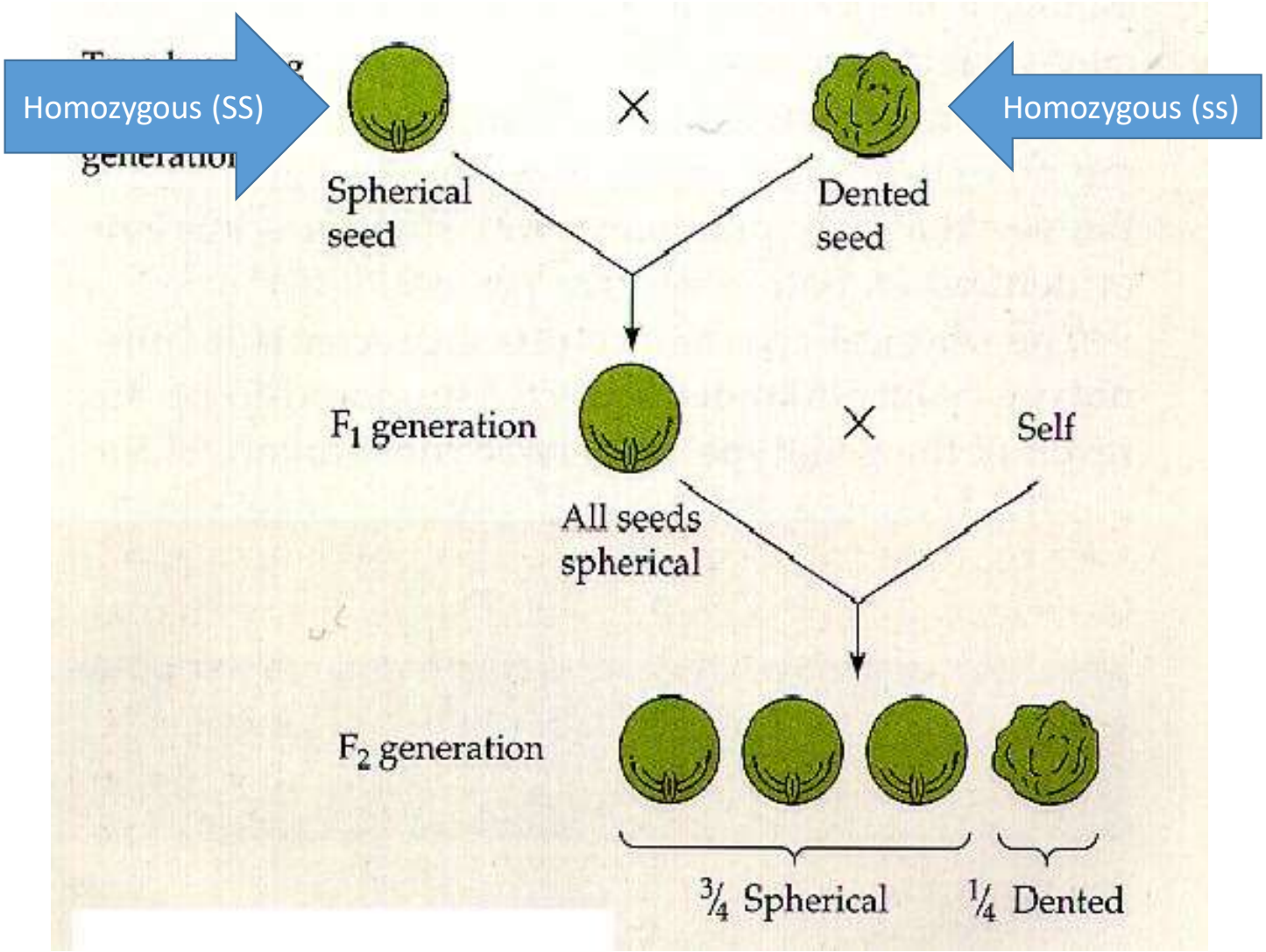
Heterozygous

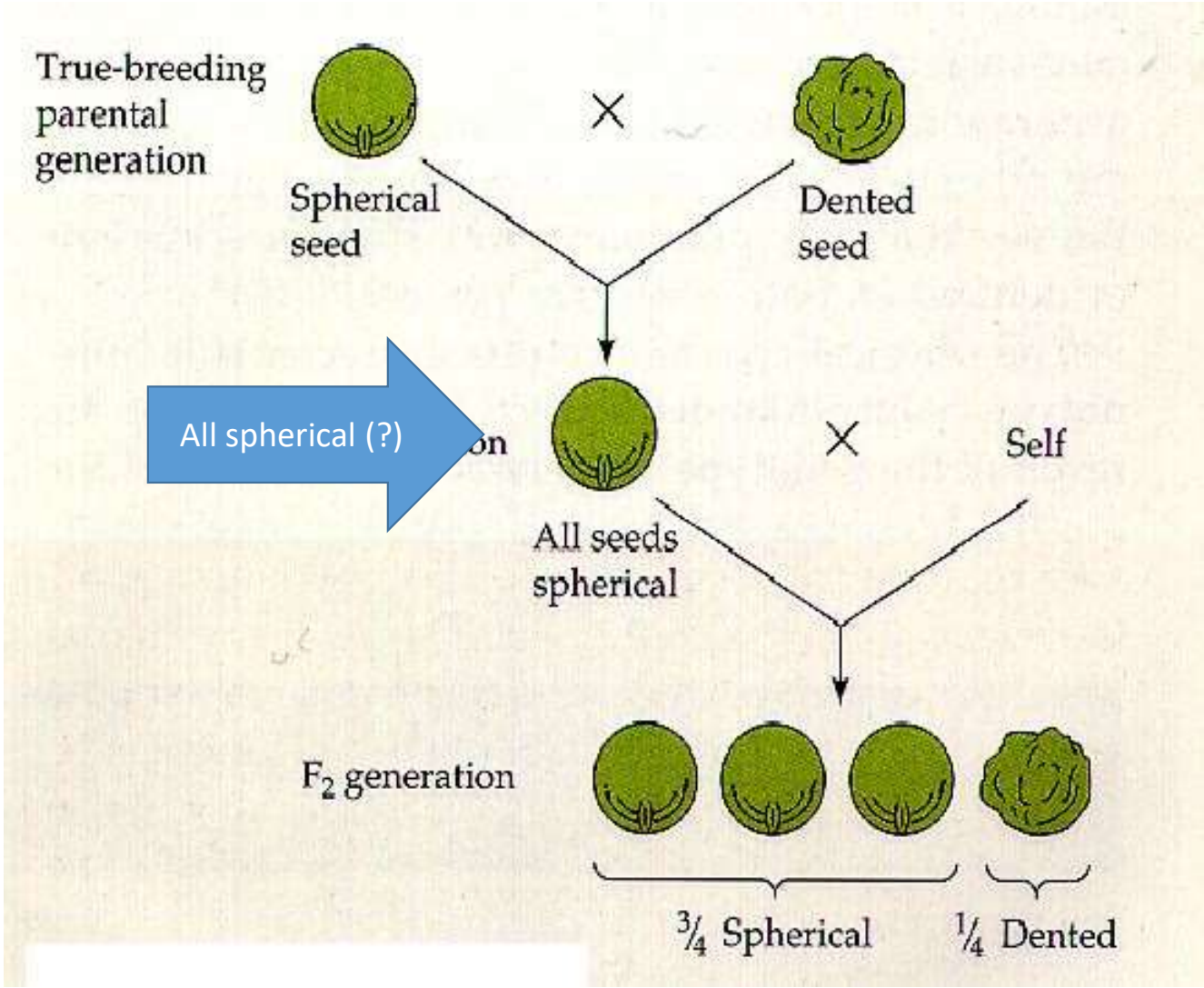
- Two different allele (types) of the same gene

Homozygous

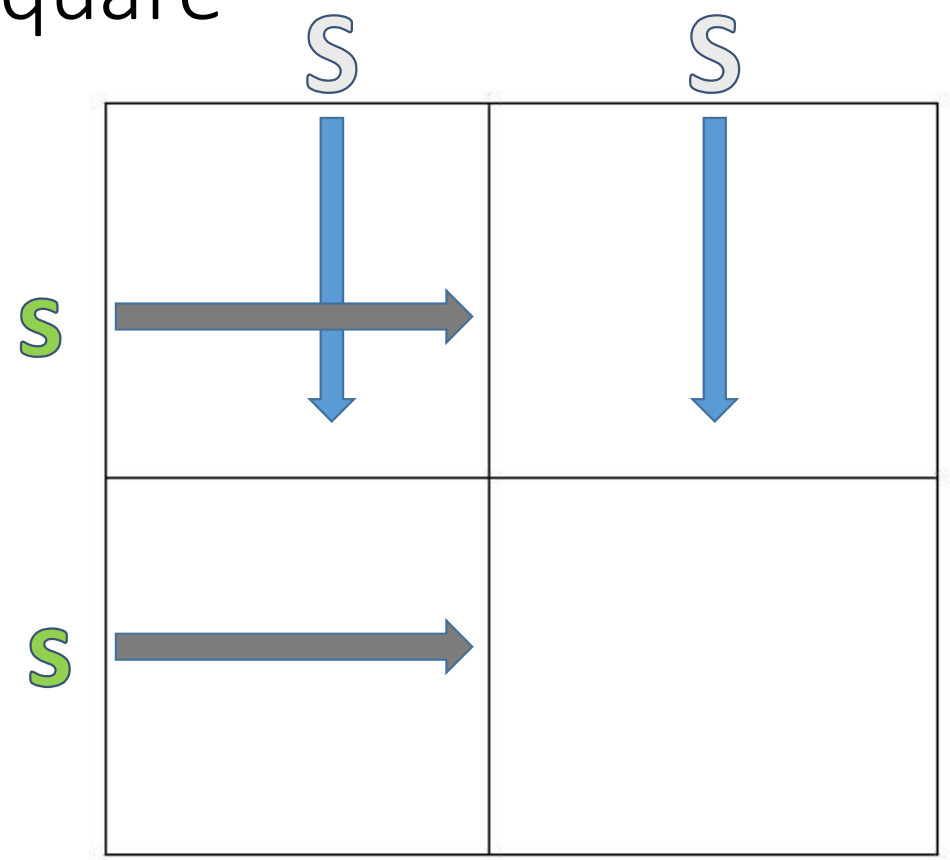
- Two of the same allele of a gene



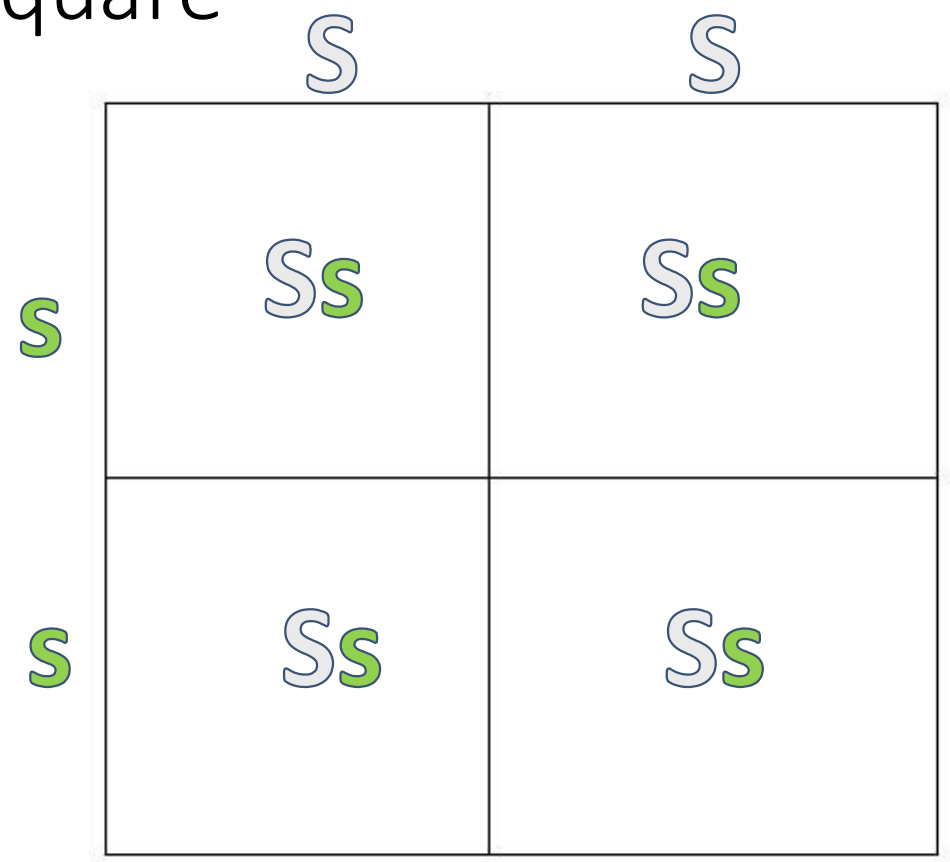

Homozygous (SS)
Homozygous (ss)
Spherical seed
Dented seed
F1 generation
All seeds spherical
Self
F2 generation
¾ Spherical
¼ Dented

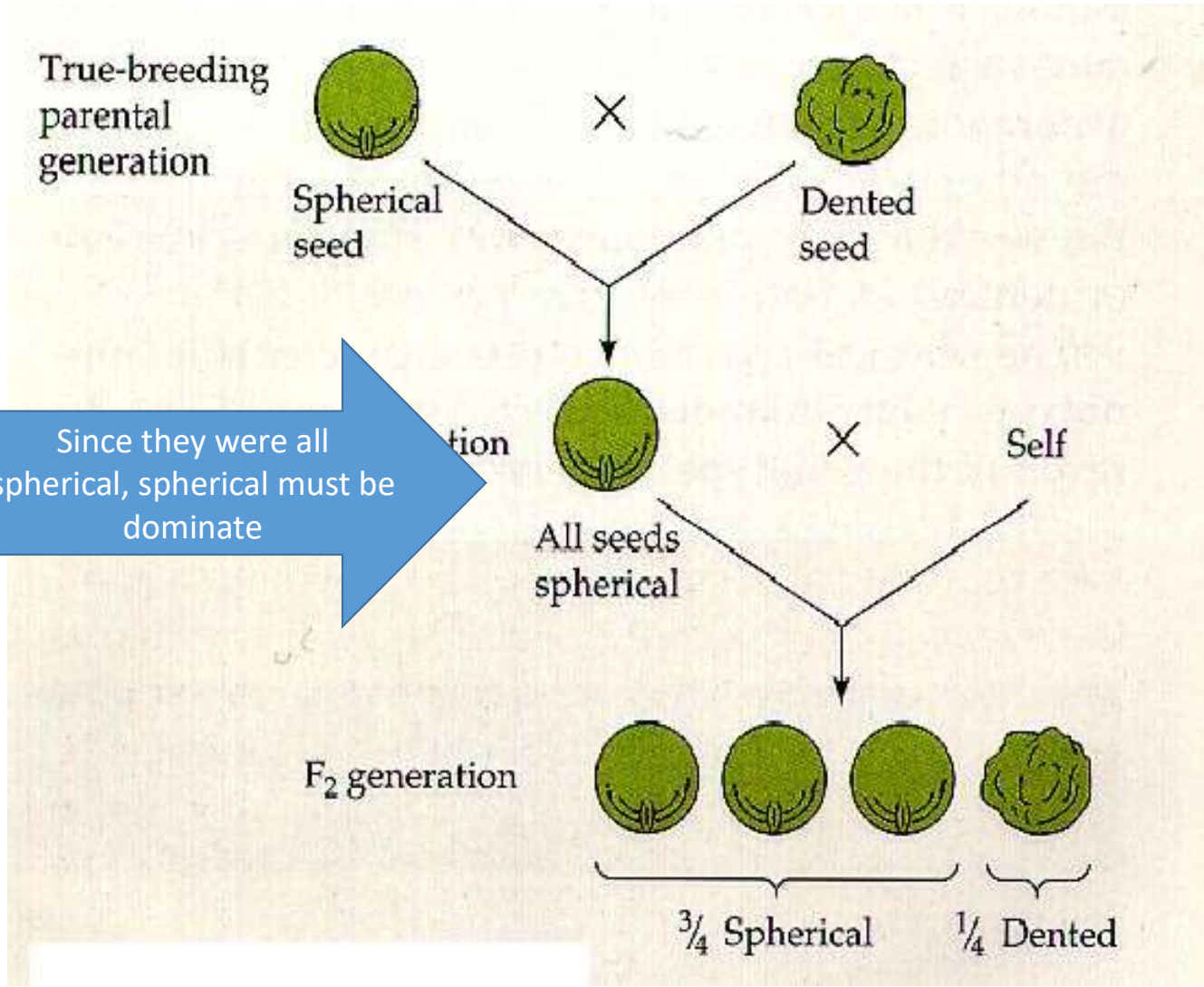

True-breeding parental generation
Spherical seed
×
Dented seed
All spherical (?)
All seeds spherical
×
Self
F2 generation
¾ Spherical
¼ Dented

Punnett square



Punnett square





Since they were all spherical, spherical must be dominate

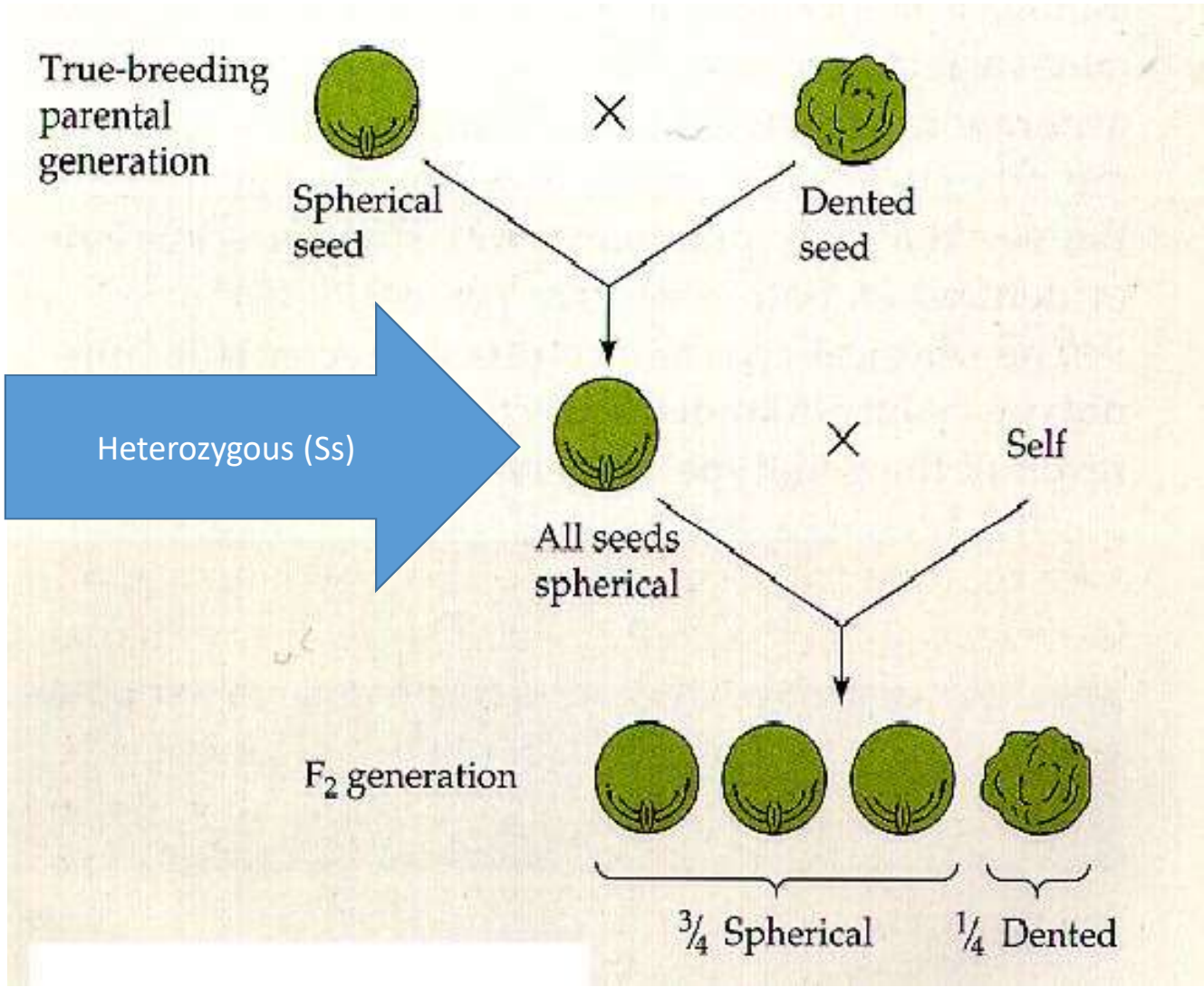
Words to know

Dominate

- Expressed over other a

Recessive

- Only expressed if paired with another recessive trait


True-breeding parental generation
Spherical seed
×
Dented seed
Heterozygous (Ss)
All seeds spherical
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Punnett square