

CARTA 10th YEAR ANNIVERSARY: REVISITING THE AGENDA

Glossary

Admixture: Breeding between isolated populations.

Allele: Alternative DNA sequence at the same locus (location on the chromosome)

American Sign Language (ASL): A natural language that serves as the predominant sign language of Deaf communities in the United States and most of Anglophone Canada.

Ancestral Variant: A genetic variant (e.g.: single-nucleotide polymorphism, SNP, or a larger change) representing the ancestral state and coexisting with more recent variants.

Archaic *Homo sapiens*: Earlier forms of *Homo sapiens* who were anatomically and behaviorally distinct from modern humans.

Autism Spectrum Disorders: Mental conditions, present from early childhood, characterized by difficulty in communicating and forming relationships with other people and in using language and abstract concepts.

Behavior: The way in which individuals acts or conducts themselves, especially toward others.

Biallelic: Pertaining to both alleles (both alternative forms of a gene).

Bonobo (*Pan paniscus*): One of the two species comprising the genus, *Pan*, and branched from chimpanzees ~1 million years ago. Sometimes referred to as "pygmy chimpanzee." Bonobos, compared to chimpanzees, are more gracile, have female social dominance, relatively long legs, pink lips, a dark face, a "tail-tuft" through adulthood, and parted long head hair. The species is omnivorous and inhabits primary and secondary forests, including seasonally inundated swamp forests. The bonobo is found in a 500,000 km² (190,000 sq mi) area of the Congo Basin, only south of the Congo River, in the Democratic Republic of the Congo. Due to political instability, little field work in their natural habitat has been performed. Most behavioral knowledge is a result of studies of captive bonobos.

Carcinoma: A type of cancer that starts in cells that make up the skin or the tissue lining organs, such as the liver or kidneys. Carcinomas are abnormal cells that divide without control and can spread to other parts of the body.

Chimpanzee (*Pan troglodytes*): One of the two species comprising the genus, *Pan*, and branched from bonobos ~1 million years ago. Sometimes referred to as "common chimpanzees." Native to sub-Saharan Africa, chimpanzees are found in and around the Congo Basin (north of the Congo River) and throughout West Africa. Chimpanzees are divided into four subspecies, based on appearance and distribution. Compared to bonobos, chimpanzees are somewhat larger, more aggressive, and exhibit male social dominance.

Chromatin: A complex of DNA and proteins (histone and adaptor proteins) forming chromosomes.

Chromosome: Discrete strands of tightly packaged chromatin.

Cognitive Trade-off Hypothesis: As proposed by T. Matsuzawa, postulates that a trade-off between superior language facility at the expense of memory ability based on social life occurred during human evolution. In comparison to chimpanzees, who possess superior short-term memory abilities and no known language, humans de-emphasized short term memory for extraordinary language capacity, which may be one mechanism for increased collaboration and altruism in humans.

Combinatorial Phonology: A universal property of human language in which a set of basic, distinct units (phonemes, syllables, or hand shapes) can be combined in many different ways.

Complex Trait: A phenotypic trait with variability influenced by numerous genes (each with small effects).

Copy Number Variation: A phenomenon in which sections of the genome are repeated on the same or different chromosome and the number of repeats in the genome varies between individuals in the human population. Such repeats can include functional genes.

Cortical-Basal Ganglia: Subcortical nuclei in the base of the forebrains of vertebrates, including humans, which are involved with a variety of functions including control of voluntary motor movements, procedural learning, routine behaviors or "habits" such as teeth grinding, eye movements, cognition, and emotion.

Culture: Behavior and norms that are shared, learned, and socially transmitted.

Denisovans: An extinct hominin population contemporary with Neanderthals **that hybridized with ancient humans and Neanderthals**. Knowledge of Denisovan morphology is limited to two small fossils found in Siberia.

de novo: A Latin adverb meaning "from the new." A new genetic variant that is the result of a mutation in a germ cell (egg or sperm) of one of the parents, or a variant that arises in the fertilized egg during embryogenesis.

Dental Calculus: Calcified dental plaque, provides information on diet, disease, health, microbiome and protects the genetic information within the tooth from degradation.

DNA: Deoxyribonucleic acid. The molecule of inheritance, consisting of sequences of the four nucleotide building blocks (ATGC).

DNA Methylation: A process by which methyl groups are added to the DNA molecule. Methylation can change the activity of a DNA segment without changing the sequence. When located in a gene promoter, DNA methylation typically acts to repress gene transcription.

Dual Inheritance: A theory that human behavior is a product of two different and interacting evolutionary processes: genetic evolution and cultural evolution. Genes and culture continually interact in a feedback loop.

Ecology: The interaction of organisms with their physical environment, along with other organisms.

Epigenetic: Biological Information not encoded directly in DNA.

Epigenetics: The study of heritable phenotype changes that do not involve alterations in the DNA sequence.

Epigenome: Molecular modifications of the DNA and its associated histone proteins, affecting its function.

Foraging: Searching for wild food or provisions as opposed to cultivating food crops or livestock.

Gene-Culture Co-Evolution Theory: A branch of theoretical population genetics that models the transmission of genes and cultural traits from one generation to the next, exploring how they interact.

Genetic: Relating to genes or heredity

Genome Wide Association Study (GWAS): An approach for "gene mapping" in which hundreds of thousands of SNPs are tested statistically for genetic associations with a phenotype.

Genotype: The two alleles at one or more diploid loci.

"Great Apes": A taxonomic family that was once incorrectly used to denote chimpanzees, bonobos, gorillas and orangutans, but not humans.

Gyrification: The process of forming the characteristic folds of the cerebral cortex. The peak of such a fold is called a gyrus (plural: gyri), and its trough is called a sulcus (plural: sulci).

Heritability: A statistic used in the fields of breeding and genetics that estimates the degree of variation in a phenotypic trait in a population that is due to genetic variation between individuals in that population.

Hippocampus: The elongated ridges on the floor of each lateral ventricle of the brain, thought to be a center of emotion, memory, and the autonomic nervous system.

Histone Modification: A covalent post-translational modification (PTM) to histone proteins which includes methylation, phosphorylation, acetylation, ubiquitylation, and sumoylation. The PTMs made to histones can impact gene expression by altering chromatin structure or recruiting histone modifiers.

Hominid: A classification comprising all modern and extinct "Great Apes" and humans.

Hominin: A classification of species comprising humans and extinct relatives (ex. *Australopithecus*, *Paranthropus* and

Ardipithecus - not all are ancestral to humans) following the split with the common ancestor with chimpanzees.

Homo: The genus that comprises the species *Homo sapiens*, as well as several extinct species classified as ancestral to, or closely related to, humans.

Homo erectus: An extinct hominin species with fossil evidence from 1.9 million (possibly earlier) to 70 thousand years ago and found from Africa to Indonesia. May have been the first hominin to leave Africa. *H. erectus* DNA may be retrievable from other species due to archaic admixture.

Human Accelerated Regions (HARs): Segments of the human genome that are conserved throughout vertebrate evolution but are strikingly different in humans. They are named according to their degree of difference between humans and chimpanzees (HAR1 showing the largest degree of human-chimpanzee differences).

Hunter-Gatherer: A human living in a society in which most or all food is obtained by foraging (collecting wild plants and pursuing wild animals), in contrast to agricultural societies, which rely mainly on domesticated species. *Given the higher contribution from gathering, perhaps they should be called Gatherer-Hunters.*

Interbirth Interval: The period of time between successive births by an individual female.

Microfossils: Fossils or fossil fragments of bacteria, protists, fungi, animals, and plants (e.g.: starch granules) that can only be seen with a microscope.

Morality: Principles concerning the distinction between right and wrong or good and bad behavior.

Morphology (Biology): The branch of biology interested in the form and structure of organisms and their specific structural features.

Morphology (Linguistics): The sub-discipline of linguistics concerned with the structure and parts of words (stems, root words, prefixes, and suffixes), how words are formed, and their relationship to other words in the same language. Parts of speech, intonation and stress, and contextual pronunciation and meaning are aspects of Morphology.

Mutation: Change of a DNA sequence.

Mycobacterium tuberculosis: The pathogenic bacteria that causes tuberculosis.

Neanderthals: An extinct Eurasian hominin species that existed from 500,000 to 30,000 years ago and interbred with ancient humans and Denisovans.

Neocortex: A part of the cerebral cortex concerned with sight, hearing, and touch in mammals, regarded as the most recently evolved part of the cortex.

Neuron: A specialized cell that transmits nerve impulses.

Odds Ratio (in GWAS): The ratio between the odds of individuals having a phenotype associated with a specific allele and the odds of the same phenotype for individuals who do not have that same allele.

Ontogeny: The origin and development of an organism (from fertilization of the egg to the organism's mature form). Can also refer to the study of an organism's lifespan.

Optogenetic: A biological technique that involves the use of light to control gene expression and cellular function in living tissue, typically neurons, that have been genetically modified to express light-sensitive ion channels.

Phenotype: Observable traits of an organism (result from interactions between genes and environment).

Phonology: The system that combines meaningless speech sounds into meaningful words.

Primates: A group of mammals that include humans, apes, monkeys, and prosimians.

Radial Glia: A primary progenitor cell capable of generating neurons, astrocytes, and oligodendrocytes. Radial glia are defined by their position, morphology, and genetic phenotype. These cells are involved in establishing a temporary scaffold for cortical layer development.

Scavengers: Organisms that search for and feed on carrion, dead plant material, or refuse.

Semantics (Linguistics): The study of the logic and meaning of a word, phrase, sentence, or text.

Social Referencing: A process where an individual takes cues from other people in the environment, about which emotions and actions are appropriate in a certain context or situation.

Stable Isotope: Isotopes that do not decay into other elements. These isotopes, found in biological material,

including fossils, can be used to study paleo-diet and ecology.

Structural Variation (Genomics): The variation in structure of an organism's chromosomes. It consists of many kinds of variation in the genome of one species, and usually includes microscopic and submicroscopic types, such as deletions, duplications, copy-number variants, insertions, inversions and translocations.

Syntax: The arrangement of words and phrases to create well-formed sentences in a language.

Tinbergen's Four Questions: Nikolaas Tinbergen's 1962 paper "On aims and methods of Ethology," defined complementary categories for analyzing and explaining animal behavior as *proximate* (developmental: both ontogenetic and mechanistic) and *ultimate* (evolutionary: both phylogenetic and adaptive).

- Proximate/Ontogeny: *How does the trait develop in individuals?*
- Proximate/Mechanism: *How does the trait work?*
- Ultimate/Phylogeny: *What is the trait's evolutionary history?*
- Ultimate/Adaptation: *Why does the trait perform better than evolvable alternatives?*

Variation (Biology): The differences among the individual of the same species.

Working Memory: The part of short-term memory that is concerned with immediate conscious perceptual and linguistic processing. It is also important for reasoning and the guidance of decision-making and behavior.

***Yersinia pestis*:** The gram-negative bacterium that causes the plague, which takes three main forms: pneumonic, septicemic and bubonic.