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A Chronology of Human Evolution and Comparative Insights from Sikhism

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ABSTRACT

In this article I am trying to look at the complex and robust subject of "*A Chronology of Human Evolution and Comparative Insights from Sikhism*" from available literature. First, I collected the scattered scientific literature about evolution of humans at different stages, thereafter, I linked that information to make continuous research starting from the evolution of organic molecules from inorganic matter, which gave rise to the evolution of Deoxyribonucleic Acid (DNA) and ribonucleic Acid (RNA) leading to the evolution of life as Single cell. Further linkage about evolution continued till I reached to the evolution of bonobos, chimpanzees, gorillas, and orangutans and finally to Hominins which gave rise to the evolution of genus Homo and ultimately to *Homo sapiens*, the human. Along with that the comparative Insights from Sikhism was discussed.

Keywords: Single cell, bonobo, chimpanzee, hominin, *Homo sapiens*

Introduction

Throughout human history, humans have struggled to find answers to questions about their origin, existence, nature, and destiny. Securing clues to the exact makeup of the creature known as *Homo sapiens* has always been one of human's keenest intellectual pursuits. There is no such study where complete chronology of evolution of human is found in studies of humanity. Although there are many gaps to make a real continuous linkage of evolution of humans starting from inorganic mater. Therefore, I tried to collect scattered scientific literature about the evolution of humans then tried to link that to make continuous flow of evolution from inorganic matter to organic matter to the evolution of Deoxyribonucleic Acid (DNA) and ribonucleic Acid (RNA) leading to the evolution of life as Single cell. Thereafter, the evolution of simple multicellular organisms, to highly complex and organized life like animals and plants. Thereafter, I took up the chronology of evolution in animals to the "lesser apes" (siamangs and gibbons) as well as the "great apes" (bonobos, chimpanzees, gorillas, and orangutans). Among the great apes, our closest relatives are the bonobos and chimpanzees. Further evolution of humans from Hominins, a branch of the hominoid, has been done in little more details to the evolution of *Homo sapiens,* a wise man, who continued to undergo further evolution to a sub-species as *Homo sapiens sapiens*, wiser man, of today. On the other hand, most appropriate phrases from the Sikh Holi Scripture (Aad Guru Granth Sahib -AGGS) were collected to compare them with the scientific information in the evolution of humans.

Methodology

There is tremendous amount of literature on different steps of evolution to humans. I collected as many steps about evolutions as possible from literature as explained in Introduction. Thereafter, I tried to link the various studies on certain stages of evolution to develop a *chronology of human evolution and comparative insights from Sikhism*" under the heading of "Literature and Discussion". Under this heading, I have tried to link all the information

from formation of organic molecules from inorganic mater to the final stage of evolution of humans, *homo sapiens.* Thereafter, I discussed "Comparative Insights from Sikhism**".** Appropriate bani (words of Gurus) were picked from the Sikh Holi Scripture (some writers use different title for it. For example, *Adi Granth, Guru Granth, Sri Guru Granth, Sri Guru Granth Sahib ji,* etc. Here in this article I use *Aad Guru Granth Sahib* (AGGS) (Chahal, 2002)). Bani (words of Gurus) have been interpreted by the application of logic and scientific information. Besides I also used etymology of each word to find the most appropriate meanings suitable for the main theme in that phrase. Each word is numbered as super script and the same number is used to indicate meaning of that word in the interpretation so that the readers could easily understand the interpretation. Consequently, my interpretation is different from the traditional interpretation found in the literature. I collected some suitable phrases from the bani of some Sikh Gurus from the AGGS for comparative study. At the end Conclusions of this study were drawn.

Literture and Discusson

The collected literature was linked in such a way to develop a Chronology of Human Evolution and Comparative Insights from Sikhism.

In biology, abiogenesis is the origin of life from non-living matter, such as simple organic compounds. However, the origin of living entities from non-living entities is a long, complex evolutionary process. Although the occurrence of abiogenesis is uncontroversial among scientists, its possible mechanisms are poorly understood. There are several principles and hypotheses for how abiogenesis could have occurred. Miller–Urey experiment is the first which was able to synthesize small organic molecules in a mixture of simple gases in a thermal gradient created by heating and cooling the mixture at the same time with electrical discharges. (Miller, Stanley L.; Urey, 1959)

Thereafter, according to Robertson and Joyce, although there is strong evidence indicating that an RNA World did exist before DNA formation but arguments regarding whether life on earth began with RNA are very weak. However, it might be possible that all the components of RNA were available in some prebiotic pool from which some component of RNA, and other polynucleotides evolved. (Robertson, Michael P. and Joyce, 2012).

Kitadai and Maruyama have summarized experimental and theoretical findings for prebiotic chemistry include availability of biologically essential elements (N and P) on the Hadean Earth, abiotic synthesis of life's building blocks (amino acids, peptides, ribose, nucleobases, fatty acids, nucleotides, and oligonucleotides), their polymerizations to bio-macromolecules (peptides and oligonucleotides), and emergence of biological functions of replication and compartmentalization. (Kitadai, Norio and Maruyama, 2018).

Origin of Life

Biological information for life is contained within a series of strands, comprised of replicating genetic code. The main carrier for this information is deoxyribonucleic acid, DNA. DNA strands are found in every life form, and they contain genes that encode proteins needed to form various tissues in the living body. Scientists report that the energy required for the formation of these large biological molecules comes from transfers of energy such as heat or more importantly chemical energy.

These molecules organized and evolved to form the first simple forms of life. Scientists have seen fossilized cells, from approximately 3.8 billion years ago, which resemble present-day cyanobacteria. Such cells are known as prokaryotes. Prokaryotic cells are quite simple (Figure 2). Prokaryotic cells have a nucleoid region instead of a nucleus, an irregularly shaped region containing DNA and is not surrounded by a nuclear envelope. However, the cell is surrounded by a cell wall that is different from that of the plant cell wall. Prokaryotic cells have cytoplasm, a gel-like substance that makes up the "filling" of the cell like the eukaryotic cells. Both prokaryotic cells and eukaryotic cells have ribosomes, which are organelles that produce proteins, and vacuoles, small spaces in cells that store nutrients and help to eliminate waste. Some prokaryotic cells have flagella, which are tail-like structures that

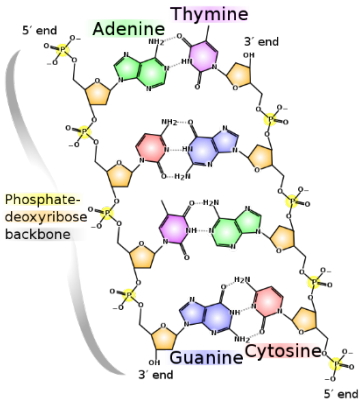

Figure 1: Chemical Structure of DNA Credit Madeleine Price Ball CC_SA 3.0

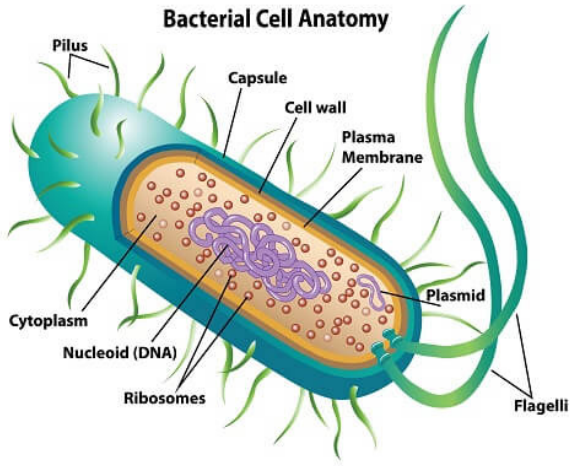

Figure 2: The-Anatomy-of-a-Bacterial-Cell_1 (Buckley, 2020)
Buckley, Gabe. Prokaryotic Cell. *(Buckley, 2020)*

enable the organism to move around, have pili, small hair-like structures that help bacteria adhere to surfaces.

The more complex cells of animals and plants, known as eukaryotes, first showed up about 2.1 billion years ago. Eukaryotes have a membrane-bound nucleus, containing their DNA, and many specialized structures located within their cell boundary (Figure 3). The animal cell is enclosed in a membrane and is flexible while the plant cell is thickened and hardened with cellulose and lignin.

Evolution of Plants and Animals

About 1.5 billion years ago the eukaryotes evolved into three groups: the ancestors of modern plants, fungi, and animals. They were sill in single-cell form, however, it led to evolution of multicellular life during this time. About 530 million years ago the first true vertebrate – an animal with a backbone appeared.

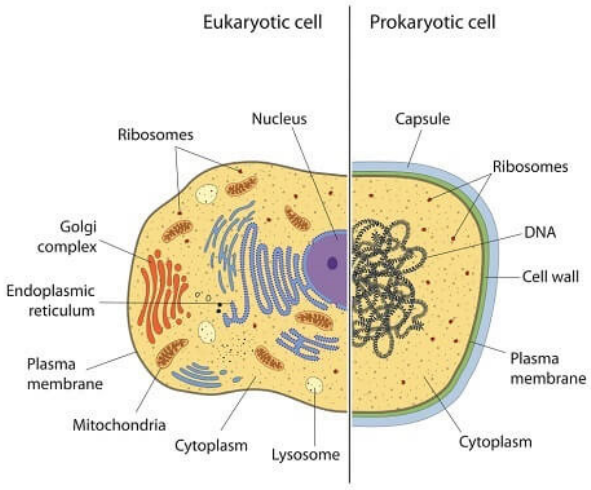

Figure 3: Eukaryotic-Cell-vs-Prokaryotic-Cell-1 *(Buckley, 2020)*

Between 500 million and 310 million years ago great diversity among plants and animal occurred evolving "mammal-like reptiles", and eventually evolve into the mammals, i.e., all the modern reptiles, dinosaurs and, birds. (Marshal, 2009).

The Main Differences and Similarities between Animals and Plants: *(Neighbor, 2012)*

Animals require readymade food for their growth and reproduction except for some lower animals like green algae which can synthesize their own food.

Plants can synthesize their own food with the help of chlorophyll from carbon dioxide (CO_2) from the air and sunlight for their growth and reproduction.

Hemoglobin (Heme) in Animals

Heme (Hemoglobin) in animals (humans) is a protein made up of four polypeptide chains (α_1, α_2, β_1, and β_2). Each chain is attached to a heme group composed of porphyrin (an organic ringlike compound) attached to an Fe (iron) atom. The chemical structure of chlorophyll is remarkably like the chemical structure of heme except it contains Mg (Magnesium) in the center instead of Fe (iron). In animals, oxygenated hemoglobin carries oxygen to every part of the body through arteries and takes up Carbon Dioxide back to the lungs through veins where it again takes up Oxygen while Carbon Dioxide is given out with breath. Fig 4.

Chlorophyll in Plants (Sapkota, 2022)

The chlorophyll molecule consists of a central magnesium atom surrounded by a nitrogen-containing

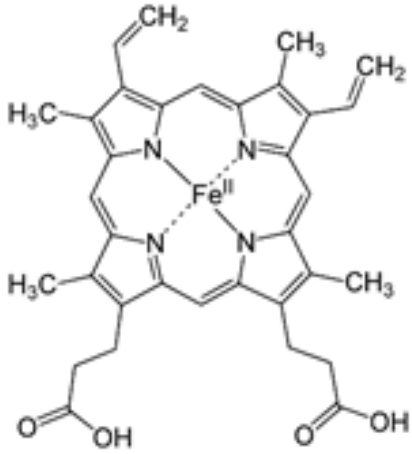

Figure 4: 800px-Heme_b.svg

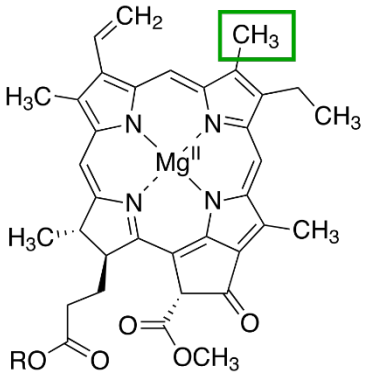

Figure 5: C-3 position Chlorophyll a - Chlorophyll a *(Sapkota, 2022)*

structure called a porphyrin ring; attached to the ring is a long carbon–hydrogen side chain, known as a phytol chain. (Figure 5) Plants synthesize their food with the help of chlorophyll by taking carbon dioxide (CO_2) from the air and nutrients and water from the soil, sent through xylem vessels, to the leaves in the presence of sunlight. This food is transported to various parts of the plant where needed through phloem present throughout the plant. (Figure7)

Circulatory System in Animals, especially in Humans (Jacob, 2022)

In humans and animals, the circulatory system is made up of blood vessels that carry blood away from and towards the heart. Arteries (in red color) carry blood away from the heart and veins (in blue color) carry blood back to the heart. The circulatory system carries oxygen, nutrients, and hormones to cells, and removes waste products, like carbon dioxide. These roadways travel in one direction only, to keep things going where they should. (Figure 6)

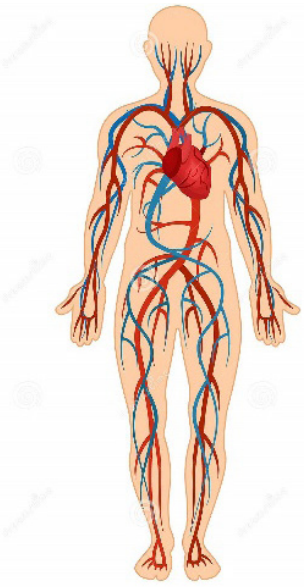

Figure 6: Circulatory System in Humans

Circulatory System in Plants

Lucas, *et al* have done extensive research on the circular system in plants. According to them the plant vascular system carries out two essential functions, the delivery of resources (water, essential mineral nutrients, sugars, and amino acids) to the various plant organs, and provision of mechanical support. This system in plants is also called 'transport in plants', where the xylem vessels move their water and nutrients from roots to the leaves. The leaves synthesize sugar and amino acids from carbon dioxide (CO^2) by chlorophyll in sunlight. The phloem moves food from the leaves down to the roots for growth and for storage in tubers in the soil and moves food upward for the growth of the plant, formation of flowers, and for storage in fruits. During transpiration water evaporates from the leaves and draws more water from the soil with the roots. (Lucas , William J., Andrew Groover, Raffael Lichtenberger, Kaori Furuta, Shri-Ram Yadav, Yka Helariutta ¨, Xin-Qiang He, Hiroo Fukuda, Julie Kang, Siobhan M. Brady, John W. Patrick, John Sperry, Akiko Yoshida, Ana-Flor Lopez-Mill 'an', Michael A. Grusak, 2013) (Figure 7).

Before we discuss the **evolution of humans from Hominins**, it is necessary to discuss viruses, which are supposed to be linked between living and non-living.

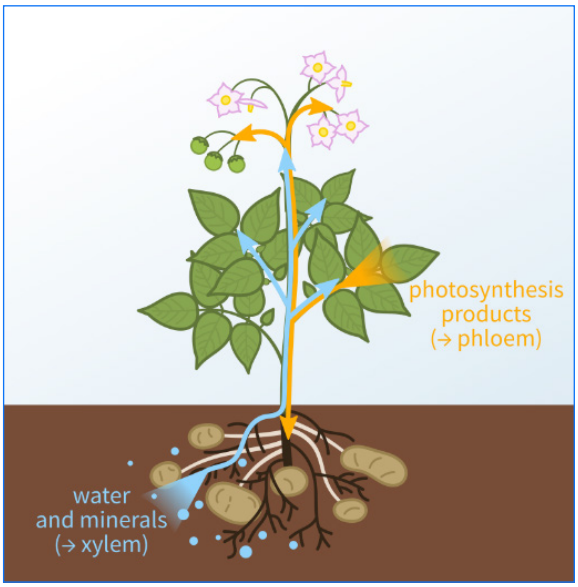

Figure 7: Xylem (blue) transports water and minerals from the roots and Phloem (yellow) transport food from leaves in plants. CC BY-SA 4.0.

Viruses

Koonin and Starokadomskyy say that the origin of viruses in the evolutionary history of life are unclear: some may have evolved from plasmids—pieces of DNA that can move between cells—while others may have evolved from bacteria. Viruses have been described as "organisms at the edge of life", and as replicators. (Koonin, Eugene V and Starokadomskyy, 2016)

Viruses are found wherever there is life and have probably existed since living cells first evolved. Dmitri Ivanovsky was the first who found a non-bacterial pathogen causing tobacco mosaic in 1892. Martinus Beijerinck in 1898 discovered tobacco mosaic virus, and now about 5,000 virus species have been described in detail and of the millions of types of viruses in the environment. While not inside an infected cell or in the process of infecting a cell, viruses exist in the form of independent particles, or virions, consisting of: (i) the genetic material, i.e., long molecules of DNA or RNA that encode the structure of the proteins by which the virus acts; (ii) a protein coat, the capsid, which surrounds and protects the genetic material; and in some cases (iii) an outside envelope of lipids/lipoprotein. The shapes of these virus particles range from simple helical and icosahedral forms to more complex structures. Most virus species virions are too small (0.05 – 0.2 microns) to be seen with an electron microscope. They are purely chemical structures without life but become active and start multiplying after entering the living cell. Therefore, the viruses are at the border or the link between non-living and living beings. (Villarreal, 2004).

In simple words, viruses are made of purely chemical elements: Five elements (*Panj Tatt*), carbon, hydrogen, oxygen, nitrogen, and phosphorus. Both DNA and RNA are built with a sugar backbone, where the sugar in DNA is called deoxyribose and the sugar in RNA is called simply ribose. RNA's extra hydroxyl group proves useful in the process of converting genetic code into mRNAs that can be made into proteins, whilst the deoxyribose sugar gives DNA more stability. The nitrogen bases in DNA are the basic units of genetic code, and their correct ordering and pairings are essential to biological function. The four bases that make up this code are adenine (A), thymine (T), guanine (G), and cytosine (C). Bases pair off together in a double helix structure, these pairs being A and T, and C, and G. RNA does not contain thymine bases, replacing them with uracil bases (U), which pair to adenine. Figure 8. (Mackenzie, 2020).

Overview of Evolution of Humans from Hominins

After discussing the origin of life as a single cell and its evolution to multicellular life, i. e., animals, and plants, I go directly to the evolution of humans. According to Pontzer our immediate evolutionary family is comprised

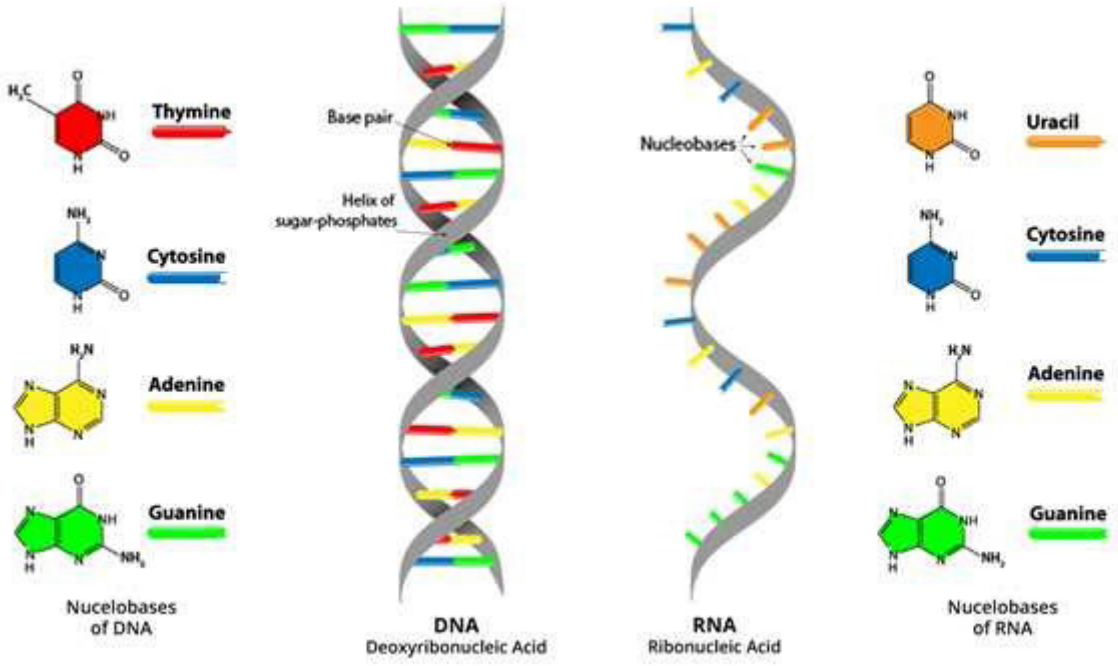

Figure 8: Ruairi J Mackenzie – DNA and RNA

of hominoids, the group of primates that includes the "lesser apes" (siamangs and gibbons) as well as the "great apes" (bonobos, chimpanzees, gorillas, and orangutans). Among the great apes, our closest relatives are the bonobos (Figure 10) and chimpanzees. (Figure 11) (Pontzer, 2012)

Gibbons says ever since researchers sequenced the chimp genome in 2005, they have known that humans share about 99% of their DNA with chimpanzees, making them our closest living relatives. However, there are two species closely related to humans: bonobos (*Pan paniscus*) and the common chimpanzee (*Pan troglodytes*). Thus, it is difficult to decide which one is closer. (Gibbons, 2012)

The further timeline of the evolution of humans from Hominins, a branch of the hominoid, is as follows:

Hominins appeared about 6-7 million years ago.
Ardipithecus ramidus appeared about 4.4 million years ago.
Australopithecus afaransis appeared about 3.6-2.9 million years ago.
Genus Homo and its species, ***Homo habilis***, appeared 1.4-2.3 million years ago.
Homo erectus appeared about 700,000 years ago.
Homo heidelbergensis (an archaic of ***Homo sapiens***) appeared 250,000 years ago.
Homo sapiens appeared about 200,000 years ago. (Figure 12)

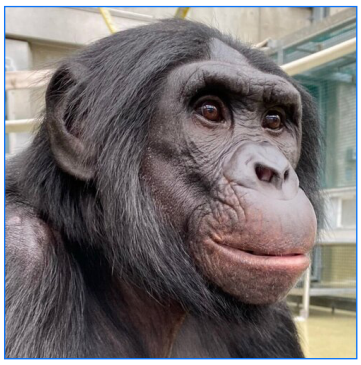

Figure 10: Bonobo - B2671A16-CCBA-4695-A580-9DF9259FA017

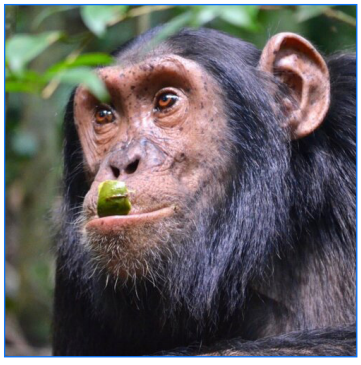

Figure 11: Chimpanzee - B2671A16-CCBA-4695-A580-9DF9259FA017

Figure 12: *Homo sapiens* evolved about 200,000 years ago and developed a capacity for language about 50,000 years ago - Sutori.

According to Adhikari, *Homo sapiens* survived and became the ancestors of modern humans, *Homo sapiens sapiens*. *H. sapiens* lived together, hunted food, and could cope with the climatic changes that occurred. They discovered how to propagate certain plants and how to breed animals, which changed history forever. (Adhikari, 2019). (Figures 13 and 14)

Homo sapiens sapiens

According to Biology online (Matsuzawa, 2022) *Homo sapiens sapiens* is the scientific name of modern humans – the only extant species of genus Homo, which appeared about 160,000 years ago in Africa. The brains of *H. sapiens sapiens* make up about 2.2% of their body

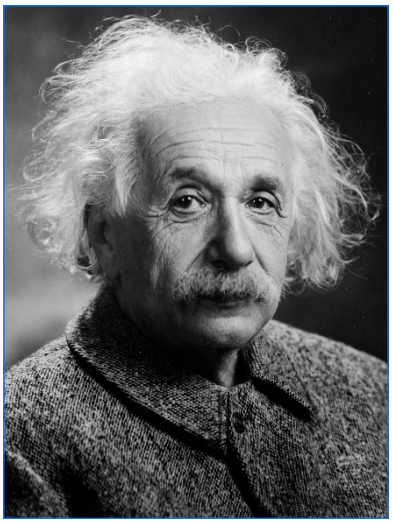

Figure 13: Image of a *Homo sapiens sapiens* - Albert Einstein (1879-1955) Intelligence

Figure 14: Image of a Homo sapiens sapiens - CC BY-SA 2.0 – Beauty

weight, making it one of the largest brains to body ratios of all the *Homo sapiens*. They are also known for their advancements in technology over the years. Their use of fire, tools, clothing, and even the levels of development in their settlements and art have distinctly differentiated them from the other *Homo sapiens*. *Homo sapiens sapiens* migrated to other parts of the world between 60,000 and 30,000 years ago. The generation of *H. sapiens sapiens* of Science Age are more wise and more beautiful (Figs. 13 and 14) than its parent species, *Homo sapiens*, which is now extinct long time ago.

Comparison of Evolution of Humans in Science and Sikhism

In many religions, it is believed that humans were created as humans directly by God but not through a successive evolution. This topic is entirely based on the philosophy embodied in the bani of Guru Nanak and that of Guru Amar Das and Guru Arjun whose bani is based on the philosophy of Guru Nanak. In rest of the bani in the AGGS one may find different views.

Guru Nanak first talks about origin of elements from ਸੁੰਨ (*sunn* - Nothingness):

> ਪੰਚ[1] ਤਤੁ[2] ਸੁੰਨਹੁ[3] ਪਰਗਾਸਾ[4] ॥
> Pancẖ ṯaṯ sunnahu pargāsā.
>
> *The five[1] elements[2] originated[4] from Sunn[3].*
> AGGS, M 1, p 1038. (*Aad Guru Granth Sahib*, 1983)

ਸੁੰਨ[3] (*Sunn*) of Guru Nanak is "Nothingness" in science. According to the concept of God in a logo, ੧ਓ, where the "One" represents "Singularity" or *Sunn* ਸੁੰਨ which is "Nothingness" in science. (Chahal, 2021) "Nothingness" does not mean that there is nothing in it. In "Nothingness" and "Singularity" the energy-matter and space-time are highly compressed form which cannot be seen. (Kaup, 2009)

ਪੰਚ[1] ਤਤੁ[2] (*panch Tat*) according to ancient mythology are: air, earth, fire, water, and sky (ether). But in 1789 the French chemist Antoine-Laurent Lavoisier (1743–1794) in his book "Traité Élémentaire de Chimie "discorded the above ancient elements and gave clear description about the atom/element. Thus, in Chemistry (science) *panch tatt* (five elements) could be carbon, hydrogen, oxygen, nitrogen, and phosphorus. (Generalic, 2002) These five elements are responsible to evolve Deoxyribonucleic Acid (DNA- known as thread of life), Ribonucleic Acid (RNA), and may other organic matters.

Thereafter, Guru Nanak says about origin of human body as follows:

> ਪੰਚ[1] ਤਤੁ[2] ਮਲਿ[3] ਇਹੁ[4] ਤਨੁ[5] ਕੀਆ[6] ॥
> Pancẖ ṯaṯ mil ih ṯan kīₐā.
>
> *This human body[4] originated[6] by the combination[3] of five[1] elements[2]*
> AGGS, M 1, p 1030 and 1039.

Note: Here the ਪੰਚ[1] ਤਤੁ[2] (*panch tat*) does not mean only five elements as mentioned early but include many elements from the Periodic Table of Elements.

Now Guru Nanak has some questions where the humans come from in these days:

> Question:
> ਕਤ[1] ਕੀ ਮਾਈ[2] ਬਾਪੁ[3] ਕਤ[4] ਕੇਰਾ[5] ਕਦ੍ਹਿ[6] ਥਾਵਹੁ[7] ਹਮ[8] ਆਏ[9] ॥
> Kaṯ kī māₐī bāp kaṯ kerā kiḏū thāvhu ham āₐe.
>
> *Who[1] is our mother[2] and who[4] is our father[3] and what[5] is the purpose[6] of life and from what place[7] we (humans)[8] came[9] from into this world?*
>
> Answer:
> ਅਗਨਿ[10] ਬੰਬਿ[11] ਜਲ[12] ਭੀਤਰਿ[13] ਨਪਿਜੇ[14] ਕਾਹੇ[15] ਕੰਮਿ[16] ਉਪਾਏ[17] ॥੧॥
> Agan bimb jal bẖīṯar nipje kāhe kamm upāₐe. ||1||

We are developed[14] in the bubble of water[12] and from energy[10] in[13] the womb[11] (Fertilization of an egg in the womb of mother by the sperm of father and energy from the mother's body) and for what purpose[16] we are born[17]?

However, Guru Nanak also explains that we became as humans after passing through a continuous evolution in a simple language although it does not explain the right sequence in the modern theory of evolution:

ਕੇਤੇ[18] ਰੁਖ[19] ਬਰਿਖ[20] ਹਮ[21] ਚੀਨੇ[22] ਕੇਤੇ[23] ਪਸੂ[24] ਉਪਾਏ[25] ॥
Keṯe rukẖ birakẖ ham cẖīne keṯe pasū upā▫e.

ਕੇਤੇ[26] ਨਾਗ[27] ਕੁਲੀ[28] ਮਹਿ[29] ਆਏ ਕੇਤੇ[30] ਪੰਖ[31] ਉਡਾਏ[32] ॥੨॥
Keṯe nāg kulī mėh ā▫e keṯe pankẖ udā▫e. ||2||

We (humans)[21] evolved[22] after passing[25] through many[18] lives of trees[19], plants[20] and many[23] animals[24].

And we evolved after passing through many[26] species[28] of snakes[27] (creeping animals) and many[30] types of flying[32] birds[31].
AGGS, M 1, p 156.

Similarly, Guru Arjun writes in a little more detail the above philosophy of Guru Nanak as follows:

ਕਈ ਜਨਮ[1] ਭਏ ਕੀਟ[2] ਪਤੰਗਾ[3] ॥
Ka▫ī janam bẖa▫e kīt paṯangā.

ਕਈ ਜਨਮ ਗਜ[4] ਮੀਨ[5] ਕੁਰੰਗਾ[6] ॥
Ka▫ī janam gaj mīn kurangā.

ਕਈ ਜਨਮ ਪੰਖੀ[7] ਸਰਪ[8] ਹੋਇਓ ॥
Ka▫ī janam pankẖī sarap ho▫i▫o.

ਕਈ ਜਨਮ ਹੈਵਰ[9] ਬ੍ਰਖਿ[10] ਜੋਇਓ[11] ॥੧॥
Ka▫ī janam haivar barikẖ jo▫i▫o. ||1||

Many generations[1] as (microorganism) worms[2] and as insects[3] evolved in the beginning.

Then many generations as elephants[4], fish[5], and deers[6] evolved.

Many generations as birds[7], and snakes[8] continued to evolve.

Thereafter, many generations as yoked[11] oxen[9], and horses[10] (highly organized animals including humans) were evolved. 1.
AGGS, M 5, p 176.

Here again, the biological sequences of evolution to human described by Guru Arjun does not match with the sequence of modern theory of evolution.

Guru Arjun has also observed that human is the highest stage of evolution:

ਅਵਰ[1] ਜੋਨਿ[2] ਤੇਰੀ[3] ਪਨਹਿਾਰੀ[4] ॥
Avar jon ṯerī panihārī.

ਇਸੁ[5] ਧਰਤੀ[6] ਮਹਿ[7] ਤੇਰੀ[8] ਸਕਿਦਾਰੀ[9] ॥
Is ḏẖarṯī mėh ṯerī sikḏārī.

ਅਗਗਸ, ਮ 5, ਪੰਨਾ 374.

All other[1] species[2] (animals and plants) are at your[3] service[4] since you, human, is at highest stage of evolution. Therefore, on[7] this[5] Earth[6] is your[8] sovereignty[9].
AGGS, M 5, p 374.

It is a fact that humans, *Homo sapiens sapiens* is the highest stage of evolution in animals. This observation in Sikhism matches the evolution theory that human is at the highest stage of evolution.

Finally, Guru Arjun says that there is no life for humans after their death. He advises:

ਆਗਾਹਾ[1] ਕੂ ਤ੍ਰਾਘਹਿ[2] ਪਛਿਾ[3] ਫੇਰਨਿ ਮੁਹਡ਼ਾ[4] ॥
Āgāhā kū ṯarāgẖ picẖẖā fer na muhaḏṛā.

ਨਾਨਕ ਸਿਝਿ[5] ਇਵੇਹਾ[6] ਵਾਰ ਬਹੁੜਿ[7] ਨ ਹੋਵੀ ਜਨਮੜਾ[8] ॥੧॥
Nānak sijẖ ivehā vār bahuṛ na hovī janamṛā. ||1||
AGGS, M 5, p 1096.

Think[2] about the future[1], look not on the past[3] over your shoulders[4].

Make[5] the present[6] life a great success since there is no birth[8] again[7].

According to philosophy of Guru Nanak everything in this Universe evolved from the One:

ਏਕ[1] ਮਹਿ ਸਰਬ[2] ਸਰਬ[3] ਮਹਿ ਏਕਾ[4] ਏਹ ਸਤਿ[5] ਗੁਰਿ[6] ਦੇਖੀ[7] ਦਖਿਾਈ[8] ॥੫॥
Ėk mėh sarab sarab mėh ekā eh saṯgur ḏekẖ ḏikẖā▫ī. ||[5]||

Guru Nanak Says:

The True[5] Enlightenment[6] has given[7] (me) the vision[8], the One[1] is in everything[2], everything[3]is in One[4].
AGGS, M 1, p 907.

That One (੧) in ੧ੴ – the Concept of God

The One **(੧)** in Guru Nanak's concept of God as ੧ੴ (ਇਕ ਓ ਬੇਅੰਤ – *Ek Oh Beant*) in Punjabi and "One and Only That is Infinite, amount of Energy" in English. This One (੧) in ੧ੴ, is called "Singularity", "Nothingness" or *Sunn* (ਸੁੰਨ) stage by Guru Nanak. (Chahal, 2021) This "Singularity" and "Nothingness" does not mean there is nothing in them, but the energy-matter and space-time are highly

compressed that they look single point which cannot be seen, therefore, it is also called "Nothingness" or *Sunn* (ਸੁੰਨ) stage. (Kaup, 2009)

According to the Einstein equation, **E = mc**^{2}, which means Energy into Matter (everything) and Matter (everything) again goes back to Energy and so on. Therefore, this One is comparable to Singularity from which everything appeared. In the above phrase, Guru Nanak is saying that everything (including humans) has come from One (the source of energy).

For example,

According to Mass energy equivalence formula, **E = mc^2:**

> **E** is the rest energy of the object.
>
> **m** is simply the mass of an object.
>
> **c** is the speed of light - a constant value of 299,792,458 m/s (300, 000,000 miles/second).

A common example of this is that 1 gram of water – if its whole mass were converted into pure energy via E=mc^2 – contains as much energy as 20,000 tons (18,143 metric tons) of TNT exploding. That's why such a small amount of uranium or plutonium can produce such a massive atomic explosion. (Lamb, 2021)

Szyk calculated that the average adult human weighs 62 kg. Such a person, according to Einstein's equation, E = mc^2, has a rest energy of 5.6 X 10^{12} mega joules (MJ). Just for comparison, the bomb dropped on Nagasaki had the energy of 8.4 X 10^7 MJ. In essence, if you managed to explode and set all your rest energy free (which is not achievable... yet), you would cause destruction as over 66,000 nuclear bombs. (Szyk, 2021)

This basic philosophy of Guru Nanak says that human is made up of energy as explained by Guru Amar Das as:

> ਮਨ[1] ਤੂੰ ਜੋਤਿ[2] ਸਰੂਪੁ[3] ਹੈ ਆਪeਣਾ ਮੂਲੁ[4] ਪਛਾਣੁ[5] ॥
> ਮਨ ਹਰਿ[6] ਜੀ ਤੇਰੈ ਨਾਲਿ ਹੈ ਗੁਰਮਤੀ[7] ਰੰਗੁ[8] ਮਾਣੁ[9] ॥
>
> Mann ṯū'n joṯ sarūp hai āpṇā mūl pacẖẖāṇ.
> Mann har jī ṯerai nāl hai gurmaṯī rang māṇ.

Keeping in view the above explanation and scientific information available and using logic, the above verse has been interpreted as follows:

> *Hey mind[1] (man)! You are the embodiment[3] of energy[2], try to recognize[5] your roots[4] (origin); that is the Energy.*
>
> *Hey mind (man)! The God[6] (the Energy) is in you all the time, enjoy[9] and imbibe[8] the enlightening philosophy[7] of the Guru (Nanak)).*
>
> ਮੂਲੁ ਪਛਾਣਹਿ ਤਾਂ ਸਹੁ[10] ਜਾਣਹਿ ਮਰਣ ਜੀਵਣ ਕੀ ਸੋਝੀ ਹੋਈ ॥
> ਗੁਰ[11] ਪਰਸਾਦੀ[12] ਏਕੋ ਜਾਣਹਿ ਤਾਂ ਦੂਜਾ ਭਾਉ ਨ ਹੋਈ ॥
>
> Mūl pacẖẖāṇėh ṯā'n saho jāṇėh maraṇ jīvaṇ kī sojẖī ho▫ī.
> Gur parsādī eko jāṇėh ṯā'n ḏūjā bẖā▫o na ho▫ī.
>
> *As soon as you recognize your roots (origin) then you will understand about God[10], and about life and death.*
>
> *You would also realize that there is no other than the One Enlightener[11] and Bounteous[12] (God).*

(The God here means "Energy" (ੴ) as explained above.)

> ਮਨਿ ਸਾਂਤਿ ਆਈ ਵਜੀ ਵਧਾਈ[13] ਤਾ ਹੋਆ ਪਰਵਾਣੁ [14]॥
> ਇਉ ਕਹੈ ਨਾਨਕੁ[15] ਮਨ ਤੂੰ ਜੋਤਿ ਸਰੂਪੁ ਹੈ ਅਪਣਾ ਮੂਲੁ ਪਛਾਣੁ ॥੫॥
>
> Mann sā'nṯ ā▫ī vajī vaḏẖā▫ī ṯā ho▫ā parvāṇ.
> I▫o kahai Nānak man ṯū'n joṯ sarūp hai apṇā mūl pacẖẖāṇ.
> ||5||
> ਅਗਗਸ, ਮ: 3, ਪੰਨਾ 441.
>
> *Then mind will attain peace (contentment) and success[14], (Then everybody will) congratulate[13] you.*

Guru Amar Das says:

> **Guru Nanak says this philosophy[15].** *Hey mind (man)! You are the embodiment of energy. Try to recognize your roots (origin) from Energy.*
> AGGS, M 3, p 441.

For proper interpretation of this verse, it is important to understand in which context allegories and metaphors have been used in this verse:

> ਮਨ[1] (*Mann)* = in general means the 'mind' this is actually the brain, which is the place for the origin of conscience and consciousness, and all thoughts. '*Mann*' also represents 'man' itself.
>
> ਜੋਤਿ[2] (*Jot)* = means energy, flame, light, spiritual illumination, enlightenment. Here *Jot* as energy is a more suitable meaning.
>
> ਸਰੂਪੁ[3] (*Sarup)* = means embodiment.
>
> ਮੂਲੁ[4] (*Mool)* = means the roots, origin.
>
> ਇਉ ਕਹੈ ਨਾਨਕੁ[15] (*Aeyoh kahae Nanak)* = Here 'Nanak' is not a pen name of Guru Amar Das as is for all the other

Sikh Gurus. Here 'Nanak' is Guru Nanak himself, whose philosophy was preached and taught by the Sikh Gurus, who succeeded to the 'House of Nanak'. According to Prof Sahib Singh's grammar 'Nanak' with *'onkar'* to *'kaka'* means Nanak himself not as a pen name (*Nom de Plume*), although in some cases the '*kaka*' is without '*onkar*' in 'Nanak' even then it means Guru Nanak himself.

Therefore, ਇਉ ਕਹੈ ਨਾਨਕੁ[15] *(Aeyoh kahae Nanak*) is interpreted as *'Guru Nanak says this philosophy'*. It means it is the philosophy of Guru Nanak, being represented by Guru Amar Das. However, most of the interpreters, except Prof Sahib Singh, translate 'Nanak' as a pen name for Guru Amar Das (*Mahla* 3). If it is so, then it becomes the philosophy of Guru Amar Das. In fact, it is the philosophy of Guru Nanak being represented by Guru Amar Das.

Most of the time, ਮਨ ਤੂੰ ਜੋਤਿ ਸਰੂਪੁ ਹੈ ਅਪਣਾ ਮੂਲੁ ਪਛਾਣੁ ॥, is usually interpreted by many scholars as *"Oh my soul, you have emanated from the Divine light of God, know your true essence"*, which is quite far away from the real theme of philosophy of Guru Nanak. However, Prof Sahib Singh's interpretation accepts that God is ਨਰਿਾ ਨੂਰ ਹੀ ਨੂਰ ਹੈ (*nira nur hee nur hai*) meaning 'Wholly Solely Light' as follows:

"ਹੇ ਮੇਰੇ ਮਨ! ਤੂੰ ਉਸ ਪਰਮਾਤਮਾ ਦੀ ਅੰਸ ਹੈਂ ਜੋ ਨਰਿਾ ਨੂਰ ਹੀ ਨੂਰ ਹੈ (ਹੇ ਮਨ!) ਆਪਣੇ ਉਸ ਅਸਲੇ ਨਾਲ ਸਾਂਝ ਬਣਾ।

(Hey merai mann! Tu uss parmatma di ans hai jo *nira nur hee nur hai, apnai uss aslai naal sanj bana.*) Logically and scientifically, it means 'Wholly Solely Light' stands for 'Energy' – that Energy which is represented as $E = mc^2$. In the above verse, Guru Amar Das advises the man that he has originated from the primordial Energy, ੴ, which is called Singularity, Nothingness or *Sunn* (ਸੁਨ), from which everything appeared in this Universe.

Conclusions

In this research study I tried to link all the stages of evolutions to develop "*A Chronology of Human Evolution and Comparative Insights from Sikhism*". Evolution of organic molecules from inorganic matter appeared to give rise to the evolution of Deoxyribonucleic Acid (DNA) and Ribonucleic Acid (RNA) leading to the evolution of life as Single cell. Approximately 3.8 billion years ago prokaryotic and eukaryotic cells appeared. From eukaryotic cells, fungi, plants, and animals appeared around 1.5 billion years ago. Although plants and animal are quite different from each other still are linked with each other since the structures of chlorophyll in plants and structure of heme are similar except that in chlorophyll it is Mg (Magnesium) and in heme is Fe (Ferrous, iron) in the centers of their structures. Besides the animals and plants have similar circulatory systems. Although viruses are a different group in which the virions (virus particles) are without life but become alive when infect the host. Some scientists consider the viruses are at the border or the link between non-living and living beings.

Our immediate evolutionary family is comprised of hominoids, the group of primates that includes the "lesser apes" (siamangs and gibbons) as well as the "great apes" (bonobos, chimpanzees, gorillas, and orangutans). Among the great apes, our closest relatives are the bonobos and chimpanzees. Recently it has been discovered that humans share about 99% of our DNA with bonobos (*Pan paniscus*) and chimpanzee (*Pan troglodytes*). However, it is difficult to decide which one is closer.

The further timeline of the evolution of humans from Hominins, a branch of the hominoid, is as follows:

Hominins appeared about 6–7 million years ago.
Ardipithecus ramidus appeared about 4.4 million years ago.
Australopithecus afaransis appeared about 3.6-2.9 million years ago.
Genus Homo and its species, ***Homo habilis***, appeared 1.4-2.3 million years ago.
Homo erectus appeared about 700,000 years ago.
Homo heidelbergensis (an archaic of ***Homo sapiens***) appeared 250,000 years ago.
Homo sapiens appeared about 200,000 years ago.

Homo sapiens sapiens, modern humans appeared about 160,000 years ago in Africa. It is the only extant sub species of *Homo sapiens*, which has become extinct now. *Homo sapiens sapiens* moved to rest of the world about 60,000 and 30,000 years ago.

Comparison of Evolution of Humans in Science and Sikhism

Bani (words of Gurus) quoted here for comparison were interpreted by the application of logic and scientific information. Besides etymology of each word was used to find the most appropriate meanings suitable for the main theme. As a result, my interpretation becomes different from the traditional interpretation found in the Sikh literature. In many religions, it is believed that humans were created as humans directly by God but not through a successive evolution. In general, most of the theologians are against the evolution. However, philosophy embodied in the bani of Guru Nanak and that of Guru Amar Das

and Guru Arjun whose bani is based on the philosophy of Guru Nanak is comparable to the evolution to some extent but not exactly in that sequence. on the other hand, one fundamental finding of Guru Nanak, "One is in everything, everything is in One" is very much comparable to that of Einstein equation, **E = mc**^{2}, which means Energy into Matter (everything) and Matter (everything) again goes back to Energy and so on. However, I may add here that most of the bani in the AGGS goes against the evolution.

Competing Interests Statement

The author declares that he has no significant competing financial, professional, or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

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Biographical Statement of Author(s)

Professor Dr. Devinder Singh Chahal disabled since July 26, 2018

Professor Dr. Devinder Singh Chahal was formerly a Professor and Head of Department of Microbiology at Punjab Agricultural University, Ludhiana, India, Fulbright Fellowship in 1974 at the Department of Food Science and Chemical Engineering, at Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, USA and then visiting scientist in the Department of Chemical Engineering at the University of Waterloo, Ontario, Canada.

In 1982, he moved to the *Institut Armand-Frappier, Université du Québec*, Laval, Québec, and retired as Professor of Industrial Microbiology in 1996. His work is on the utilization of waste cellulosic materials into food, feed, and fuel. He is the inventor of "solid state fermentation" for production of cellulases, which has been quoted by many scientists (312 + 84) throughout the world.

Since 1999, he has been the Founder and the President of the Institute for Understanding Sikhism and the Editor-in-Chief of *Understanding Sikhism: The Research Journal,* a Member of Advisory Committee of Sri Guru Granth Sahib Study Centre at Guru Nanak Dev University, Amritsar since 2011, and a member of World Sikh Council, UK.

He has been one of the 100 Top Most Influential Sikhs of the World from 2012 to 2016 as a writer. He was honored by Shiromani *Gurdwara Parbandhak* Committee (SGPC - "Supreme Gurdwara Management Committee"), Amritsar, India in 2004, and by the Delhi Sikh Gurdwara Management Committee (DSGMC, New Delhi on Khalsa Fateh Divas on March 8-9, 2014. DSGMC is an autonomous organisation which manages Gurdwaras in the state of Delhi, India.

Professor Devinder is handicapped since July 26, 2018. However, after one year of occupational therapy and physiotherapy he is able walk a little distance with the help of a walker and is able to work on a computer for about 1-2 hours per day.

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