

Comparative Anthropogeny: From Molecules to Societies

Glossary

ABO Blood Groups: The **blood group** system particular to primates that denotes the presence or absence of A, B, and O **antigens** on **erythrocytes** (red blood cells). The **ABO gene** encodes an enzyme responsible for producing A or B antigens, or an inactive enzyme resulting in the presences of O **antigens**. It is theorized that ABO and other **blood groups** provide protective diversity within populations to combat microbial invasion and has been maintained for millions of years. In humans, ABO is the major blood group for determining transfusion compatibility.

Age at maturity: The age at first reproduction. In modern hunter gatherers, this is roughly at 18 years old.

Agglutination (hemagglutination): The clumping of cells due to the interaction of **antibodies** (or other **proteins**) and specific **molecules** on the surface of cells.

Aggressive scavenging: Seizure of prey from initial predators while the latter are still feeding.

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

Allosomes: **Chromosomes** that determine sex (XY, with Y-Chromosome inherited paternally).

Alu element: A type of primate-specific **transposable element**, or "jumping gene," that is roughly 300 base pairs long and exists in large copy number across all **chromosomes** of primate **genomes** (over 1 million copies in the human genome). Alu elements are also called **Short Interspersed Elements (SINES)**. They lack the ability to copy and paste themselves directly, but are able to "hitchhike" via the activity of Long Interspersed Elements (LINES) that have retained the ability to copy and paste. Alu elements were considered to be a part of what has been called "junk DNA" because they do not code for the production of proteins, however they may serve some yet unknown function and definitely contribute to genomic plasticity, evolution, and disease.

Amino acids: Organic compounds that are the building blocks of **proteins** and participate in a number of processes such as neurotransmitter transport and biosynthesis. Amino acids are encoded by the **genome** as different three letter codes.

Antibody: A **glycoprotein** formed by immune cells (**B-cells**) that specifically recognize certain **molecules (antigens)** to neutralize pathogens such as **bacteria** and **viruses**. They exist in pentameric form (IgM), dimeric form (IgA) or single form (IgG, IgE, IgD), which consist of Y-shaped units that each have two antigen-binding pockets on one side and a region recognized by immune cells on the opposite. The tips of the "Y" can recognize specific **antigens** and lead to a successful immune response, while the bottom of the "y" regulates immune cell responses. Also known as **immunoglobulin**.

Antigen: A **molecule** or molecular structure that can trigger an immune response and can be specifically recognized by an **antibody**.

Antiserum (plural: antisera): Blood serum that contains **antibodies** and is used via transfusion to impart immunity.

Ardipithecus: A basal hominin genus dating between 4.0-4.4 mya. *Ardipithecus* is distinguished by primitive feet featuring a divergent big toe contrasted against its other bipedal anatomy. The life history of *Ardipithecus* is thought to have been similar to that of modern chimpanzees with age at first reproduction between 10-12 years, an inter-birth interval of 4-5 years, and a maximum longevity of 50 years. Only two *Ardipithecus* fossils have been described thus far, *Ardipithecus ramidus* and *Ardipithecus kadabba*, both found in Ethiopia.

Axon (nerve fiber): In invertebrates, a long, slender projection of a **neuron** that transmits information (as electrical impulses) to different neurons, muscles, and glands.

Bacteria: A type of **prokaryotic** microorganism. Unlike **eukaryotes**, bacterial cells do not contain a nucleus and rarely harbour membrane-bound organelles. Bacteria were among the first life forms to evolve on Earth, and can be found in most every habitat, including soil, water, acidic hot springs, radioactive waste, the deep biosphere of the earth's crust, and in and on other living organisms as **symbionts** and **parasites**. Bacteria can be beneficial, such as those comprising the gut flora, or **pathogenic** and cause **infectious disease**. However, the vast majority of the bacteria in the body are rendered harmless by the protective effects of the immune system.

Balanced polymorphism: The maintenance of a genetic **polymorphism** generated by **balancing selection**. The **MHC system** and **ABO** in humans are examples.

Balancing selection: The selection favoring rare **variants** for a **gene** preventing fixation of one particular variant.

B-cells (B lymphocyte): A type of **white blood cell** whose function in the adaptive **immune system** is to secrete **antibodies**. Additionally, B-cells present **antigens** and secrete **cytokines**. In mammals, B-cells mature in the bone marrow. B-cells express **B-cell receptors** on their cell membrane, which allow the B-cell to bind to a specific antigen, against which it will initiate an antibody response. These cells can create an almost infinite repertoire through recombination and shuffling.

B-cell receptors (BCRs): **Immunoglobulin molecules** that form a receptor **protein** on the outer surface of **B-cells**. BCRs allow the B-cell to bind to a specific **antigen**, against which it will initiate an **antibody** response. BCRs also control B-cell activation by biochemical signaling and by physical acquisition of antigens from immune synapses with antigen-presenting cells.

Biological enculturation: The ensemble of biological phenomena that supports and makes **enculturation** possible (e.g., cortical plasticity of the human brain and configuration of motor programs that make culturally invented practices, such as reading and writing, possible).

Biologically evolved preconditions (BEPs): The necessary conditions for the manifestation of a behavioral or cognitive ability which, although having evolved via natural selection, do not constitute precursors of such abilities (e.g., human balance mechanisms are BEPs for learning how to snowboard, but they

are not precursors or proto-forms of it).

Blood group: The system comprising the totality of **antigens** on **erythrocytes**, **endothelial** and other cells types, secreted **molecules** in blood and bodily secretions. (This is why they are also known as histo-blood groups - histo being Greek for "tissue")

Blood type: The specific pattern of reaction to **antisera** within a **blood group**.

Bonobos (*Pan paniscus*): One of the two species comprising the genus, *Pan*, having 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.

Broca's Area: A region in the frontal lobe of the dominant hemisphere (usually the left) of the human brain with functions linked to speech production.

CD33 (*Siglec-3*): A **Siglec** that functions as a transmembrane receptor on myeloid cells and some lymphoid cells.

CD33-related Siglecs: A subclass of **Siglec** receptors that rapidly evolved in humans and do not have true orthologues (counterparts identical by descent) in most mammalian species. For the CD33rSiglecs, it has been more difficult to translate studies in animal models to human conditions.

Central Nervous System (CNS): The majority of the nervous system that consists of the brain, spinal cord, retina, optic nerves, and olfactory epithelium. The CNS integrates sensory information and coordinates and influences the activity of the body in bilaterally symmetric animals (all multicellular animals except sponges and radially symmetric animals such as jellyfish).

Chimpanzees (*Pan troglodytes*): One of the two species comprising the genus, *Pan*, having 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.

Chlorophyll: The green pigment that captures light energy and is essential for photosynthesis in cyanobacteria, algae, and plants.

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

Chromosome: Discrete strands of tightly packaged **chromatin**.

Cis (molecular interactions): Receptors expressed on a cell

surface that bind **ligands** on the same cell surface.

Coalitional aggression: At least two or more individuals jointly direct aggression at one or more conspecific targets. In humans coalitional aggression is socially organized.

Coalitional violence: Collective violence or violence between groups of individuals.

Codominant inheritance: A form of genomic inheritance in which both inherited **alleles** (one from each parent) are expressed and contribute to the **phenotype**.

Communicable (disease): An illness that is **transmittable** from an infected person or animal to another person or animal through direct contact or indirectly via contaminated food, water, or a **vector**.

Cooperative breeding: A social system in which parents and other individuals within the group provide care for offspring.

Copy number variation (CNV): 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**.

Cytokines: A broad and loose category of small **proteins** secreted by certain cells of the **immune system** and are important in cell signaling and have an effect on other cells.

Deoxyribonucleic acid (DNA): The **molecule** of inheritance, which consists of sequences of the four **nucleotide** bases: Adenine, Thymine, Guanine, and Cytosine. This molecule composed of two polynucleotide chains that coil around each other to form a double helix. It carries the genetic instructions for the development, functioning, growth and reproduction of all known organisms and some virus.

Digestive system: The organs of the body that are involved in the breakdown and absorption of food, and elimination of wastes. This includes the mouth, pharynx (throat), esophagus, stomach, small intestine, large intestine, rectum, and accessory digestive organs such as the salivary glands, liver, gallbladder, and pancreas.

DNA sequence: The specific order of the **nucleotide** bases Adenine, Thymine, Guanine, and Cytosine.

Ectoderm: The outermost of the three primary germ layers formed in embryonic development and develops into the nervous system and skin.

Embryogenesis: The development of an embryo after fertilization of an egg cell.

Enculturation: The gradual acquisition of cultural traits (the characteristics and norms of a culture or group) by an individual or another culture.

Endoderm: The innermost of the three primary germ layers formed in embryonic development and develops into some of the body's internal organs, including the gastrointestinal tract, the urinary tract, the respiratory tract, endocrine glands, and the auditory system.

Endothelial cells: The cell type that forms the interior lining

of blood and **lymphatic vessels**, and controls the transfer of materials, including **white blood cells**, into and out of the bloodstream.

Enveloped viruses: Viruses that possess an outer **lipid** membrane formed by cell membrane of the host cells from which the virus buds. The envelope protects the virus as it travels between hosts and cells.

Epithelial cells: The cell type that lines the surfaces of the body, including skin, blood vessels, urinary tract, and organs to provide protection.

Erythrocytes (red blood cells - RBCs): The most common type of blood cell and the vertebrate's principal means of oxygen delivery from lungs or gills to all tissues of the body. Erythrocytes of most mammals do not contain a nucleus with **chromosomes**.

Eukaryotes: Organisms whose cells have a nucleus enclosed within membranes. (see **Prokaryotes**)

Extracellular matrix: The structural network of enzymes, glycoproteins, and collagen that support surrounding cells.

Exosome: A type of extracellular vesicle that contain constituents (protein, **DNA**, and **RNA**) of the cells that secrete them. They are taken up by distant cells, where they can affect cell function and behavior.

Female- vs. male -biased fertile sex ratios: The relative numbers of individuals capable of having children. In female-biased situations, males face less competition for mating opportunities. In male-biased situations, these opportunities are lower, thus greater male-male competition for each one.

Foregut fermentation: A digestive process in which plant materials are fermented in a specialized combination of stomach compartments together called the reticulorumen. In ruminants, the fermented cud of the reticulorumen is regurgitated and chewed again to further break down the plant material, a process called rumination. After rumination, the food is finally digested in other stomach compartments, the omasum and abomasum (true stomach). Foregut fermentation also exists in some species that do not ruminate, such as leaf monkeys.

Gene: A **DNA sequence** which encodes a specific function.

Gene conversion: A type of concerted evolution where one gene on a chromosome can "paste" its sequence over a neighboring **gene** of high sequence similarity such that the sequences become identical after the conversion event. This phenomenon is common between similar genes located on the same **chromosome** region.

Genome: The totality of **DNA** in a cell. Also refers to the DNA sequence that typifies an individual or species.

Glia (neuroglia): Non-neuronal cells in the **central nervous system** and the peripheral nervous system that do not produce electrical impulses. Their function is to ensure homeostasis, form **myelin**, and provide support and protection for **neurons**. Glia make up ~50% of our brain cells.

Glycans: One of the four classes of major biomolecules.

Glycans consist of varying numbers of sugars (**monosaccharides**) attached to **proteins** or **lipids** or secreted as free glycans. Glycans are essential biomolecules whose functions can be divided into three broad categories: structural and modulatory properties (including nutrient storage and sequestration), specific recognition by other molecules, and molecular mimicry of host glycans.

Glycolipid: A type of a **lipid** (fat) with an attached **glycan** that functions to maintain the stability of the cell membrane and to facilitate cellular recognition. Glycolipids are crucial in immune response and tissue formation.

Glycoprotein: A class of **proteins** with covalently attached **glycans**. Glycoproteins play a part in important cellular functions like embryonic development, cell-to-cell recognition, cell adhesion, and immune functions.

Glycosyltransferases: **Proteins** with enzymatic functions that are involved in adding **monosaccharides** to other **molecules**.

Grandmother hypothesis: An explanation of the post-menopausal life stage of human females whereby the existence of grandmothers serves as a biological and social adaptive advantage for humans. Post-reproductive life stages are non-existent among non-human primates, so it is hypothesized that humans evolved to have grandmothers and grandmothers to have individuals who are free to invest their energy into the offspring of their children. This off-loads the reproductive cost of parenting through social kin-networking, and off-set the resource cost of brain- building as parents are freed to provision resources. Increased resource procurement may reduce the inter-birth interval by allowing for earlier weaning, which in turn increases offspring production potential, passes down generational knowledge, and increase social networks. In doing so, the grandmother ensures the survival of her genes in subsequent generations. The extended post-reproduction lifestage of grandmothers likely had the added output of producing grandfathers, who also provide benefits to the extended family, as well as their own extended reproductive timeline that competes with subsequent generations.

"Great apes": A taxonomic family denoting the extant chimpanzees, bonobos, gorillas, and orangutans. This is biologically invalid grouping given that **chimpanzees** and **bonobos** are more closely related to humans.

HapMap collection: A map of informative subsets of **single nucleotide polymorphisms (SNPs)** found along a stretch of a chromosome used to identify blocks of genetic variation existing along human **chromosomes**.

Hematopoietic stem cells: Stem cells that can become different types of blood cells.

Hindgut fermentation: A digestive process in which cellulose and other polysaccharides are broken down by symbiotic bacteria residing the colon of some mammalian species.

Histo-blood groups: Meaning "tissue-related", these blood group **antigens** originally evolved on epithelial cells prior to expression on **erythrocytes** (red blood cells). **ABO** is a classic example of a histo-blood group.

Homeostasis: The state of steady internal, physical, and chemical conditions maintained by living organisms.

Hominin: A classification of species comprising humans and our extinct relatives following the split with the common ancestor with chimpanzees.

Host: A living organism on or in which a **parasite**, **pathogen**, commensal or **symbiont** lives (see **Parasitism**).

Human Arcuate Fasciculus: The specialized connections composed of **axons** linking **Broca's area** and **Wernicke's area** in the human brain and is a major anatomic feature supporting language function in humans.

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.

Hunting hypothesis: The idea that hunting of large game by males provided sufficient provisions for themselves, their mates and offspring, while allowing for the reduction of female workloads, enhancement of fertility, and favoring of the later **ages at maturity** needed to learn and perfect essential skills. But modern data show that large animal prey would not have provided the reliable energy stream the argument requires.

Imitation: Behavior copying. This term has been used to mean everything from social learning in general to the reproduction of action intentions but is now most commonly used in the narrow sense of copying the form or topography of observed movements.

Immune system: The biological defense system of an organism that protects against disease.

Immunoglobulin domain/fold (Ig): A type of region (domain) present in many different **proteins** that is self-stabilizing and folds independently

Immunoglobulins: A type of **protein** that forms **antibodies** and other receptors both on cell surfaces and as soluble proteins of vertebrates. Comprised of a massive superfamily, immunoglobulins perform many different functions, including recognition, binding, or adhesion processes of cells.

Immunoreceptor tyrosine-based activation motif (ITAM): A highly conserved region in the cytoplasmic domain of signaling chains of adapter proteins and receptors and typically result in activation of inflammatory responses.

Immunoreceptor tyrosine-based inhibitory motif (ITIM): A conserved sequence of **amino acids**, including phosphorylated tyrosine, that is found intracellularly in the cytoplasmic domains of many inhibitory receptors.

Infection: The invasion of an organism's organs or tissues by **pathogens**, their multiplication, and the reaction of the host tissues to the pathogens.

Infectious (disease): The capability of producing **infection** or spreading **disease** to others. Synonymous with **communicable** and **transmissible**.

Interactive synchrony: Temporal coordination of behavior,

physiology, neural activity, and/or mental representations between individuals.

Inter-birth-interval: The space between births.

Internal model: A simulation of a system's response to events or states. In motor control, forward models use motor commands to predict sensory consequences whereas inverse models use intended sensory consequences to generate appropriate motor commands.

I-type lectins (aka Siglecs): A class of **lectins** belonging to the **immunoglobulin** superfamily.

Large quantity discrimination (LQD): The rough discrimination of collections of discrete items above the **subitizing** range, whose **numerosities** usually differ by a substantial amount.

Lectin: A **protein** that can bind to a **glycan** without catalyzing a modification of the glycan.

Lexical semantics: Word meanings.

Ligand: A **molecule** specifically recognized by another molecule and involved in specific interactions.

LINE1 Retrotransposons: Long interspersed nuclear elements class 1 (LINE1) is a type of **transposable element**, or "jumping gene," that randomly copies and inserts itself into different genomic locations through reverse transcription (conversion of **RNA** into **DNA**). These active LINE1s can interrupt the genome through insertions, deletions, rearrangements, and **copy number variations**. LINE1 activity has contributed to the instability and evolution of **genomes**. As such, they are tightly regulated in the germline, however, they are controlled differently in apes and humans. LINE1 retrotransposons make up to ~17% of the human genome. While the majority are inactive in the human genome, there are roughly 80-100 that have retained the ability to retrotranspose with considerable variation between individuals.

Lipid: One of the four classes of major biomolecules. A fatty or waxy organic compound involved in important cellular activities like storing energy, as a component of the cell membrane, and signaling within and between other cells.

Locus: A unique physical position on a **chromosome**.

Lymphatic Vessels: Thin-walled vessels (tubes) of the lymphatic system that are complementary to the cardiovascular system and are devoted to the movement of lymphatic fluid.

Macrophages: Specialized immune cells involved in the detection, phagocytosis and destruction of bacteria and other harmful organisms. In addition, they can also present antigens to T cells and initiate inflammation by releasing molecules.

Major histocompatibility complex (MHC): A set of closely linked polymorphic **genes** that code for cell surface **proteins** (MHC molecules) that assist the adaptive **immune system** in detection of foreign **molecules**.

Malignant neoplasm: A cancerous growth capable of invading normal tissues and growing in otherwise hostile environments.

Mate guarding (humans): The retention of exclusive reproductive access to a mate by attempting to restrict the access of others and discouraging the mate from seeking other sexual opportunities.

Meningitis: An inflammation (swelling) of the protective membranes covering the brain and spinal cord.

Menopause: The time of life when female menstruation naturally and permanently ceases.

Mentalizing: The process of representing and reasoning about the mental states, thought, and feelings of the self and others. Also known as Theory of Mind.

Mesoderm: The middle of the three primary germ layers formed in embryonic development and develops into the muscles of the cardiac and skeletal systems, the skeleton and connective tissue, blood vessels and cells, and some other internal organs such as the kidneys and gonads.

Microglia: A type of **glia** that functions as the primary innate immune cells of the **central nervous system** and are involved in brain development and maintenance. These cells are not of neuronal origin but rather migrate from the yolk sac to the brain during embryogenesis.

Molecule: A group of two or more atoms bonded together to form the smallest fundamental unit of a chemical compound that can take part in a chemical reaction.

Monosaccharides: A simple sugar; the most basic unit of a carbohydrate.

Myelin Sheaths: Sleeves of fatty tissue (wrapped cell membrane) that protect nerve cells.

N-acetylneuraminic acid (Neu5Ac): The most common **sialic acid** in most vertebrates and was first discovered in animal saliva and brains.

N-glycolylneuraminic acid (Neu5Gc): A common variant of **sialic acid** in many vertebrates that is not made by humans but can be incorporated from diets rich in red meat.

Natural Antibodies (NAb): A type of **antibody** that exists in the absence of active immunization via infection and/or contact with fetal **antigens** during pregnancy as a first line of defense until a specific antibody response is mounted.

Neoplasia: The new growth of cells proliferating without regard to stop signals and with attendant new blood vessels that forms a **neoplasm**.

Neoplasm: A tumor mass, either benign (not cancer) or malignant (cancer), that is composed of cells that have lost their regulatory checks and multiply without control or do not undergo pre-programmed cell death.

Neuron: A specialized cell that transmits nerve impulses.

Niche construction: A form of ecological inheritance in which organisms alter the environment in ways that affect the developmental context and selection pressures acting on subsequent generations.

Nucleic Acid: One of the four classes of major biomolecules.

The overall name for **DNA** and **RNA**, which are composed of **nucleotides**.

Nucleotide: Molecular building blocks for **DNA** and **RNA**. Specifically, they consist of three components: a 5-carbon sugar, a phosphate group, and a nitrogenous base. The type of sugar, either deoxyribose or ribose, determines if the resulting **nucleic acid** is DNA or RNA.

Number: Exact symbolic quantifier that designates the cardinality of a collection of objects. It is abstract (i.e., it transcends perceptual modalities), relational, and operable. In its most prototypical case it is associated with the familiar counting sequence '1, 2, 3, ...'

Numeral: A sign for a number, such as the Hindu-Arabic digit '5', the Roman 'V', or the French word 'cinq', that signify the number five.

Numerosity: A scale of measurement for evaluating the numerosness of stimuli (e.g., a collection of discriminable objects) utilized especially by psychophysicists in the mid-20th century, and by means of which an experimenter establishes the cardinal attribute of physical collections of objects.

Numerousness: A property or attribute of a stimulus (discrete quantities) which can be measured by an investigator in units of numerosity.

Pair bonding: Forming a close relationship with another individual through courtship and sexual activity.

Paired receptors: Related membrane **proteins** that have similar extracellular appearance but opposite signaling functions and are found in pairs or clusters primarily on immune cells.

Parasite: An organism that lives on or in a host organism at the expense of the host.

Parasitism (biology): A close relationship between two organisms where one benefits at the expense of the other.

Pathogen: A **bacterium**, **virus**, or other microorganism that can cause disease.

Phenotype: Observable traits of an organism that result from interactions between **genes** and environment during development.

Phonology: The sound patterns of language.

Phytanic Acid: A branched chain fatty acid produced during the digestion of chlorophyll, especially in **foregut fermenting** species (ruminants) that consume plant materials. Humans obtain phytanic acid by consuming dairy products, ruminant animals, and some fish.

Phytanic Acid Metabolism (in humans): Eating ruminants (red meat and dairy) creates special demands on detoxifying metabolism as phytanic acid (lipids) from plants eaten by ruminants can be toxic to humans.

Polymorphism: The "many forms," or genetic **variants**, of a single **gene** that exist and are maintained in a population at a frequency of 1% or higher.

Polysialic acid: A homopolymer of sialic acids abundant in the brain and fish eggs and found on certain pathogenic bacteria.

Prion: A type of abnormal, pathogenic **protein** that can cause other, normal, proteins to similarly misfold. Prions are involved in many neurodegenerative diseases, such as Bovine Spongiform Encephalopathy (BSE), also known as "mad cow disease."

Prokaryotes: Unicellular organisms that lack a membrane-bound nucleus, mitochondria, or any other membrane-bound organelle. (see **Eukaryotes**)

Protein: One of the four classes of major biomolecules. Proteins are molecules encoded by **DNA sequences** and composed of **amino acids** connected by peptide bonds. These range in size from a few amino acids (short peptides) to large molecules (long polypeptides) comprised of thousands of amino acids.

Pseudogene: A **gene** that has lost its function. Some pseudogenes may be translated into a **protein**, but typically the protein is inactive.

Quantical: Pertaining to quantity-related cognition (e.g., **subitizing**) that is shared by many species and which provides biological evolved preconditions for numerical cognition and arithmetic, but is itself not about number or arithmetic. Quantical processing seems to be about many sensorial dimensions other than number, and does not, by itself, scale up to produce number and arithmetic.

Quantifier (natural): Determiners or pronouns which occur in various degrees in all natural languages and indicate the magnitude of quantities, such as the English 'few' or 'many'.

Quantitative: Relating to, measuring, or measured by the quantity of something rather than its quality.

Recessive allele: A genetic **variant** that only has a **phenotypic** effect if it is present in two copies, except on most of an **X-chromosome** where a single copy is expressed when paired with a **Y-chromosome** as much of the Y does not correspond to the X and lacks X-linked genes.

Retrotransposons: A type of **transposable element**, or "jumping gene," that copies and pastes itself into different **genomic** locations through reverse transcription (converting **RNA** back into **DNA**).

Ribonucleic Acid (RNA): A **molecule** essential in **gene** coding, decoding, regulation, and expression. RNA consists of sequences of the four **nucleotide** bases: Adenine, Uracil, Guanine, and Cytosine. Types of RNA include messenger RNA (mRNA), transfer RNA (tRNA), ribosomal RNA (rRNA), small nuclear RNA (snRNA), and other non-coding RNAs. Some viruses including Influenza A and Sars-Cov-2 have RNA genomes.

Rogue protein: Misfolded **proteins** that cause damage, particularly resulting in neurological disorders such as Parkinson's, Alzheimer's, multiple sclerosis, and mad cow disease. The abnormal shape of these proteins can be triggered by another type of protein, called a **prion**.

Sabre-tooth felids: Extinct Large cats characterized by

long, curved sabre -shaped canine teeth that protruded from the mouth when closed. Three genera are known from Early Pleistocene East Africa: *Dinofells*, *Megantereon*, and *Homotherium*.

Self-associated molecular patterns (SAMPS): A class of molecular patterns that signal intrinsic inhibitory receptors of immune cells to remain in or return to their baseline, non-activated state.

Serum (blood): The fluid, or plasma, constituent of blood and does not contain clotting **proteins**.

Short Interspersed Nuclear Elements (SINEs): A type of **retrotransposon**, or **transposable element** ("jumping genes") that are abundant, non-autonomous, non-coding, and are 100 - 700 base pairs in length such as *Alu* elements.

Sialic acids: Family of acidic sugars with a nine-carbon backbone. They are found at the outermost fringes of the sugar chains (**glycans**) that cover all vertebrate cells. The two most common sialic acids in mammals are **N-acetylneuraminic acid (Neu5Ac)** and **N-glycolylneuraminic acid (Neu5Gc)**.

Sialic acid-binding immunoglobulin-type lectins (Siglec): Cell-surface **proteins** that bind **sialic acid**. They are primarily found on immune cell surfaces. These sialic acid-binding proteins that are members of the I-type lectin family and have an outer terminal with a typically conserved amino acid sequence.

Siglec chimera: The extra-cellular, **sialic acid** binding portion of a **Siglec protein** fused to another protein domain and transgenically expressed in a cell line. They are used to study Siglec binding.

Siglec-11: An innate immune receptor expressed uniquely in human brain **microglia** cells.

Single Nucleotide Polymorphisms: A **variation** involving a single base-pair, occurring in at least 1% of the population.

Social Institutions: Established rules or norms that result in stable patterns of behavior within a community.

Stroma: The structural framework of an organ or tissue.

Stromal fibroblasts: The common type of cells of **stroma**, they synthesize the **extracellular matrix** and collagen, and are also involved in wound healing.

Subitizing: The quick, reliable, and accurate discrimination of small quantities (usually within **numerosities** 1–4).

Symbiont: An organism that lives in a **symbiosis** providing benefits to its host.

Symbiosis: A close and long-term biological interaction between two different biological organisms, be it mutualistic, commensalistic, or parasitic.

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

Trans (molecular interactions): Receptors expressed on a cell surface that bind ligands on a different cell surface or between a cell surface and an extra-cellular molecule.

Transmembrane protein: A type of cell membrane **protein** that spans the width of the membrane and functions as a gateway for specific substances to enter or leave the cell or as a signaling molecule.

Transmissible (disease): Illnesses that are transmitted from one **host** to another through direct or indirect contact, via a **vector** or contaminated food and water. Synonymous with **communicable** and **infectious**.

Transposable Elements: DNA sequence that can change its position within a **genome**, sometimes creating or reversing mutations and altering the cell's genetic identity and genome size. They can also be referred to as "jumping genes". They were discovered by Barbara McClintock and she earned the Nobel Prize in 1983 for that discovery. These sequences can be considered a type of "molecular parasite" within the genome.

Type 1 Membrane protein: A type of transmembrane **protein** oriented with the amino-terminal facing outside the cell.

Variation (biology): The differences among the individuals of the same species.

Vector: Any agent which carries and transmits an infectious pathogen to another living organism. Most agents that act as vectors are living organisms.

Virus: A submicroscopic infectious agent 10 million times smaller than a human that relies on a living **host** cell for metabolic processes and replication. Like living organisms, viruses possess **genes** and evolve by natural selection. Unlike living organisms, viruses lack cellular structure, do not have their own metabolism, instead relying on a living host cell for production of materials, and replication through self-assembly inside a host cell.

V-set domain (Siglec): The outermost **protein** domain of **Siglec** proteins and contains the **sialic acid** binding site.

Wernicke's area: An important brain region involved in comprehension of written and spoken language.

White blood cells (WBCs): A type of immune cell involved in protecting the body against infectious disease and foreign invaders. WBCs are also called leukocytes.

X-chromosome: One of the two **allosomes** of the mammalian **genome** that determine sex. The X-chromosome can be inherited maternally and paternally.

Y-chromosome: One of the two **allosomes** of the mammalian **genome** that determine sex. The Y-chromosome can only be inherited paternally.

This glossary is the product of the Anthropogeny Graduate Specialization students, Anthropogeny faculty, and CARTA staff.

Funding for the MOCA/CompAnth project and this symposium has been generously provided by longtime CARTA supporter, Annette Merle-Smith