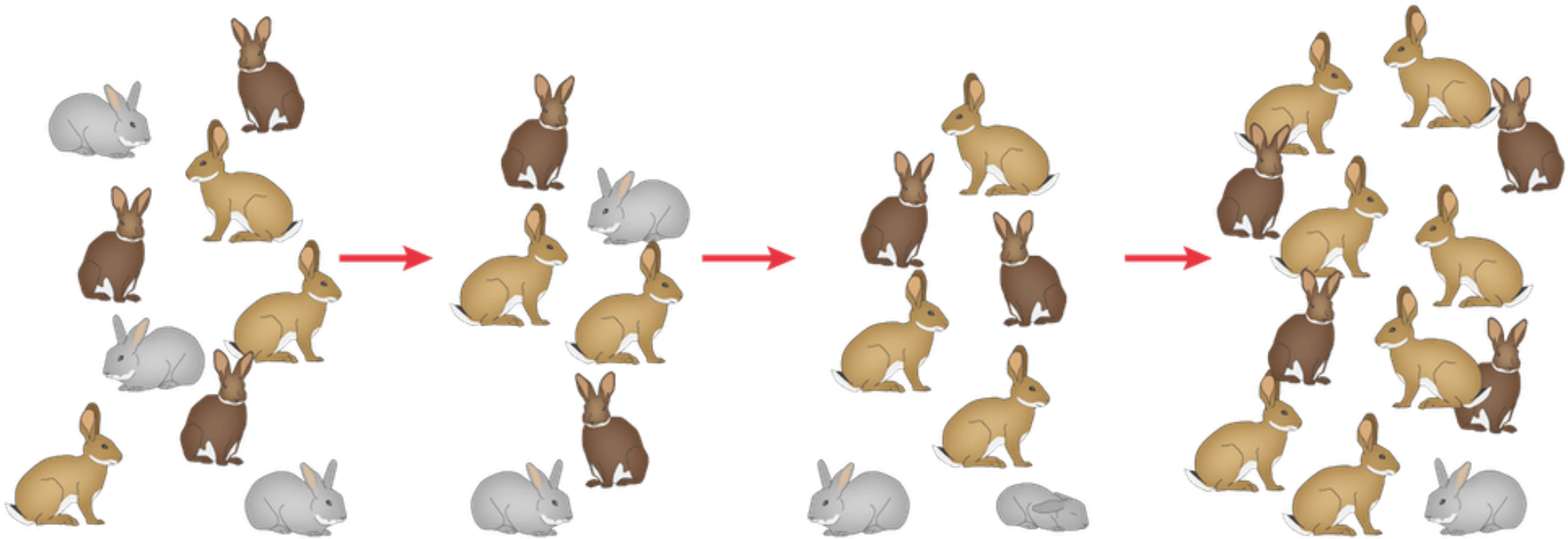


1. Overproduction

Every species tends to produce more individuals than can survive to maturity

2. Variation

The individuals have many characteristics that differ

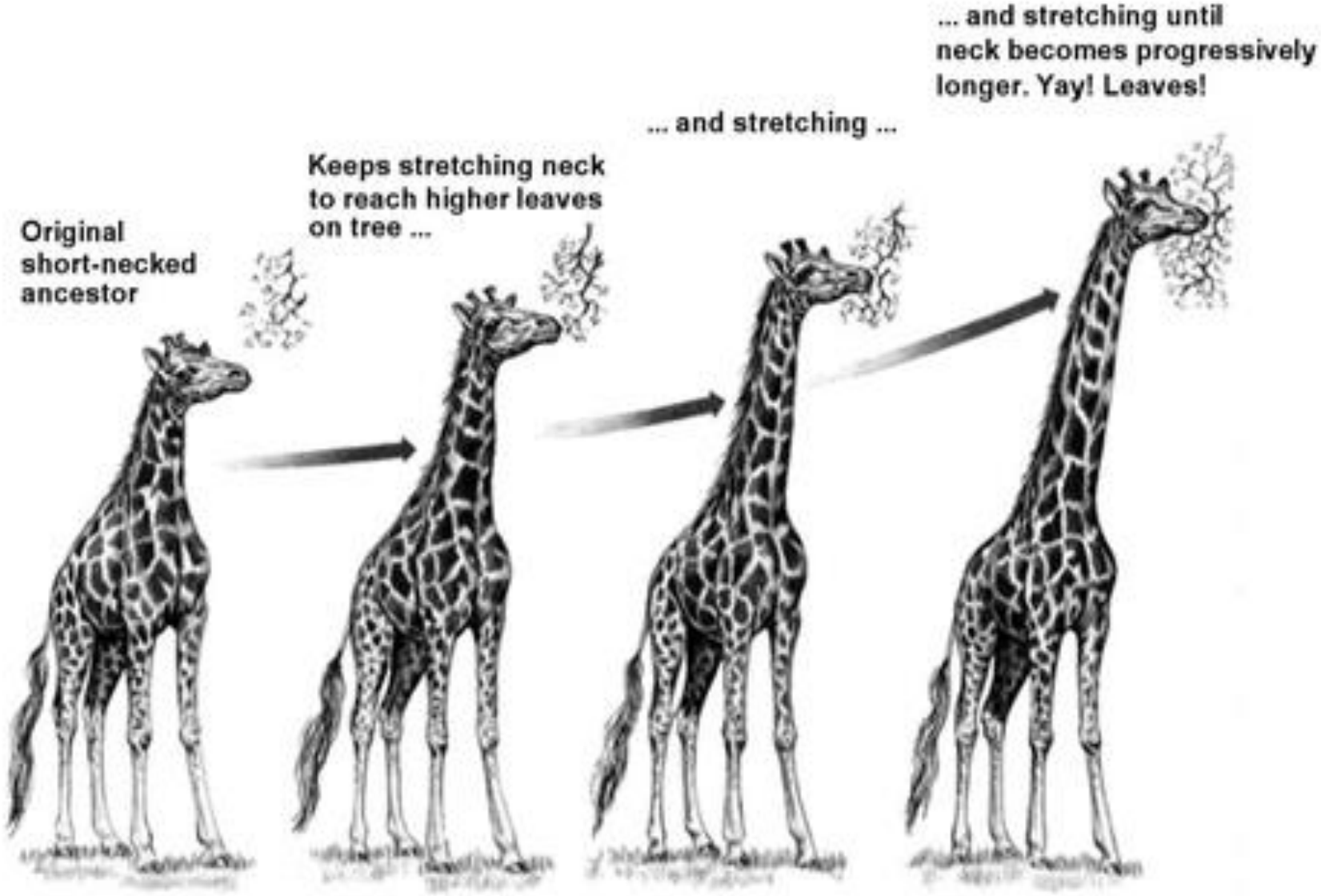
3. Selection

Some individuals survive longer and reproduce more than others do

4. Adaption

The traits of those individuals that survive and reproduce will become more common in a population

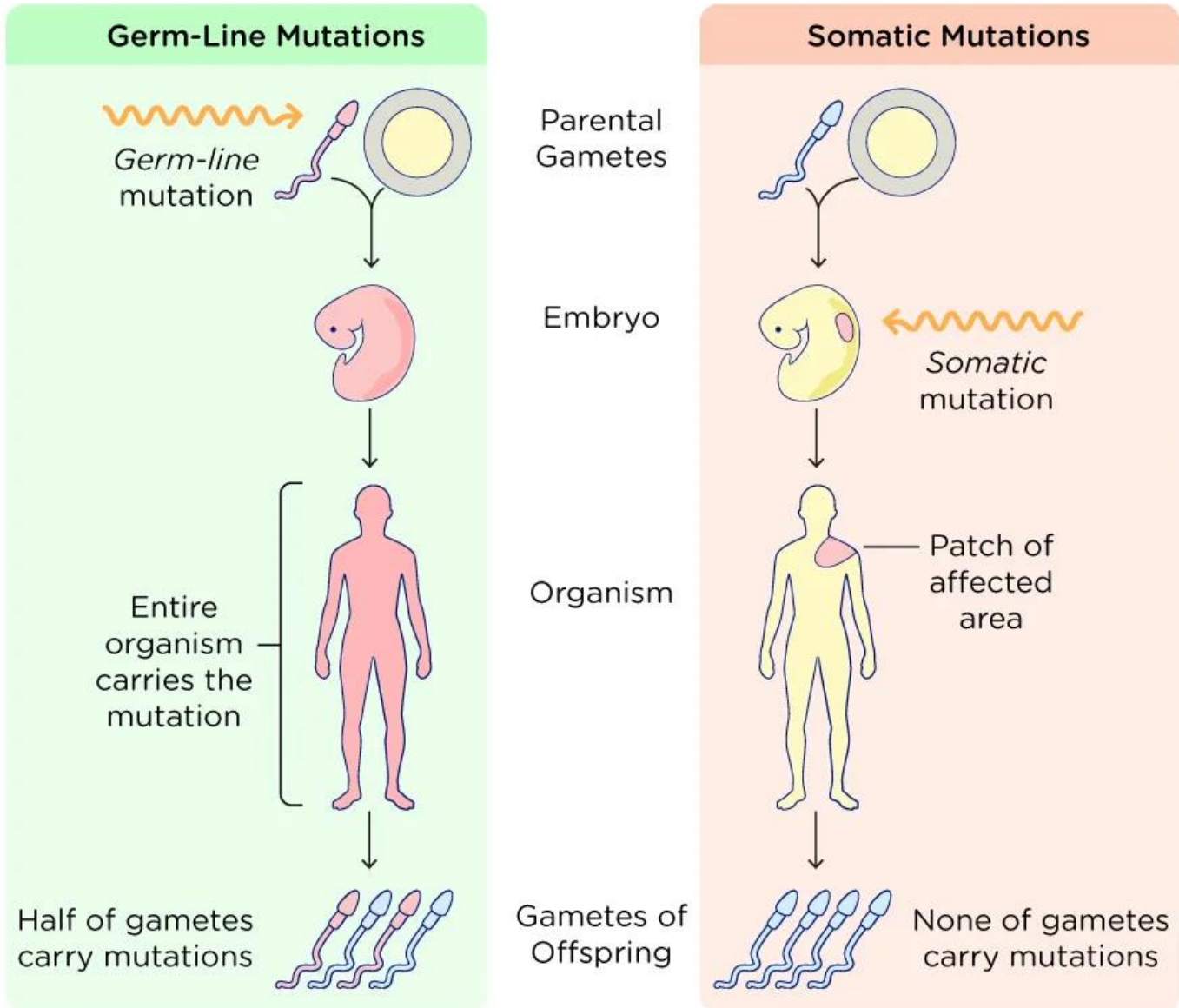
Causes of Variation



Lamarck's Giraffe

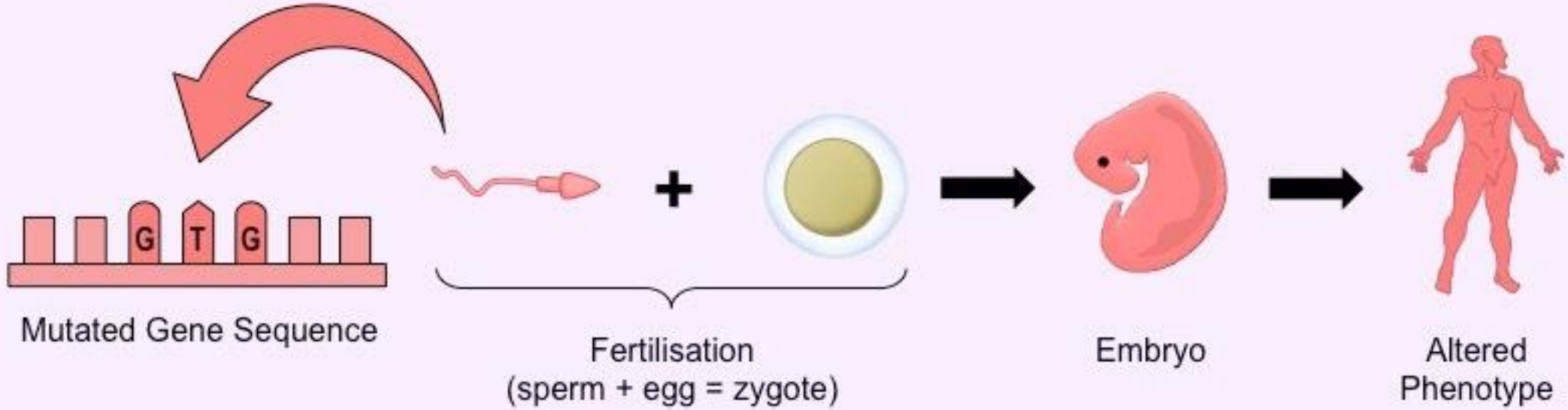
Germ Line Cells: sex cells (sperm and egg) which form offspring

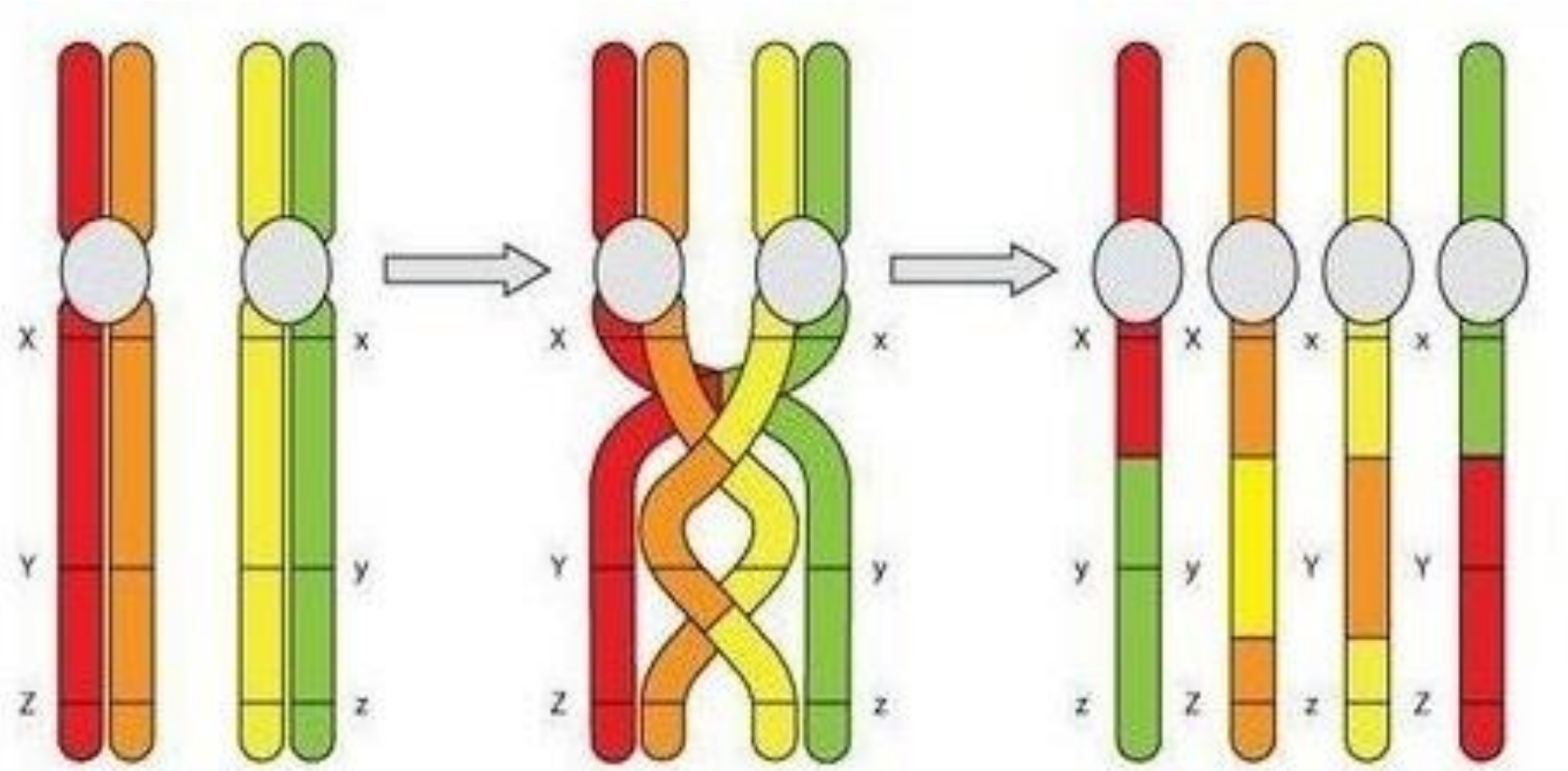
Somatic Cells: cells of an organism, other than the germ line cells

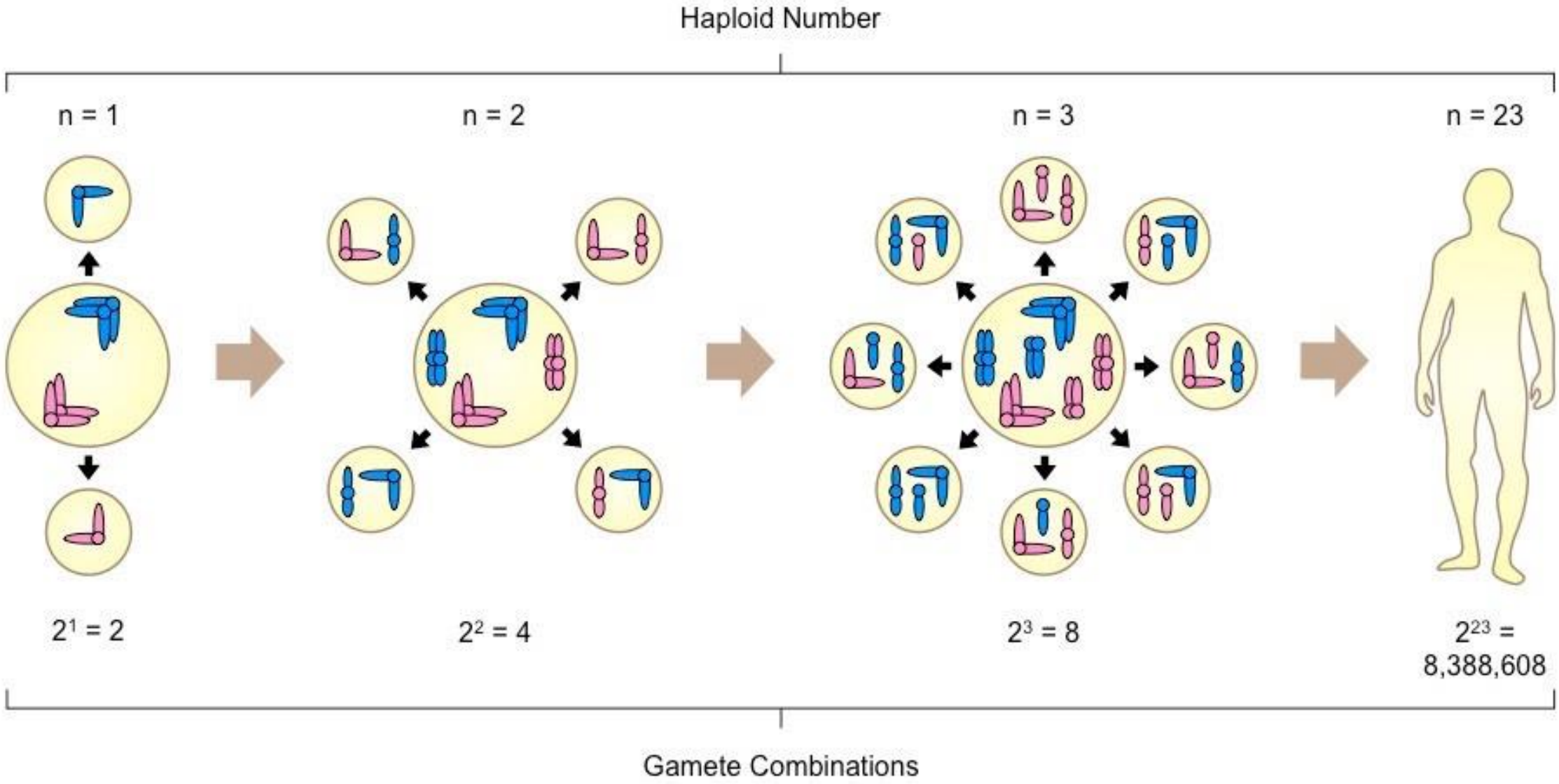


Phenotype 1 – Normal Gene Sequence

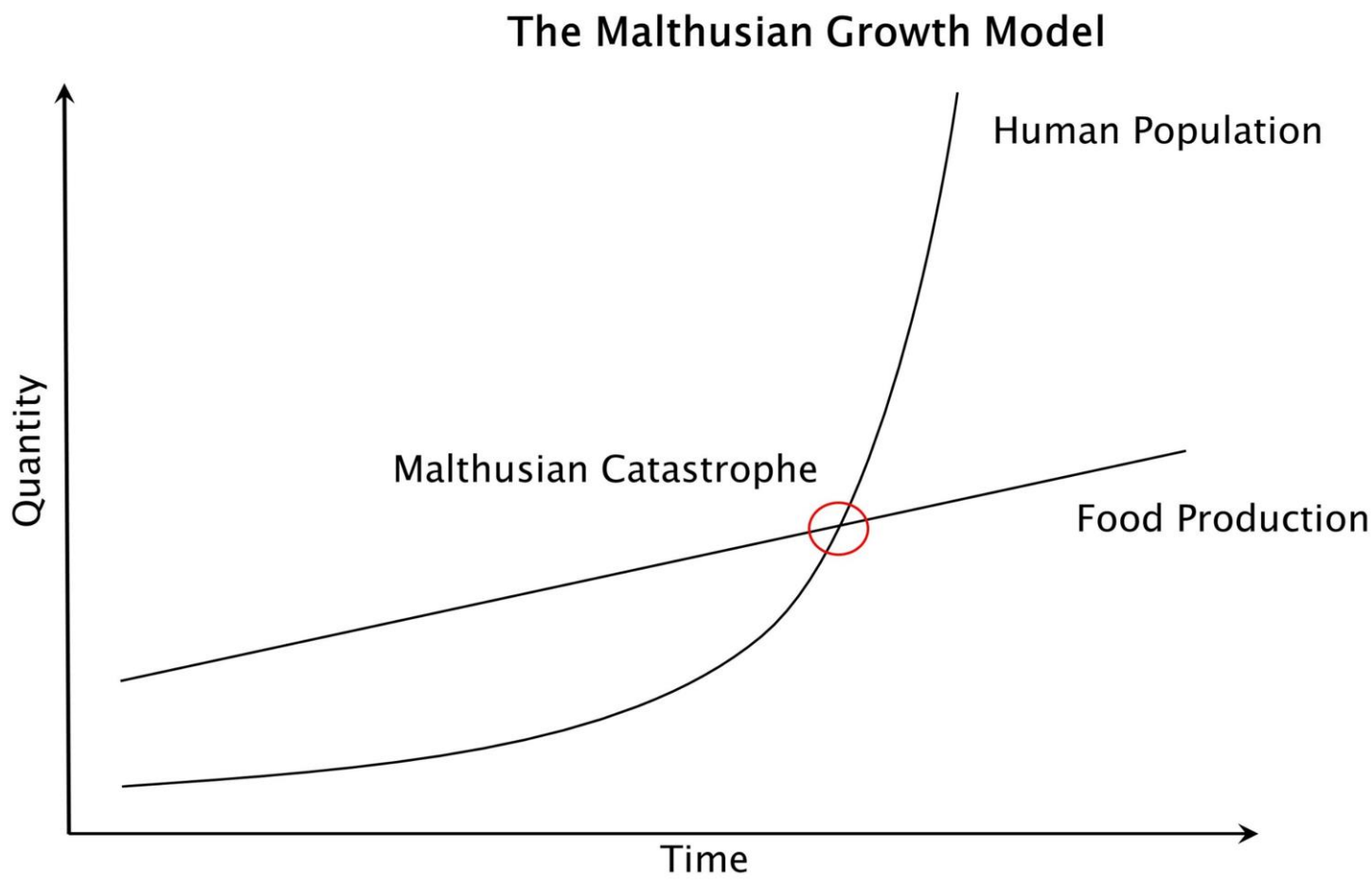
Phenotype 2 – Mutated Gene Sequence



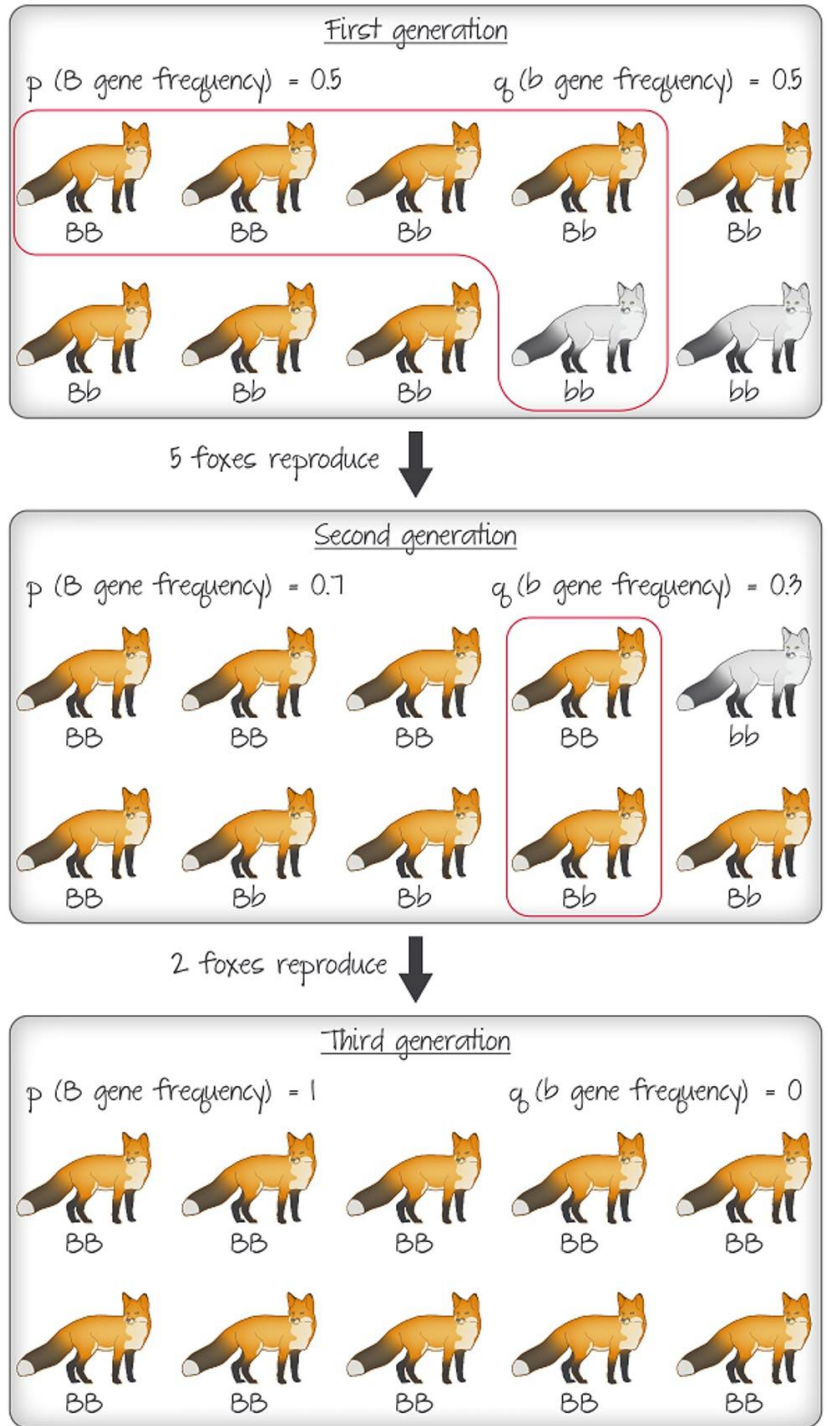



Haploid Number
n = 1
n = 2
n = 3
n = 23
2¹ = 2
2² = 4
2³ = 8
2²³ = 8,388,608
Gamete Combinations

Malthusian Dilemma



Overproduction of Offspring & Adaptations


First generation
p (B gene frequency) = 0.5
q (b gene frequency) = 0.5
BB
BB
Bb
Bb
Bb
Bb
Bb
Bb
bb
bb
5 foxes reproduce
Second generation
p (B gene frequency) = 0.7
q (b gene frequency) = 0.3
BB
BB
BB
BB
bb
BB
Bb
Bb
Bb
Bb
2 foxes reproduce
Third generation
p (B gene frequency) = 1
q (b gene frequency) = 0
BB
BB
BB
BB
BB
BB
BB
BB
BB
BB

Adaptations

- Structural
- Behavioural
- Physiological
- Biochemical
- Developmental

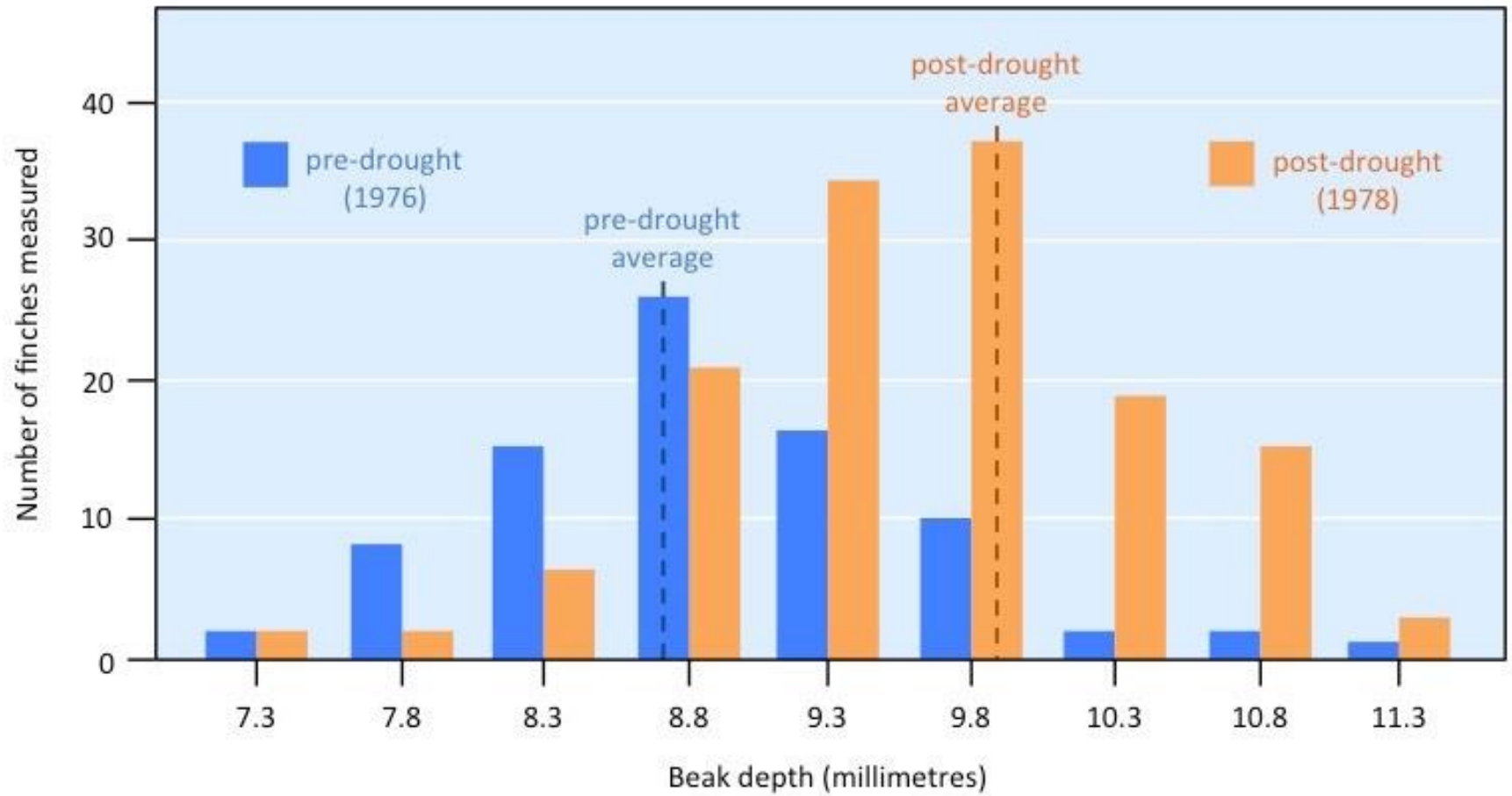
Example: Echidna Adaptations

Structural Adaptations
Sharp quills for protection from predators
Protruding snout (for accessing termite mounds)
Sharp claws for digging / burrowing

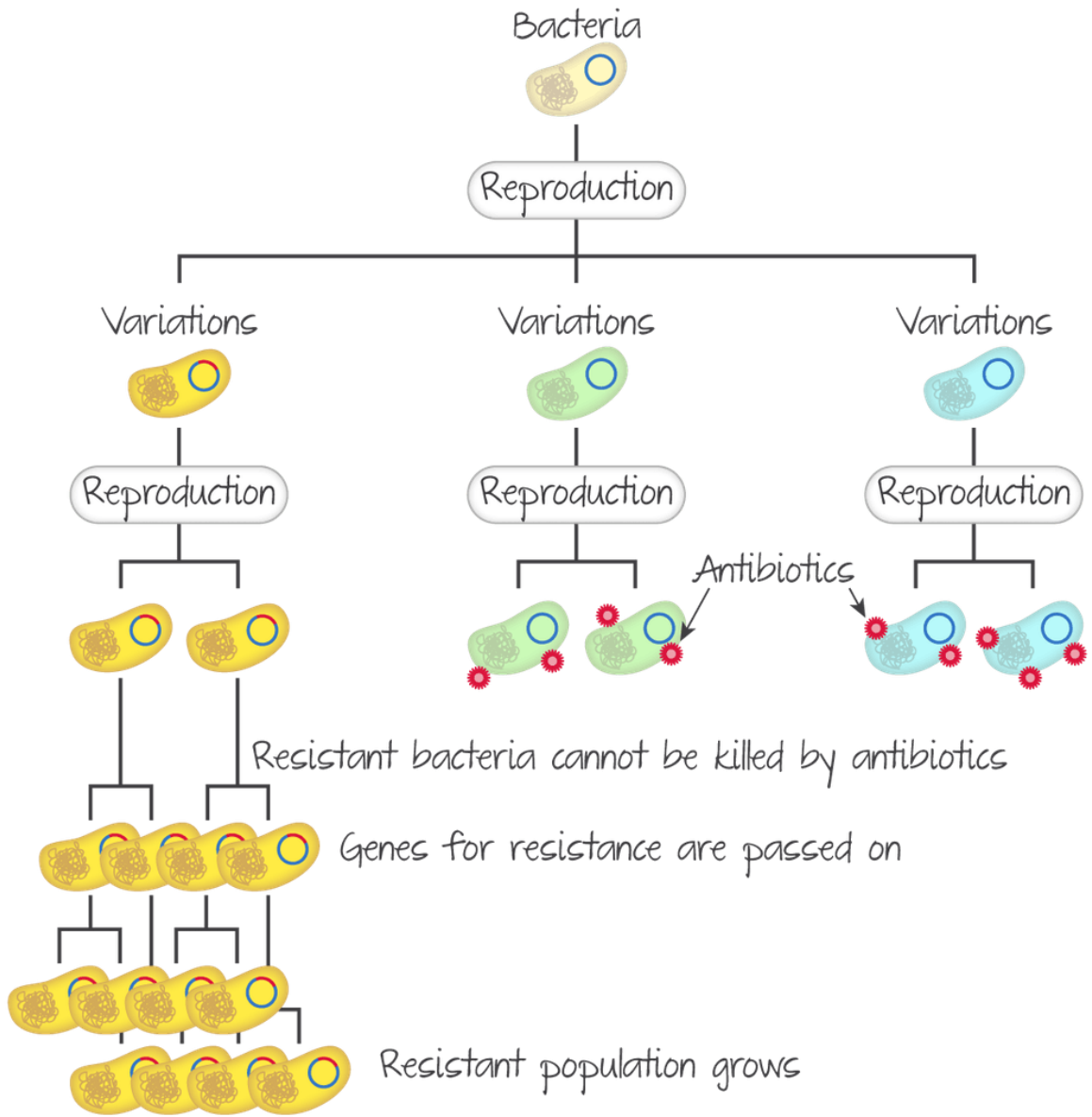
Behavioural Adaptations
Curls into ball when threatened (exposes quills)
Digs burrows in which to nest and rest
May hibernate during winter in very cold regions

Physiological Adaptations
Ears sensitive to low frequencies (detect ant sounds)
Well developed olfactory system (used for detection)
Tongue can stiffen and penetrate soil due to blood flow

Hypothesis: Dry conditions produce larger seeds and may affect beak size in finches due to natural selection



Conclusion: Drought produced larger seeds, meaning birds with larger beaks were more likely to survive and reproduce


Bacteria
Reproduction
Variations
Variations
Variations
Reproduction
Reproduction
Reproduction
Antibiotics
Resistant bacteria cannot be killed by antibiotics
Genes for resistance are passed on
Resistant population grows

Peppered Moth

The peppered moth exhibits variation in its pigmentation – light vs dark *(melanic)*

- Pollution from industrial activities darkened tree bark *(was covered with soot)*
- This conferred a benefit to dark moths *(camouflage)*, changing allele frequency

Unpolluted Environment (Pre-Industrial)

Polluted Environment (Post-Industrial)