

SUBJECT : MEDICAL BIOLOGY

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TOPIC : BOTTLENECK EFFECT IN **HUMAN POPULATION**

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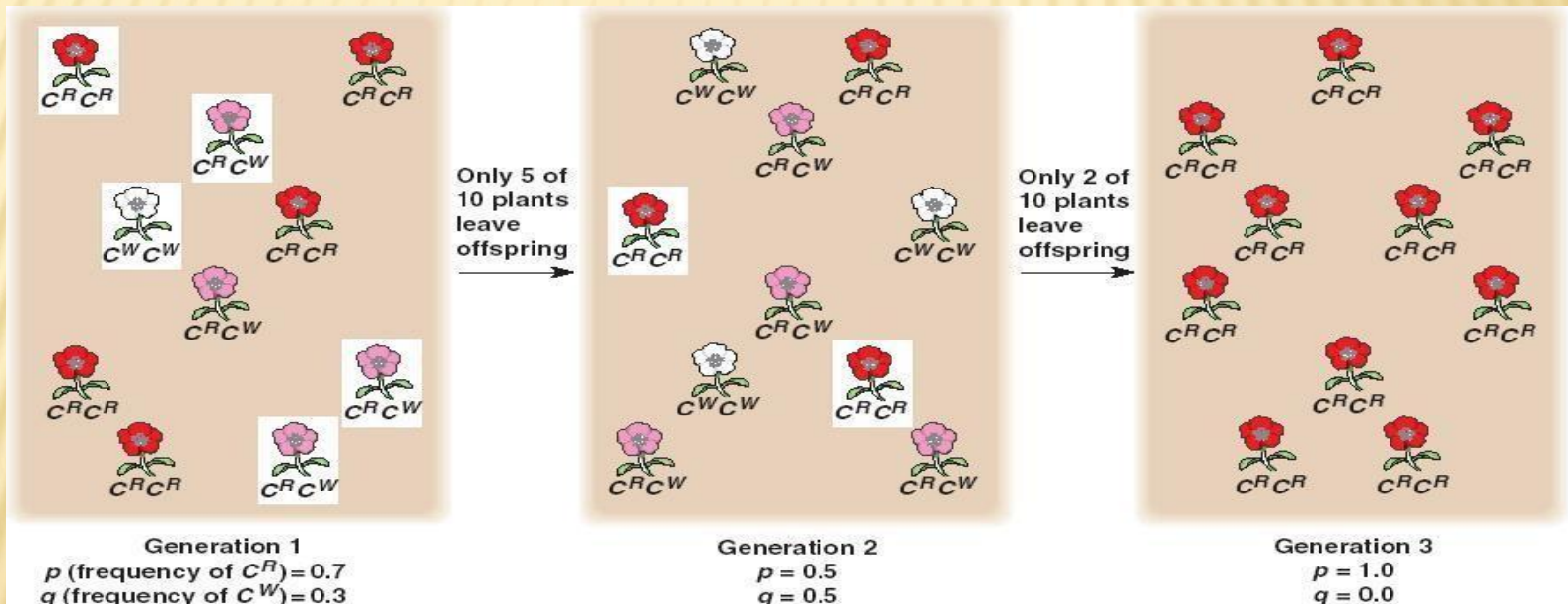
INTRODUCTION

Introduction

- Basic mechanisms of evolution (along with natural selection and mutation).
- Random, stochastic process.
- Independent of selection
- “Random Drift” or “Random Genetic Drift” (allele frequencies do not change in any predetermined direction in this process)

“The change in the frequency of an allele in a population due to random sampling of organisms.”

- Common in small population, no significance in large population.
- Some alleles become more common while others become less common over time (or lost).
- When there is only one allele left for a particular gene pool, that allele is said to be fixed.



Source: <http://bio1151.nicerweb.com/Locked/media/ch23/drift.html>

GENETIC DRIFT V/S NATURAL SELECTION

Genetic Drift v/s Natural Selection

□ Genetic Drift

- Random process
- Doesn't occur due to environment challenges
- Non directional
- Non adaptive evolution
- Important allele may disappear

Natural Selection

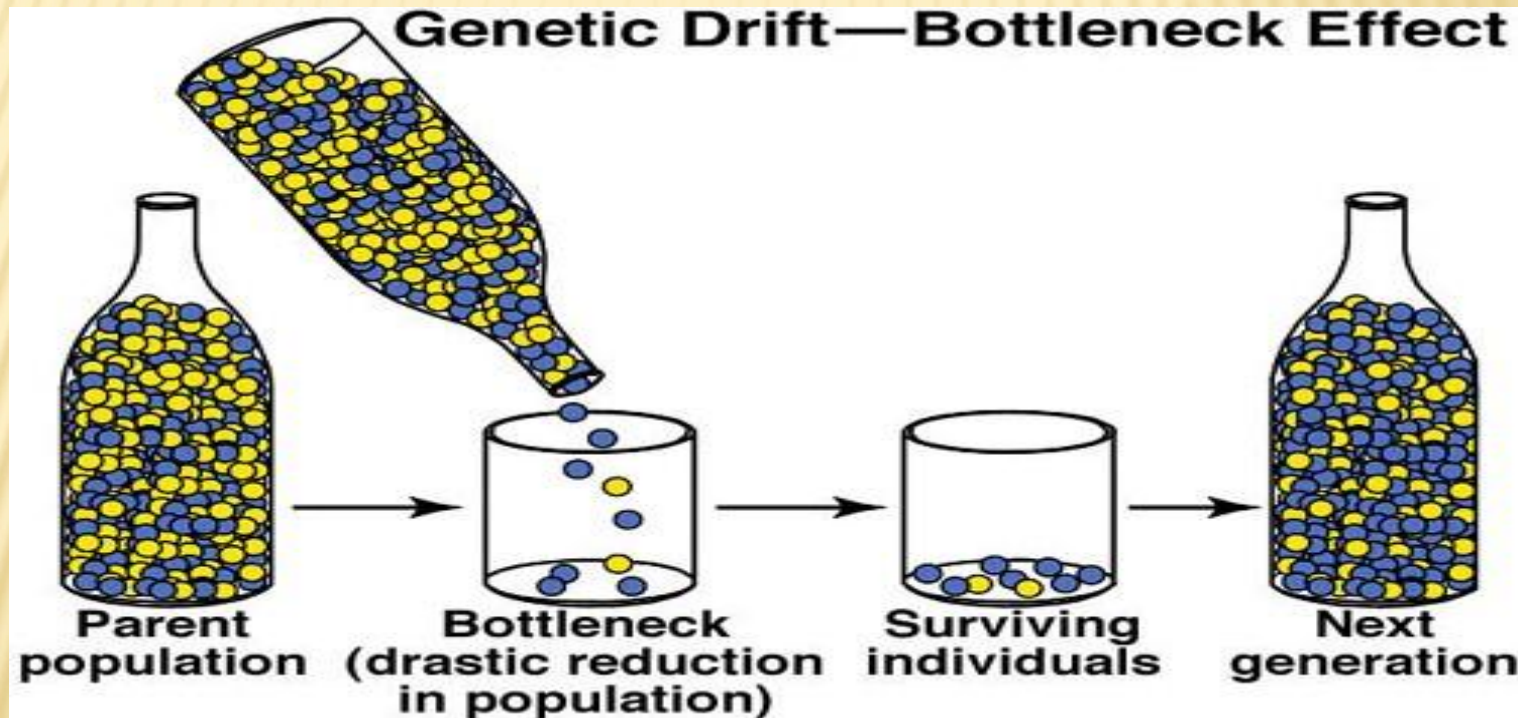
- Non random process
- Occur due to environment challenges
- Directional
- Generation of adaptive trait
- Ends up with survival of fittest
- Operate on any allele
- Increase genetic variation

KINDS OF GENETIC DRIFT

- Factors that cause genetic drift are:
 - Bottleneck Effect
 - Reduction in population size
 - Founder Effect
 - Subset of population founds new population

BOTTLENECK EFFECT

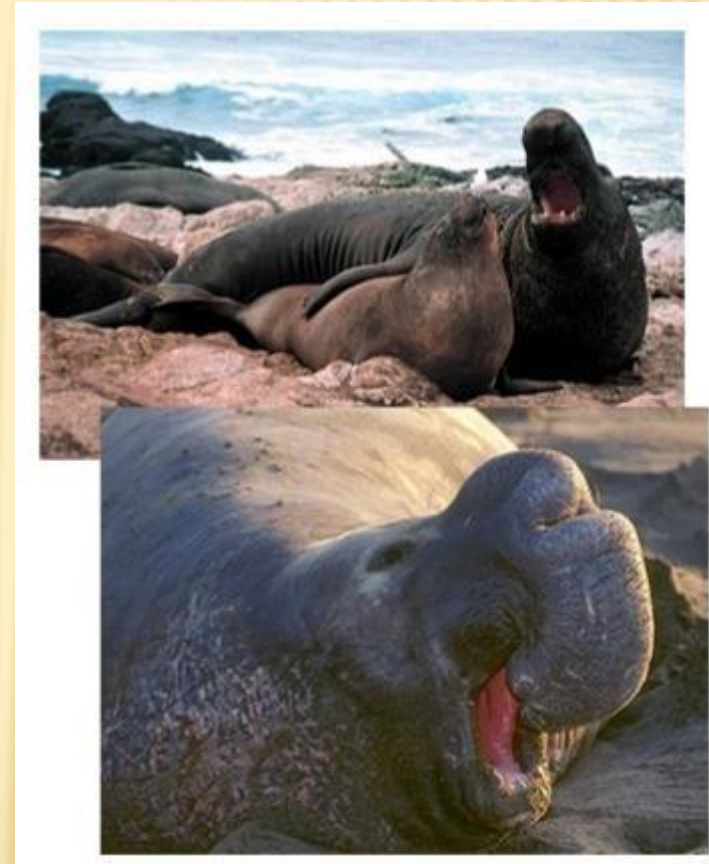
- The bottleneck effect occurs when a natural disaster or similar event randomly kills a large portion (i.e. random sample) of the population, leaving survivors that have allele frequencies that were very different from the previous population.



Source: <http://evolgen.wikispaces.com/Group+19?responseToken=ff19f377988e5706840fce1e021e0034>

EXAMPLE OF A BOTTLENECK

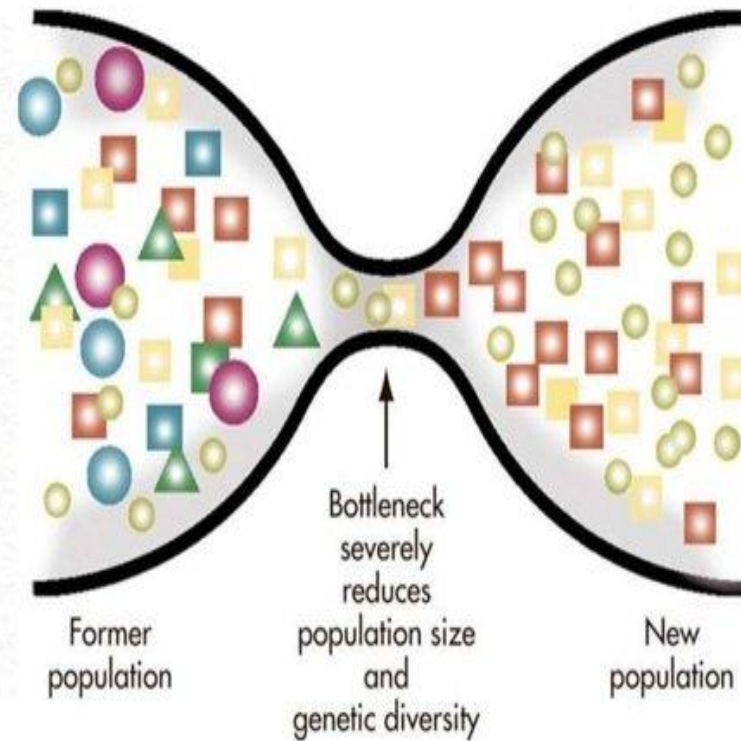
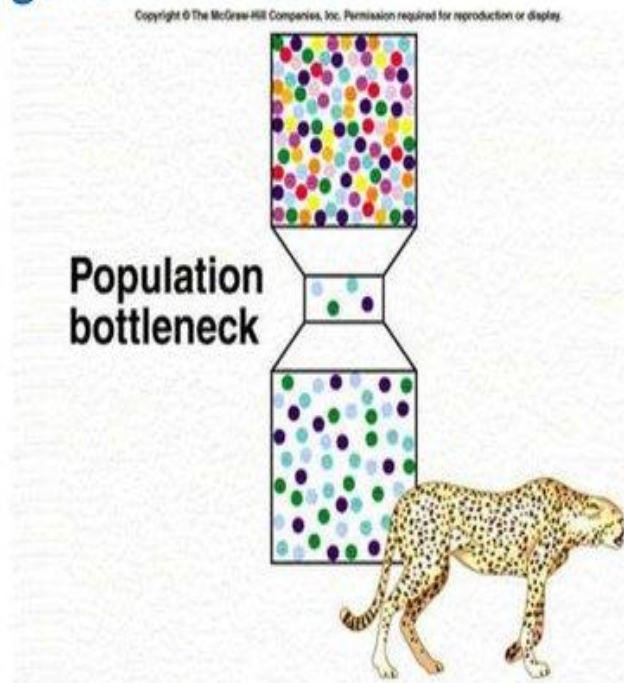
- Northern elephant seals
- Bottleneck event
 - Humans hunting (1890s)
- Population size 20 individuals (at the end of the 19th century)
- Now Population 30,000
 - — but their genes still carry the marks of this bottleneck:
- Much less genetic variation



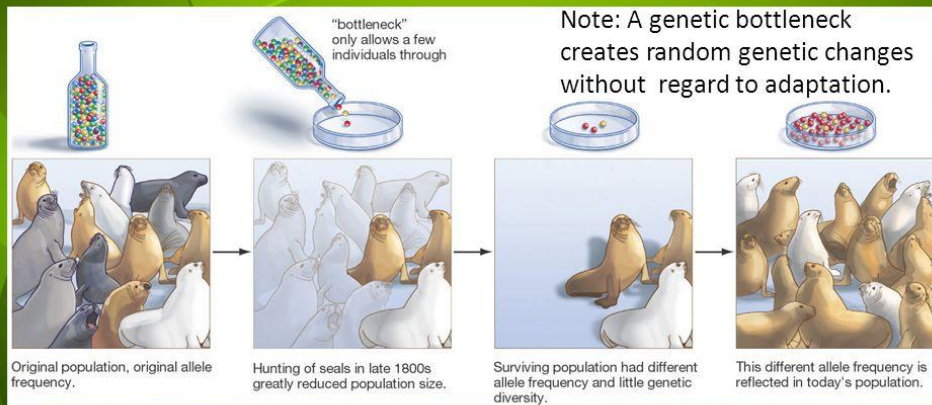
Source: <http://science.opposingviews.com/comparison-bottleneck-effect-founder-effect-5188.html>

Bottleneck effect

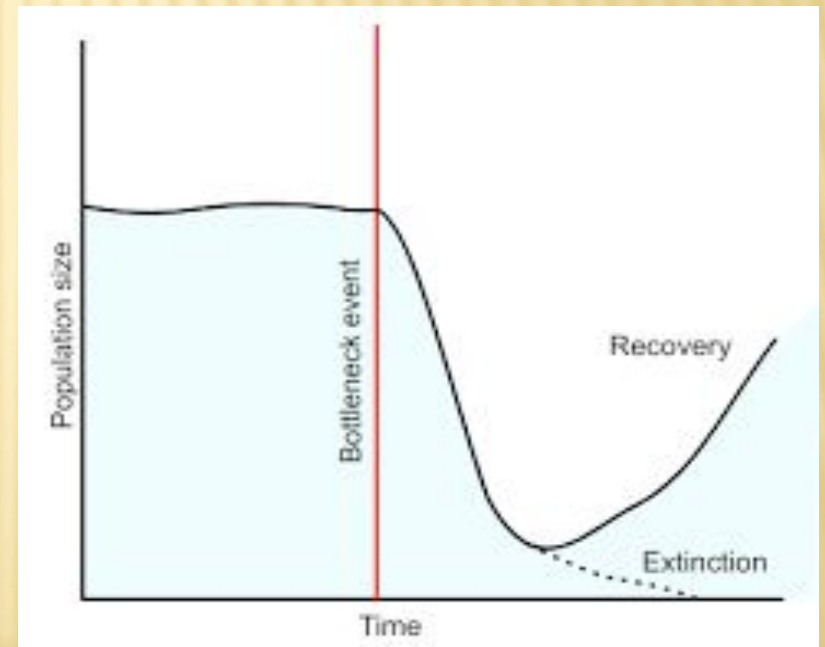
- Genetic drift can cause **big losses** of **genetic variation for small populations.**
- **reduces genetic variation**



Genetic Bottleneck – A Historical Case



A severe genetic bottleneck occurred in northern elephant seals. Other animals known to be affected by genetic bottlenecks include the cheetah and both ancient and modern human populations.



ROLE OF BOTTLENECK EFFECT IN EVOLUTION

- . Affects the genetic makeup of the population.
- . Mechanism of evolution, doesn't work to produce adaptations.
 - . Cause non-adaptive evolution
- . Allele fixing
- . Decreases gene diversity
- . New population genetically distinct from its original population
- . Plays a role in the evolution of new species

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**THANK
YOU**