

NATURAL SELECTION ACTS ON _____, BUT EVOLUTION CONSISTS OF CHANGES IN _____ (HINT: ALLELE)

NATURAL SELECTION ACTS ON _____, BUT EVOLUTION CONSISTS OF CHANGES IN _____ (HINT: ALLELE)

UNDERSTANDING THE MECHANISMS OF EVOLUTION IS FUNDAMENTAL TO BIOLOGY, AS IT EXPLAINS THE DIVERSITY OF LIFE ON EARTH. CENTRAL TO THIS DISCUSSION IS THE CONCEPT THAT NATURAL SELECTION ACTS ON INDIVIDUALS, BUT EVOLUTION IS A CHANGE IN POPULATIONS OVER TIME, PRIMARILY THROUGH SHIFTS IN ALLELE FREQUENCIES. THIS ARTICLE EXPLORES THE NUANCED RELATIONSHIP BETWEEN NATURAL SELECTION AND EVOLUTION, EMPHASIZING THE ROLE OF ALLELES—THE DIFFERENT FORMS OF A GENE—IN DRIVING GENETIC CHANGE ACROSS GENERATIONS.

WHAT IS NATURAL SELECTION?

NATURAL SELECTION IS A PROCESS PROPOSED BY CHARLES DARWIN THAT EXPLAINS HOW CERTAIN TRAITS BECOME MORE COMMON IN A POPULATION OVER TIME. IT IS BASED ON THE IDEA THAT INDIVIDUALS WITH ADVANTAGEOUS TRAITS ARE MORE LIKELY TO SURVIVE AND REPRODUCE, PASSING THOSE TRAITS ON TO THEIR OFFSPRING.

KEY PRINCIPLES OF NATURAL SELECTION

- **VARIATION:** INDIVIDUALS WITHIN A POPULATION EXHIBIT DIFFERENCES IN TRAITS.
- **HERITABILITY:** TRAITS ARE INHERITED FROM PARENTS TO OFFSPRING.
- **DIFFERENTIAL SURVIVAL AND REPRODUCTION:** SOME INDIVIDUALS ARE MORE SUCCESSFUL AT SURVIVING AND REPRODUCING BASED ON THEIR TRAITS.
- **ADAPTATION:** OVER GENERATIONS, POPULATIONS BECOME BETTER SUITED TO THEIR ENVIRONMENTS.

HOW NATURAL SELECTION ACTS

1. VARIATION EXISTS WITHIN POPULATIONS DUE TO GENETIC DIFFERENCES.
2. ENVIRONMENTAL PRESSURES SELECT FOR CERTAIN TRAITS THAT CONFER SURVIVAL ADVANTAGES.
3. INDIVIDUALS WITH ADVANTAGEOUS TRAITS ARE MORE LIKELY TO REPRODUCE.
4. THESE TRAITS BECOME MORE COMMON IN THE POPULATION OVER GENERATIONS.

EVOLUTION: CHANGES IN ALLELE FREQUENCIES

WHILE NATURAL SELECTION OPERATES AT THE LEVEL OF INDIVIDUALS, EVOLUTION REFERS TO THE CHANGE IN THE GENETIC MAKEUP OF A POPULATION OVER TIME. SPECIFICALLY, EVOLUTION INVOLVES SHIFTS IN ALLELE FREQUENCIES—THE PROPORTION OF DIFFERENT VERSIONS OF A GENE IN A POPULATION.

WHAT ARE ALLELES?

ALLELES ARE DIFFERENT FORMS OF THE SAME GENE. FOR EXAMPLE, THE GENE FOR FLOWER COLOR IN A PLANT MIGHT HAVE ALLELES FOR RED, WHITE, OR PINK FLOWERS. THE COMBINATION AND FREQUENCY OF THESE ALLELES DETERMINE THE TRAITS OBSERVED IN THE POPULATION.

HOW ALLELE FREQUENCIES CHANGE

- **GENETIC DRIFT:** RANDOM FLUCTUATIONS IN ALLELE FREQUENCIES, ESPECIALLY IN SMALL POPULATIONS.
- **GENE FLOW:** MOVEMENT OF ALLELES BETWEEN POPULATIONS DUE TO MIGRATION.
- **MUTATION:** INTRODUCTION OF NEW ALLELES THROUGH GENETIC CHANGES.
- **NATURAL SELECTION:** DIFFERENTIAL REPRODUCTIVE SUCCESS BASED ON TRAIT ADVANTAGE, LEADING TO NON-RANDOM CHANGES IN ALLELE FREQUENCIES.

DISTINGUISHING NATURAL SELECTION FROM OTHER EVOLUTIONARY MECHANISMS

WHILE ALL THESE MECHANISMS CAN CAUSE ALLELE FREQUENCIES TO CHANGE, NATURAL SELECTION SPECIFICALLY FAVORS ALLELES THAT CONFER A SURVIVAL OR REPRODUCTIVE ADVANTAGE IN A GIVEN ENVIRONMENT.

CONNECTING NATURAL SELECTION AND EVOLUTION

THE KEY DISTINCTION LIES IN THE LEVEL AT WHICH EACH PROCESS OPERATES. NATURAL SELECTION ACTS ON INDIVIDUALS, INFLUENCING WHICH INDIVIDUALS ARE MORE LIKELY TO SURVIVE AND REPRODUCE. EVOLUTION, HOWEVER, IS A POPULATION-LEVEL PHENOMENON, CHARACTERIZED BY CUMULATIVE CHANGES IN ALLELE FREQUENCIES OVER GENERATIONS.

NATURAL SELECTION AS A DRIVER OF EVOLUTION

1. INDIVIDUAL ORGANISMS WITH BENEFICIAL ALLELES ARE MORE LIKELY TO SURVIVE AND REPRODUCE.
2. THESE ADVANTAGEOUS ALLELES BECOME MORE PREVALENT IN THE GENE POOL.
3. OVER MANY GENERATIONS, THIS LEADS TO SIGNIFICANT GENETIC CHANGE—EVOLUTION.

CHANGES IN ALLELES AS THE BASIS OF EVOLUTION

EVOLUTIONARY CHANGE IS FUNDAMENTALLY ABOUT HOW THE GENETIC COMPOSITION OF A POPULATION SHIFTS OVER TIME, PRIMARILY THROUGH CHANGES IN ALLELE FREQUENCIES. THIS PROCESS CAN RESULT IN NEW TRAITS, SPECIATION, OR ADAPTATION TO CHANGING ENVIRONMENTS.

EXAMPLES ILLUSTRATING NATURAL SELECTION AND EVOLUTION

PEACOCK TAIL LENGTH

- IN PEACOCKS, MALES WITH LONGER, MORE ELABORATE TAILS ARE OFTEN MORE SUCCESSFUL AT ATTRACTING MATES.
- NATURAL SELECTION FAVORS THESE TRAITS AT THE INDIVIDUAL LEVEL, INCREASING THEIR FREQUENCY.
- OVER GENERATIONS, THE POPULATION'S ALLELE FREQUENCIES SHIFT TOWARD THOSE THAT PRODUCE LONGER TAILS, ILLUSTRATING EVOLUTION.

BACTERIAL ANTIBIOTIC RESISTANCE

- EXPOSURE TO ANTIBIOTICS KILLS SUSCEPTIBLE BACTERIA, BUT RESISTANT BACTERIA SURVIVE.
- RESISTANT ALLELES BECOME MORE COMMON IN THE BACTERIAL POPULATION.
- THIS CHANGE IN ALLELE FREQUENCY EXEMPLIFIES EVOLUTION DRIVEN BY NATURAL SELECTION.

FINCH BEAK MORPHOLOGY

- DURING DROUGHT CONDITIONS, FINCHES WITH THICKER BEAKS ARE BETTER AT CRACKING HARD SEEDS.
- NATURAL SELECTION INCREASES THE FREQUENCY OF ALLELES ASSOCIATED WITH THICKER BEAKS.
- THIS RESULTS IN A POPULATION ADAPTED TO THE AVAILABLE FOOD SOURCES, DEMONSTRATING EVOLUTION.

IMPLICATIONS OF THE DISTINCTION

UNDERSTANDING THAT NATURAL SELECTION ACTS ON INDIVIDUALS WHILE EVOLUTION INVOLVES CHANGES IN POPULATIONS HELPS CLARIFY MANY BIOLOGICAL PHENOMENA:

WHY NOT ALL TRAITS ARE SELECTED FOR

- SOME TRAITS MAY BE NEUTRAL OR EVEN DETRIMENTAL BUT PERSIST DUE TO GENETIC DRIFT OR GENE FLOW.
- NATURAL SELECTION SPECIFICALLY INCREASES THE FREQUENCY OF BENEFICIAL ALLELES IN RESPONSE TO ENVIRONMENTAL CHALLENGES.

EVOLUTION CAN OCCUR WITHOUT NATURAL SELECTION

- GENETIC DRIFT AND MUTATION CAN CAUSE EVOLUTIONARY CHANGES INDEPENDENT OF NATURAL SELECTION.
- FOR EXAMPLE, IN SMALL POPULATIONS, CHANCE EVENTS CAN DRAMATICALLY ALTER ALLELE FREQUENCIES.

THE ROLE OF ALLELES IN ADAPTIVE EVOLUTION

ALLELE VARIATION PROVIDES THE RAW MATERIAL UPON WHICH NATURAL SELECTION ACTS. WITHOUT GENETIC DIVERSITY, POPULATIONS CANNOT ADAPT EFFECTIVELY TO ENVIRONMENTAL CHANGES, UNDERSCORING THE IMPORTANCE OF ALLELES IN EVOLUTIONARY PROCESSES.

SUMMARY: NATURAL SELECTION AND EVOLUTION IN CONTEXT

IN ESSENCE, NATURAL SELECTION ACTS ON INDIVIDUALS, INFLUENCING WHICH TRAITS ARE PASSED ON BASED ON THEIR SURVIVAL AND REPRODUCTIVE SUCCESS. THESE TRAITS ARE DETERMINED BY UNDERLYING GENETIC VARIANTS CALLED ALLELES. OVER TIME, THE CUMULATIVE EFFECT OF DIFFERENTIAL REPRODUCTIVE SUCCESS LEADS TO CHANGES IN ALLELE FREQUENCIES WITHIN A POPULATION, WHICH CONSTITUTES EVOLUTION. THIS DISTINCTION UNDERSCORES THE IMPORTANCE OF GENETIC VARIATION, PARTICULARLY ALLELES, AS THE FOUNDATION OF EVOLUTIONARY CHANGE DRIVEN BY NATURAL SELECTION.

CONCLUSION

UNDERSTANDING THE RELATIONSHIP BETWEEN NATURAL SELECTION AND EVOLUTION IS FUNDAMENTAL TO COMPREHENDING BIOLOGICAL DIVERSITY. WHILE NATURAL SELECTION OPERATES ON INDIVIDUAL ORGANISMS BY FAVORING CERTAIN PHENOTYPES, THE OVERARCHING PROCESS OF EVOLUTION INVOLVES THE STATISTICAL CHANGE IN ALLELE FREQUENCIES WITHIN POPULATIONS OVER GENERATIONS. THIS PROCESS ENABLES SPECIES TO ADAPT, DIVERSIFY, AND EVOLVE IN RESPONSE TO ENVIRONMENTAL PRESSURES, WITH ALLELES SERVING AS THE GENETIC CURRENCY OF EVOLUTIONARY CHANGE.

FREQUENTLY ASKED QUESTIONS

WHAT DOES NATURAL SELECTION ACT ON IN THE PROCESS OF EVOLUTION?

NATURAL SELECTION ACTS ON INDIVIDUALS' TRAITS, SPECIFICALLY ON THEIR ALLELES, WHICH ARE VARIATIONS OF GENES THAT INFLUENCE OBSERVABLE CHARACTERISTICS.

HOW DOES EVOLUTION DIFFER FROM THE IMMEDIATE EFFECTS OF NATURAL SELECTION?

EVOLUTION CONSISTS OF CHANGES IN ALLELE FREQUENCIES WITHIN A POPULATION OVER TIME, WHILE NATURAL SELECTION ACTS ON INDIVIDUAL ORGANISMS' TRAITS TO INFLUENCE WHICH ALLELES BECOME MORE COMMON.

WHY ARE ALLELES IMPORTANT IN THE PROCESS OF EVOLUTION?

ALLELES ARE IMPORTANT BECAUSE THEY REPRESENT THE GENETIC VARIATIONS ON WHICH NATURAL SELECTION ACTS, LEADING TO CHANGES IN A POPULATION'S GENETIC MAKEUP OVER GENERATIONS.

CAN NATURAL SELECTION ACT ON ALL GENETIC VARIATIONS EQUALLY?

NO, NATURAL SELECTION ACTS MORE STRONGLY ON CERTAIN ALLELES THAT CONFER ADVANTAGEOUS TRAITS, LEADING TO INCREASED REPRODUCTIVE SUCCESS OF INDIVIDUALS WITH THOSE ALLELES.

WHAT IS THE RELATIONSHIP BETWEEN NATURAL SELECTION AND CHANGES IN ALLELE FREQUENCIES?

NATURAL SELECTION CAUSES CHANGES IN ALLELE FREQUENCIES BY FAVORING CERTAIN ALLELES OVER OTHERS, WHICH LEADS TO EVOLUTION IN THE POPULATION'S GENETIC COMPOSITION.

ADDITIONAL RESOURCES

NATURAL SELECTION ACTS ON ALLELES, BUT EVOLUTION CONSISTS OF CHANGES IN ALLELE FREQUENCIES

UNDERSTANDING THE MECHANISMS THAT DRIVE BIOLOGICAL DIVERSITY IS FUNDAMENTAL TO THE STUDY OF EVOLUTION. THE PHRASE "NATURAL SELECTION ACTS ON ALLELES, BUT EVOLUTION CONSISTS OF CHANGES IN ALLELE FREQUENCIES" SUCCINCTLY CAPTURES A CORE CONCEPT IN EVOLUTIONARY BIOLOGY: THAT THE OBSERVABLE PROCESS OF EVOLUTION IS ROOTED IN CHANGES AT THE GENETIC LEVEL, SPECIFICALLY IN THE FREQUENCIES OF DIFFERENT ALLELES WITHIN POPULATIONS. THESE SHIFTS ARE OFTEN SUBTLE ON A SINGLE-GENERATION SCALE BUT, OVER TIME, LEAD TO PROFOUND TRANSFORMATIONS IN SPECIES. THIS ARTICLE EXPLORES THE DISTINCTION BETWEEN THE IMMEDIATE ACTION OF NATURAL SELECTION ON ALLELES AND THE BROADER PROCESS OF EVOLUTION, WHICH ENCOMPASSES CUMULATIVE GENETIC CHANGES ACROSS POPULATIONS.

UNDERSTANDING NATURAL SELECTION AND ITS ACTION ON ALLELES

WHAT ARE ALLELES?

ALLELES ARE ALTERNATIVE VERSIONS OF A GENE THAT ARISE THROUGH MUTATIONS AND ARE FOUND AT THE SAME LOCUS ON HOMOLOGOUS CHROMOSOMES. FOR EXAMPLE, THE GENE DETERMINING FLOWER COLOR IN A PLANT SPECIES MIGHT HAVE A RED ALLELE AND A WHITE ALLELE. THESE VARIANTS CONTRIBUTE TO GENETIC DIVERSITY WITHIN A POPULATION.

NATURAL SELECTION: THE MECHANISM

NATURAL SELECTION IS A PROCESS WHERE CERTAIN ALLELES BECOME MORE COMMON IN A POPULATION BECAUSE THEY CONFER SOME ADVANTAGE IN SURVIVAL OR REPRODUCTION. IT ACTS DIRECTLY ON PHENOTYPES, WHICH ARE THE OBSERVABLE TRAITS RESULTING FROM THE INTERACTION OF ALLELES WITH THE ENVIRONMENT, BUT THE ULTIMATE TARGET IS THE ALLELES THEMSELVES.

> KEY POINT: NATURAL SELECTION "ACTS ON" PHENOTYPES BUT "ACTS UPON" ALLELES BECAUSE PHENOTYPIC TRAITS ARE

ENCODED BY ALLELES. THE ENVIRONMENT "SELECTS" FOR BENEFICIAL ALLELES BASED ON HOW THEY INFLUENCE AN ORGANISM'S FITNESS.

HOW NATURAL SELECTION ACTS ON ALLELES

- DIFFERENTIAL SURVIVAL: ALLELES THAT PRODUCE ADVANTAGEOUS TRAITS INCREASE AN ORGANISM'S CHANCES OF SURVIVING AND REPRODUCING.
- REPRODUCTIVE SUCCESS: ALLELES ASSOCIATED WITH HIGHER REPRODUCTIVE SUCCESS TEND TO INCREASE IN FREQUENCY.
- ENVIRONMENTAL INFLUENCE: CHANGES IN ENVIRONMENTAL CONDITIONS CAN ALTER WHICH ALLELES ARE ADVANTAGEOUS.

EXAMPLES OF NATURAL SELECTION ACTING ON ALLELES

- THE PEPPERED MOTH'S COLORATION: DURING THE INDUSTRIAL REVOLUTION, DARKER MOTHS BECAME MORE COMMON BECAUSE THEY WERE LESS VISIBLE TO PREDATORS ON SOOT-COVERED TREES, ILLUSTRATING SELECTION ACTING ON ALLELES RELATED TO COLORATION.
- ANTIBIOTIC RESISTANCE IN BACTERIA: CERTAIN ALLELES CONFER RESISTANCE, ALLOWING BACTERIA CARRYING THESE ALLELES TO SURVIVE ANTIBIOTIC EXPOSURE, LEADING TO INCREASED PREVALENCE.

PROS OF NATURAL SELECTION ACTING ON ALLELES:

- EXPLAINS ADAPTATION TO SPECIFIC ENVIRONMENTS.
- CAN LEAD TO THE DEVELOPMENT OF COMPLEX TRAITS OVER TIME.
- PROVIDES A MECHANISM FOR THE MAINTENANCE OF GENETIC DIVERSITY.

CONS OR LIMITATIONS:

- NATURAL SELECTION REQUIRES VARIATION; WITHOUT GENETIC DIVERSITY, IT CANNOT ACT.
- IT MAY BE SLOW, ESPECIALLY IN LARGE, STABLE POPULATIONS.
- IT DOES NOT PRODUCE PERFECT ORGANISMS BUT RATHER "GOOD ENOUGH" ADAPTATIONS.

EVOLUTION AS CHANGES IN ALLELE FREQUENCIES

WHAT IS EVOLUTION?

EVOLUTION IS THE CHANGE IN THE GENETIC COMPOSITION OF A POPULATION OVER GENERATIONS. IT IS NOT AN ACTIVE PROCESS BUT A CONSEQUENCE OF MECHANISMS LIKE NATURAL SELECTION, GENETIC DRIFT, MUTATION, AND GENE FLOW ALTERING ALLELE FREQUENCIES.

FROM SELECTION TO EVOLUTION

WHILE NATURAL SELECTION ACTS ON SPECIFIC ALLELES, EVOLUTION ENCOMPASSES ALL PROCESSES THAT CHANGE ALLELE FREQUENCIES:

- GENETIC DRIFT: RANDOM FLUCTUATIONS IN ALLELE FREQUENCIES, ESPECIALLY SIGNIFICANT IN SMALL POPULATIONS.
- MUTATION: INTRODUCES NEW ALLELES INTO THE GENE POOL.
- GENE FLOW: MOVEMENT OF ALLELES BETWEEN POPULATIONS.

MEASURING EVOLUTION: CHANGES IN ALLELE FREQUENCIES

- ALLELE FREQUENCY: THE PROPORTION OF A SPECIFIC ALLELE AMONG ALL ALLELES AT A LOCUS IN A POPULATION.
- GENOTYPE FREQUENCY: THE PROPORTION OF INDIVIDUALS WITH A SPECIFIC GENOTYPE.
- EVOLUTIONARY CHANGE: EVIDENCED BY SHIFTS IN THESE FREQUENCIES OVER TIME.

FEATURES OF EVOLUTION THROUGH CHANGES IN ALLELE FREQUENCIES

- MICROEVOLUTION: SMALL-SCALE CHANGES WITHIN A POPULATION, SUCH AS SHIFTS IN ALLELE FREQUENCIES.
- MACROEVOLUTION: LARGE-SCALE CHANGES LEADING TO THE EMERGENCE OF NEW SPECIES, OFTEN BUILT ON CUMULATIVE ALLELE FREQUENCY CHANGES.

PROS OF EVOLUTION AS CHANGES IN ALLELE FREQUENCIES:

- PROVIDES A QUANTITATIVE FRAMEWORK FOR UNDERSTANDING GENETIC CHANGE.
- ALLOWS PREDICTIONS ABOUT FUTURE GENETIC MAKEUP OF POPULATIONS.
- EXPLAINS PHENOMENA LIKE ADAPTATION, SPECIATION, AND GENETIC DIVERSITY.

CONS OR CHALLENGES:

- DIFFICULT TO MEASURE ALLELE FREQUENCIES ACCURATELY IN NATURAL POPULATIONS.
- SOME EVOLUTIONARY PROCESSES (E.G., GENETIC DRIFT) ARE STOCHASTIC AND UNPREDICTABLE.
- THE TIMESCALES FOR SIGNIFICANT CHANGES CAN BE VERY LONG.

DISTINGUISHING THE ACTION OF NATURAL SELECTION FROM EVOLUTION

NATURAL SELECTION VS. EVOLUTION: THE CORE DIFFERENCE

- NATURAL SELECTION IS THE PROCESS THAT CAUSES CERTAIN ALLELES TO BECOME MORE COMMON DUE TO THEIR ADVANTAGEOUS EFFECTS ON FITNESS.
- EVOLUTION IS THE CUMULATIVE OUTCOME OF NATURAL SELECTION AND OTHER MECHANISMS, REFLECTED IN THE CHANGE IN ALLELE FREQUENCIES OVER GENERATIONS.

WHY THE DISTINCTION MATTERS

- NATURAL SELECTION CAN ACT ON A SINGLE GENERATION, CAUSING IMMEDIATE SHIFTS IN ALLELE FREQUENCIES.
- EVOLUTION IS A LONG-TERM PROCESS, INVOLVING THE ACCUMULATION OF SMALL CHANGES THAT MAY BE INFLUENCED BY MULTIPLE FACTORS.

ILLUSTRATIVE EXAMPLE: THE SICKLE CELL TRAIT

- IN REGIONS WITH MALARIA, THE SICKLE CELL ALLELE PROVIDES RESISTANCE TO MALARIA. NATURAL SELECTION FAVORS THIS ALLELE IN AFFECTED AREAS, INCREASING ITS FREQUENCY.
- HOWEVER, THE OVERALL EVOLUTION OF THE POPULATION INVOLVES THE INCREASE IN THE SICKLE CELL ALLELE OVER GENERATIONS, REPRESENTING AN EVOLUTIONARY CHANGE DRIVEN BY SELECTION.

SUMMARY AND IMPLICATIONS FOR EVOLUTIONARY BIOLOGY

UNDERSTANDING THAT NATURAL SELECTION ACTS ON ALLELES, BUT EVOLUTION CONSISTS OF CHANGES IN ALLELE FREQUENCIES, PROVIDES A NUANCED PERSPECTIVE ON HOW GENETIC CHANGE OCCURS. THIS DISTINCTION EMPHASIZES THAT NATURAL SELECTION IS A PROCESS THAT FILTERS EXISTING GENETIC VARIATION, FAVORING SOME ALLELES OVER OTHERS BASED ON ENVIRONMENTAL PRESSURES. OVER MANY GENERATIONS, THESE SHIFTS LEAD TO EVOLUTIONARY TRANSFORMATIONS, SHAPING THE DIVERSITY OF LIFE ON EARTH.

KEY TAKEAWAYS:

- NATURAL SELECTION TARGETS PHENOTYPIC TRAITS BUT OPERATES AT THE GENETIC LEVEL.
- EVOLUTION IS OBSERVABLE THROUGH MEASURABLE CHANGES IN ALLELE FREQUENCIES WITHIN POPULATIONS.
- MULTIPLE MECHANISMS INFLUENCE THESE GENETIC CHANGES, NOT JUST NATURAL SELECTION.
- THE INTERPLAY OF THESE MECHANISMS RESULTS IN THE VAST ARRAY OF BIOLOGICAL DIVERSITY OBSERVED TODAY.

FINAL THOUGHTS:

APPRECIATING THE DIFFERENCE BETWEEN THE ACTION OF NATURAL SELECTION ON ALLELES AND THE BROADER PROCESS OF EVOLUTION UNDERSCORES THE IMPORTANCE OF GENETIC VARIATION AND THE MECHANISMS THAT INFLUENCE IT. IT ALSO HIGHLIGHTS THE DYNAMIC NATURE OF POPULATIONS AND THEIR CAPACITY TO ADAPT, DIVERSIFY, OR REMAIN STABLE OVER TIME. THIS UNDERSTANDING FORMS THE FOUNDATION FOR FIELDS RANGING FROM CONSERVATION BIOLOGY TO MEDICINE, WHERE MANAGING GENETIC DIVERSITY AND UNDERSTANDING EVOLUTIONARY PROCESSES ARE CRUCIAL.

IN CONCLUSION, THE DISTINCTION ARTICULATED BY THE PHRASE “NATURAL SELECTION ACTS ON ALLELES, BUT EVOLUTION CONSISTS OF CHANGES IN ALLELE FREQUENCIES” ENCAPSULATES A FUNDAMENTAL PRINCIPLE: THAT THE VISIBLE AND LONG-TERM PATTERNS OF BIOLOGICAL CHANGE ARE ROOTED IN THE SUBTLE, OFTEN INCREMENTAL SHIFTS IN THE GENETIC MAKEUP OF POPULATIONS DRIVEN BY NATURAL SELECTION AND OTHER EVOLUTIONARY FORCES. RECOGNIZING THIS HELPS CLARIFY THE MECHANISMS UNDERLYING THE INCREDIBLE DIVERSITY OF LIFE AND THE PROCESSES THAT CONTINUE TO SHAPE IT TODAY.

Natural Selection Acts On But Evolution Consists Of Changes In Hint Allele

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