

# Adaptation

IN BIOLOGY, **ADAPTATION** HAS THREE RELATED MEANINGS. FIRSTLY, IT IS THE DYNAMIC EVOLUTIONARY PROCESS THAT FITS ORGANISMS TO THEIR ENVIRONMENT, ENHANCING THEIR EVOLUTIONARY FITNESS. SECONDLY, IT IS A STATE REACHED BY THE POPULATION DURING THAT PROCESS. THIRDLY, IT IS A PHENOTYPIC TRAIT OR **ADAPTIVE TRAIT**, WITH A FUNCTIONAL ROLE IN EACH INDIVIDUAL ORGANISM, THAT IS MAINTAINED AND HAS EVOLVED THROUGH NATURAL SELECTION.

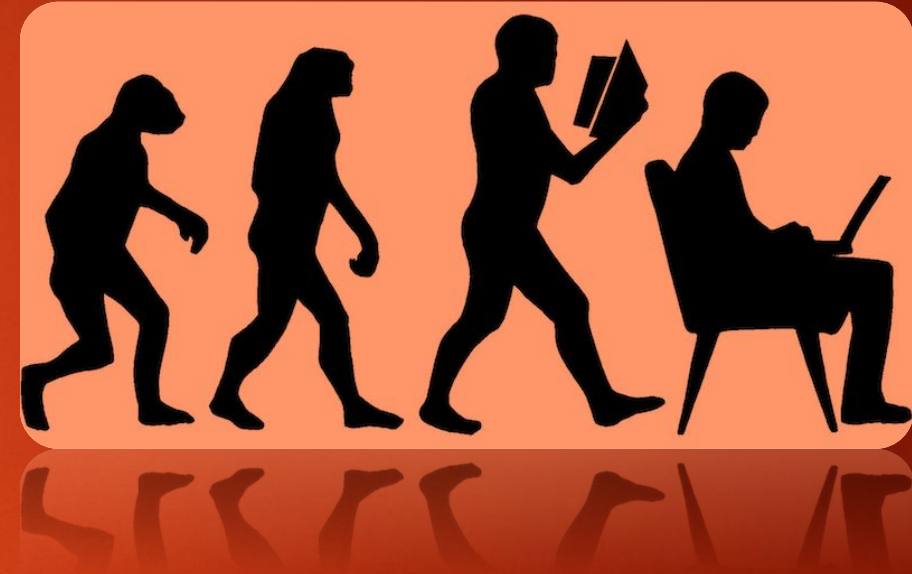


Scientists widely believe that the polar bear evolved from a group of brown bears that became isolated by glaciers in an area near Siberia. The stranded bears underwent a rapid series of evolutionary changes in order to survive on the ice. Today's polar bear is superbly adapted to life in the Arctic.

Adaptation is a process by which an organism becomes better suited to its environment. This process can occur over a long period of time, or it can occur over a short period of time. Adaptation is a key concept in biology, and it is essential for understanding the diversity of life on Earth.

# Human adaptation

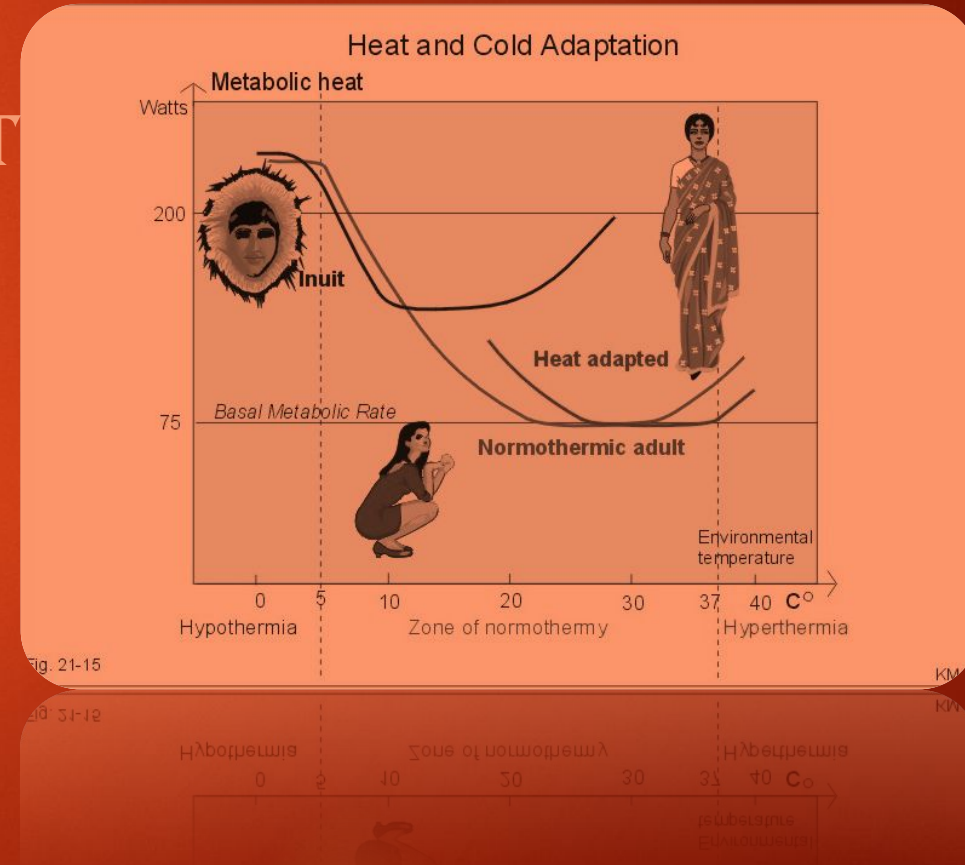
**HUMANS** HAVE BIOLOGICAL PLASTICITY, OR AN ABILITY TO **ADAPT** BIOLOGICALLY TO OUR ENVIRONMENT. AN **ADAPTATION** IS ANY VARIATION THAT CAN INCREASE ONE'S BIOLOGICAL FITNESS IN A SPECIFIC ENVIRONMENT; MORE SIMPLY IT IS THE SUCCESSFUL INTERACTION OF A POPULATION WITH ITS ENVIRONMENT.

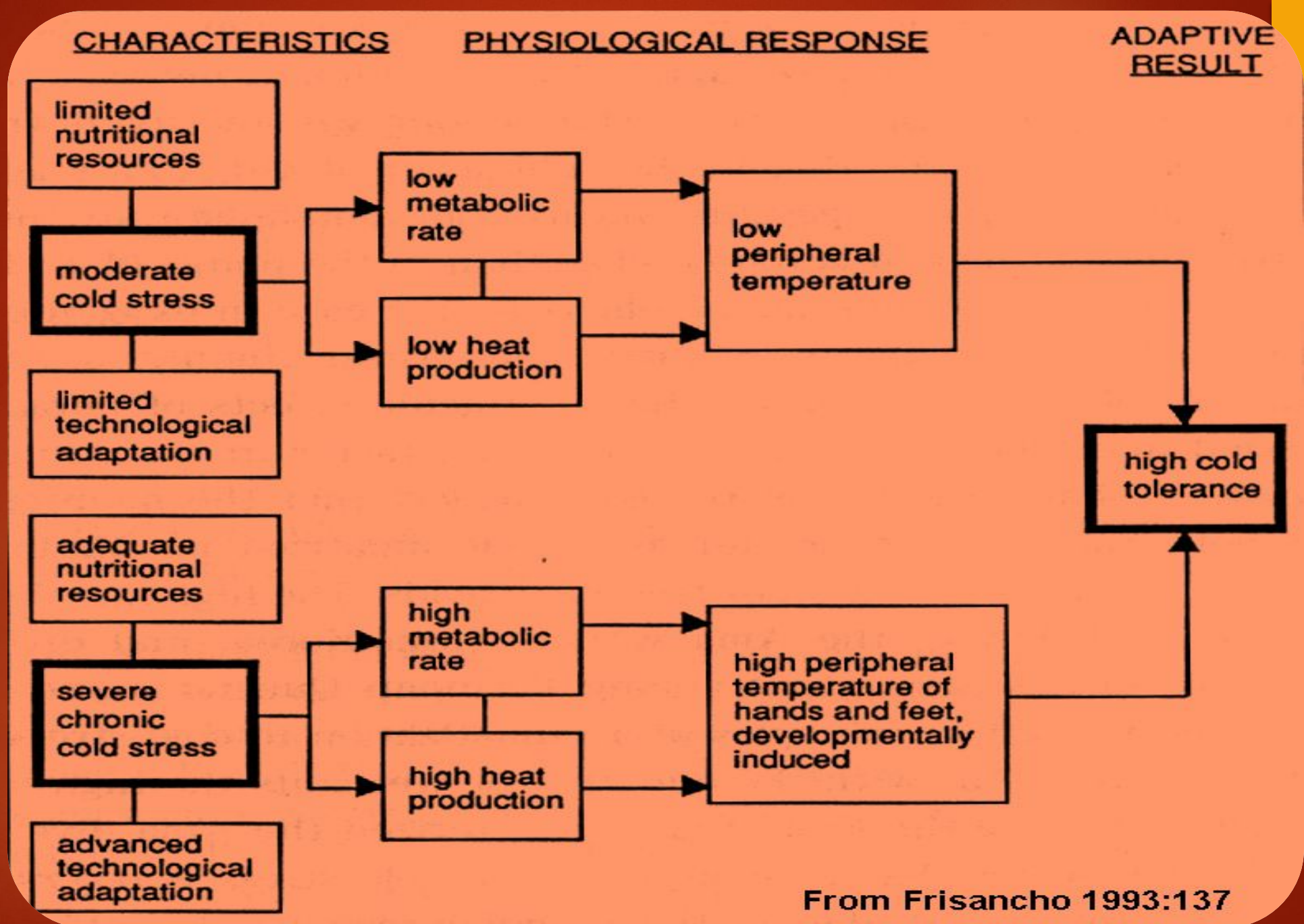




# Heat cold adaptation of human

- ▶ PHYSICAL ADAPTATIONS IN HUMAN BEINGS ARE SEEN IN RESPONSE TO EXTREME COLD, HUMID HEAT, DESERT CONDITIONS, AND HIGH ALTITUDES. COLD ADAPTATION IS OF THREE TYPES: ADAPTATION TO EXTREME COLD, MODERATE COLD, AND NIGHT COLD. ORDINARILY THE BODY RIDS ITSELF OF EXCESS HEAT BY SWEATING.





From Frisancho 1993:137

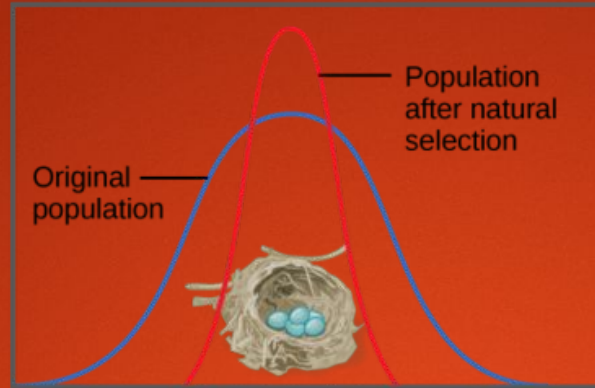
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# ADAPTIVE TYPE OF POPULATION

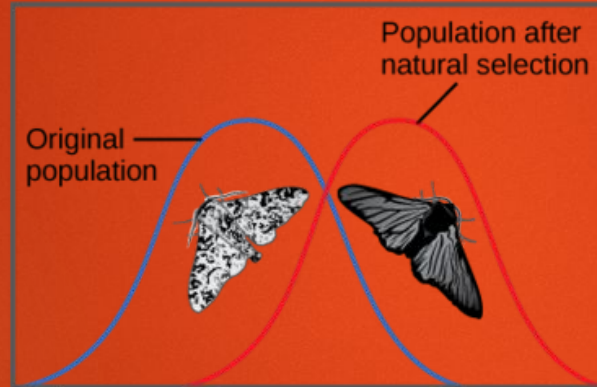
**ADAPTIVE TYPE** – IN EVOLUTIONARY BIOLOGY – IS ANY POPULATION OR TAXON WHICH HAVE THE POTENTIAL FOR A PARTICULAR OR TOTAL OCCUPATION OF GIVEN FREE OF UNDERUTILIZED HOME HABITATS OR POSITION IN THE GENERAL ECONOMY OF NATURE. IN EVOLUTIONARY SENSE, THE EMERGENCE OF NEW ADAPTIVE TYPE IS USUALLY A RESULT OF ADAPTIVE RADIATION CERTAIN GROUPS OF ORGANISMS IN WHICH THEY ARISE CATEGORIES THAT CAN EFFECTIVELY EXPLOIT TEMPORARY, OR NEW CONDITIONS OF THE ENVIRONMENT.

**(a) Stabilizing selection**



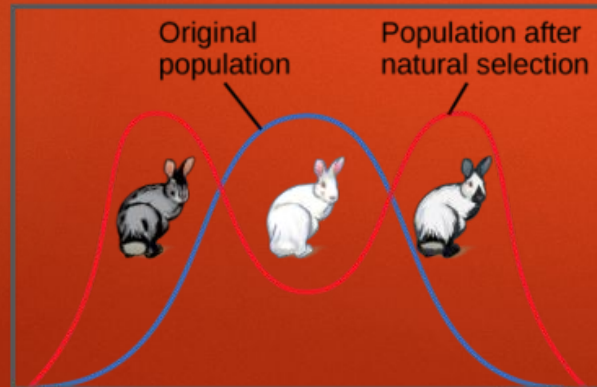
Robins typically lay four eggs, an example of stabilizing selection. Larger clutches may result in malnourished chicks, while smaller clutches may result in no viable offspring.

**(b) Directional selection**



Light-colored peppered moths are better camouflaged against a pristine environment; likewise, dark-colored peppered moths are better camouflaged against a sooty environment. Thus, as the Industrial Revolution progressed in nineteenth-century England, the color of the moth population shifted from light to dark, an example of directional selection.

**(c) Diversifying selection**



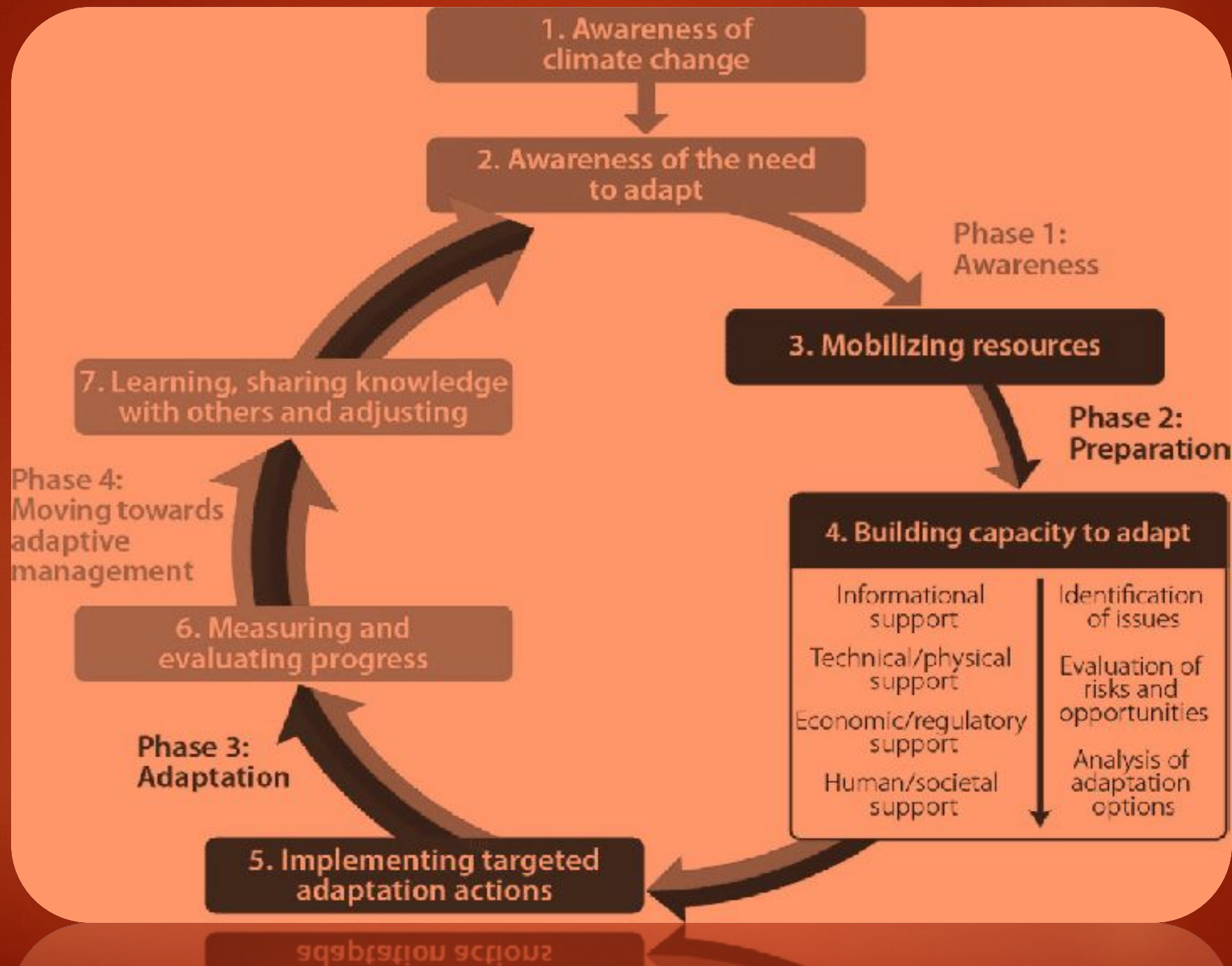
In a hypothetical population, gray and Himalayan (gray and white) rabbits are better able to blend with a rocky environment than white rabbits, resulting in diversifying selection.



SUCH EVOLUTIVE UNITS WITH ITS DISTINCTIVE – MORPHOLOGICAL AND ANATOMICAL, PHYSIOLOGICAL AND OTHER CHARACTERISTICS, I.E. GENETIC AND ADJUSTMENTS (FEATURE) HAVE A PREDISPOSITION FOR AN OCCUPATION CERTAIN HOME HABITATS OR POSITION IN THE GENERAL NATURE ECONOMY.

SIMPLY, THE ADAPTIVE TYPE IS ONE GROUP ORGANISMS WHOSE GENERAL BIOLOGICAL PROPERTIES REPRESENT A KEY TO OPEN THE ENTRANCE TO THE OBSERVED ADAPTIVE ZONE IN THE OBSERVED NATURAL ECOLOGICAL COMPLEX.

ADAPTIVE TYPES ARE SPATIALLY AND TEMPORALLY SPECIFIC. SINCE THE FRAMES OF GENERAL BIOLOGICAL PROPERTIES THESE TYPES OF SUBSTANTIALLY GENETIC ARE DEFINED BETWEEN, IN EFFECT THE EMERGENCE OF NEW ADAPTIVE TYPES OF THE CORRESPONDING CHANGE IN POPULATION GENETIC STRUCTURE AND ETERNAL CONTRADICTION BETWEEN THE NEED FOR OPTIMAL ADAPTED WELL THE CONDITIONS OF LIVING ENVIRONMENT, WHILE MAINTAINING GENETIC VARIATION FOR SURVIVAL IN A POSSIBLE NEW CIRCUMSTANCES.









# Adaptation in arctic indigenous people

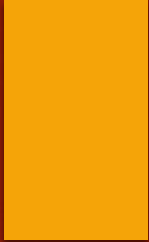
NORTHERN PEOPLE FOUND MANY DIFFERENT WAYS TO **ADAPT** TO THE HARSH **ARCTIC** CLIMATE, DEVELOPING WARM DWELLINGS AND CLOTHING TO PROTECT THEM FROM FRIGID WEATHER. THEY ALSO LEARNED HOW TO PREDICT THE WEATHER AND NAVIGATE IN BOATS AND ON SEA ICE.

THE INDIGENOUS PEOPLES OF THE NORTH AMERICAN ARCTIC INCLUDE THE **ESKIMO** (**INUIT** AND **YUPIK/YUPIIT**) AND **ALEUT**; THEIR TRADITIONAL LANGUAGES ARE IN THE **ESKIMO-ALEUT** FAMILY. MANY ALASKAN GROUPS PREFER TO BE CALLED NATIVE ALASKANS RATHER THAN NATIVE AMERICANS; CANADA'S ARCTIC PEOPLES GENERALLY PREFER THE REFERENT **INUIT**.



# WHAT DO YOU NEED TO SURVIVE IN THE ARCTIC?

- STAY HYDRATED.
- CONSUME LOTS OF CALORIES AND FOOD HIGH IN FAT.
- PROTECT YOURSELF FROM THE WIND.
- INSULATE YOURSELF FROM THE COLD.
- PROTECT EXTREMITIES.
- STAY DRY.
- DON'T GET LOST.
- AVOID WEAK ICE.

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- ▶ RINGED SEAL AND BEARDED SEAL ARE THE MOST IMPORTANT ASPECT OF AN INUIT DIET AND IS OFTEN THE LARGEST PART OF AN INUIT HUNTER'S DIET. LAND MAMMALS SUCH AS CARIBOU, POLAR BEAR, AND MUSKOX. BIRDS AND THEIR EGGS. SALTWATER AND FRESHWATER FISH INCLUDING SCULPIN, ARCTIC COD, ARCTIC CHAR, CAPELIN AND LAKE TROUT.





# Adaptation of inhabitants of tropic

- ▶ TROPICAL PEOPLE DRINK LESS WATER BECAUSE THEIR FOOD CONTAINS A LOT OF WATER. THEY KNOW HOW TO USE THOUSANDS OF EDIBLE, MEDICINAL, AND POISONOUS PLANTS AND HOW TO GROW CROPS IN THE FOREST'S POOR SOIL. THEY ALSO KNOW HOW TO HUNT AND FISH WITHOUT DRIVING THE ANIMALS TO EXTINCTION.
- ▶ THE BLOOD CONCENTRATIONS OF WATER AND SALT ADJUST TO ALLOW GREATER COOLING, THE BLOOD VESSELS ALTER TO GET MORE TO THE SKIN, AND SO ON. ATHLETES USE THIS PROCESS AND TRAIN IN HARSHER CLIMATES TO CAUSE MORE PROFOUND BODY ADAPTATIONS.







# Adaptation in arid regions

- ▶ A REGION IS ARID WHEN IT IS CHARACTERIZED BY A SEVERE LACK OF AVAILABLE WATER, TO THE EXTENT OF HINDERING OR PREVENTING THE GROWTH AND DEVELOPMENT OF PLANT AND ANIMAL LIFE. ENVIRONMENTS SUBJECT TO ARID CLIMATES TEND TO LACK VEGETATION AND ARE CALLED XERIC OR DESERTIC.
- ▶ PEOPLE HAVE BEEN LIVING IN THE DESERT FOR THOUSANDS OF YEARS AND HAVE ADAPTED TO ITS EXTREME CONDITIONS. 2.5 MILLION PEOPLE LIVE IN THE SAHARA; THIS IS INCLUDING A COUPLE OF CITIES, SUCH AS KHARTOUM, WHICH BORDER THE DESERT.



- ▶ THEIR TRADITIONAL LIFESTYLE HAS ADAPTED TO THESE EXTREMELY ARID CONDITIONS.
- THEIR NOMADIC LIFESTYLE MEANS THEY DO NOT SETTLE IN ONE AREA FOR LONG. INSTEAD, THEY MOVE ON FREQUENTLY TO PREVENT EXHAUSTING AN AREA OF ITS RESOURCES.
- THEY HAVE HERDS OF ANIMALS WHICH ARE ADAPTED TO LIVING IN DESERT CONDITIONS, SUCH AS CAMELS.
- THEIR TENTS ARE BUILT TO ALLOW AIR TO CIRCULATE WITHIN THEM, KEEPING THEM COOL. ANIMAL HAIR IS USED TO INSULATE THEM, TO KEEP THE TENT COOL DURING THE DAY AND WARMER AT NIGHT.

- ▶ **MODERN ADAPTATIONS TO ARID CONDITIONS**
- ▶ WITH BOTH MONEY AND TECHNOLOGY, DESERT AREAS CAN BE DEVELOPED TO CATER FOR MODERN LIFESTYLES. LAS VEGAS, IN THE MOJAVE DESERT, IS ONE OF THE FASTEST-GROWING CITIES IN THE USA. THE CITY OF LAS VEGAS IS LUSH AND GREEN IN COMPARISON WITH THE SURROUNDING DESERT.
- ▶ THIS IS POSSIBLE BECAUSE 90 PER CENT OF THE WATER LAS VEGAS NEEDS IS IMPORTED FROM THE COLORADO RIVER. THE REMAINING 10 PER CENT COMES FROM GROUND WATER. THE DEMAND FOR WATER IS NOT SUSTAINABLE AND THE CITY HAS STARTED TO PLAN TO REDUCE THE DEMAND FOR WATER. ONE WAY IS THAT NEW HOMES HAVE RESTRICTIONS ON THE AMOUNT AND TYPE OF LAWNS THAT THEY CAN HAVE. THE AUTHORITY ALSO RECYCLES WATER WHERE IT CAN.



# VIDEOS ON RELATED TOPIC

- ▶ <https://youtu.be/X9zXCajF4pA>
- ▶ <https://youtu.be/hTfBSIYTG4k>
- ▶ <https://youtu.be/1kJiL7AnOiU>

**THANK YOU  
FOR YOUR  
ATTENTION**

