

## Recent Major Changes in Our Linear Thinking Processing

As I described in previous work published on academia.edu and in my books **The Story of Homo loquens**, **Seven Papers**, and previous editions of **The Making, the Rise, and the Future of the Speakingman**, I repeatedly postulated that increases in the atmospheric concentration of C14 isotopes play a stimulant role in human brain neurogenesis by increasing the ROS production.

Now, I would like to correlate a similar ROS production with neurogenetic effects to atmospheric C14 isotopes increases generated by solar activity.

It means, similar phases of solar activity have been present for ages, but during our prehistoric times the geomagnetic excursions have been more frequent, and their effects been more important because of their significantly high increases in atmospheric concentration of C14 isotopes (sometimes it reached a doubling in atmospheric concentration compared to normal C14 concentration) along with a long duration that extends on hundreds to many thousands of years.

By comparison, the solar activity events responsible for increases in C14 concentration have a length of 40-70 years.

We had a chain of several solar minima from 1040 to 1080 (40 years), from 1382 to 1342 (40 years), from 1416 to 1534 (72 years), and from 1645 to 1715 (70 years), which generated a decrease of the intensity of the geomagnetic field of 30-40%. By comparison, during a geomagnetic excursion the geomagnetic field would

decrease on average 20-30% but at the peak of the excursion it can decrease up to 2-2.5 times.

During solar minimum events, the C14 atmospheric concentration increased but much less than during geomagnetic excursions when C14 can increase between 25-50% and further on to 100%. Thus, the solar minimum events effect, even being smaller, was sizable enough to influence human brain neurogenesis.

During the era AD 1040 to AD 1715, undoubtedly occurred a significant increase in human linear thinking, leading toward a massive “quantification,” but this was just another step in the evolution of the human brain. Other important steps evolved during the geomagnetic excursions of the Holocene.

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**During Holocene have been at least 25 Grand Solar Minimums,** and assumable all of them had a similar effect on human neurogenesis. But again, **they have been less significant than those two geomagnetic excursions of Holocene** (Solovki from 7500 to 4500 BCE, and Sterno-Etrussia from 2700 to 2400 BCE).

**Solovki geomagnetic excursion** (5500-2500 BCE) **marks the beginning of all big civilizations:** Sumerian (4500-4000 BCE) of Mesopotamia, Starcevo (6000-4000 BCE) and Vinca (5500-3000 BCE) civilizations of Balkans, Cucuteni-Trypillia (5500-2750 BCE) of Eastern Europe, Chinese (5000-2700 BCE), Egyptian (3100 BCE), Indus Valley (3300-2600 BCE), Minoan (3000 BCE), Athenian (3000 BCE), Korean (Gojoseon, 2400 BCE).

One defines civilization as a material realization. Thus, **these civilizations marked an important step in creating materiality**

**but also in “quantification” that is the expression inserted to all material achievements.**

The **Sterno-Etrussia geomagnetic excursion** (700-400 BCE) marks **the beginning of the world greatest philosophies: Greek Antiquity philosophy** (Plato 428-348, Aristotle 384-322, Socrates 470-399, Hippocrates 460-370, Hecataeus 360-290, Thales 626-545), **Hindu philosophy** (Ramayana and Mahabharata were created in 7<sup>th</sup> to 4<sup>th</sup> centuries BCE) and **Buddhist philosophy** (Buddha 563-483 BCE), **Taoist** (Laozi was contemporary with Confucius and they met) and **Confucianist philosophies** (Confucius 551-479).

All these people in Greece were born between 470 and 290 BCE that is the 150 years’ time when this excursion effect was locally active.

The excursion manifestation slightly varied geographically, as it began a half of century earlier in the South and East Asia.

On the other hand, Buddha, Laozi, and Confucius were contemporary (550-490 BCE) and had knowledge one of another.

In my opinion, the **Sterno-Etrussia excursion effect (550-400 BCE)** **also represented another important step in developing human thinking** because it produced a comprehensive reviewing of the achievements caused by recently formed civilizations, brought a wisdom about their meaning, and enlightened their moral and spiritual content.

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According to my hypothesis, during the solar minima the increasing of the atmospheric concentration of C14 has been enough significant to generate additional pulses of neurogenesis and influence human activity during this era.

Obviously, the **solar minima effects were global, but because they were small, they affected distinctly one location from another**. I will enhance in this paper the most significant expression that was achieved globally, but I will center my discussion on the environments of Italy and Western Europe, where the results were significantly higher than in the rest of the world, and therefore, they were more representative for the entire process.

As the Science of Complexity and Chaos indicate, a small distinction in the initial conditions can be significantly amplified, leading to a very distinct end-result. This is the case in **Western Europe, where the explained conjecture of initial conditions was different than in other localities around the globe**.

The “**Epoch of Discovery**” started with Columbus who voyaged in 1492 to Caribbean and Central America. Vasco da Gama went around África and reached India (1497-1498). Magellan expedition (1519-1521) went around South America, reached the Pacific Ocean for the first time, and after Magellan death in Philippines, the sailors of his expedition succeeded to returned to Spain, accomplishing the first sea voyage around the planet.

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I will try to show that, besides Europe, in other localities the effect of solar minimum also significantly affected local development.

**In 1526 emerged in India the greatest statal organization of its history that was the Mughal Empire.**

The Association for Asian Studies describe this era of Mughals:

*“Under the Mughals, Hindu and Muslim interacted in economics, politics, social life, the arts, and culture. Muslim scholars and Sufi religious mystics and saints migrated to India from Iran, Turkey, and*

*Central Asia. Some came in search of government jobs, others for new cultural opportunities, to study, or to spread their own beliefs. Some of the best poets immigrated from Persia, Imperial court painters, who produced masterpieces in the Persian and Mughal miniatures styles, interacted with painters of the Rajput schools in local Hindu courts across north India. Indian merchants trade across their borders and even into Muscovite, Russia, exporting cotton textiles, indigo, and sugar in exchange for luxury goods like silk, fruit, nuts, horses, gold, and silver.”*

Only the British conquest disrupted this development and dismantled all great textile industry of Indian subcontinent.

China pre-industrial economy developed beginning in roughly AD 1000, and its exported production reached in all directions, but especially around Asia.

**China encountered a great socio-economic development in the epoch starting in 1100-1200.** Again, gradual European conquest and colonization of most of Asia blocked China’s exports and made Chinese leaders to adopt a position of increased isolation.

In general, **colonial expansion of Western European powers made any local developments unnoticeable. For this reason, at the global level, the Western Europe development seems to have prevailed against all other regions of the globe.**

It would be misleading to say that a local type of Renaissance or a major local development did not occur all around the globe. **In most of the cases local development was obliterated by Islamic, Mongol, Turkic conquests, or even by the European colonial conquest.**

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**The marketplace-economy and European colonialization generated resources in Europe for further evolution of this phenomenon into Scientific and Industrial revolutions, which have not enough resources and other necessary conditions to occur in other parts of the globe.**

I would conclude that the effect of multiple solar minimums took place all over the planet, but it reached a major peak only in Western Europe.

Let's see how the neurogenetic effects of this era influenced our society and its achievements in the mentioned European localities.

Most importantly is the fact that the **first high education institutions** appeared, represented by a chain of more than 10 universities created in Europe from Bologna, Italy (1088) to University of Coimbra, Portugal, in 1290. Within this chain were the universities at Oxford, England (1096), Salamanca, Spain (1134), Paris, France (1160), Cambridge, England (1209), Padua, Italy (1222), Naples, Italy (1224), Siena, Italy (1240).

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I have to mention that a **series of plague and their extensive pandemics affected Europe** in 14<sup>th</sup> and 15<sup>th</sup> centuries, which plague have been brought in by the trade with other Asian markets. From October 1347 to 1351 (killing almost one third of European population) occurred the **Black Death Plague** (it started in the port of Messina from ships came from the Black Sea), followed by **Great Plague of London** (1665-1666) that killed almost one quart of this city population.

The Black Plague Death caused a reduction in the amount of land under cultivation. The trade was severely diminished for a while.

One third of the Western European population died and Europe needed from 160 to 200 years to return to the population before the pandemic of 1347-1350.

In the meantime, the waves of plagues, the huge losses of life, and the immense suffering affected general mentality in most of Western Europe, influencing people's religious belief and religious mentality. People became preoccupied with death and afterlife, and such trend manifested in art, too (poetry, sculpture, and painting).

The Roman Catholic Church lost its monopoly over people salvation.

It was also influential in accepting the new marketplace-economy and its financial system because laborers wages substantially increased.

Kwan Chil Lee, Jung Sun Kim, and Young Sil Kwak in their study *Relation of pandemic with solar cycles through ozone, cloud seeds, and vitamin D*, published in *Environ Sci Pollut Int.* 2023; 30(5):1327-1336 (doi: 10.1007/s11356-022-22982-1) indicate that “a substantial number of research papers show the relationship between COVID-19 and vitamin D deficiency. The data analysis of ozone thickness measured based on NASA satellite observations revealed that ozone thickness has 11 years and 28-month cycles. Because the 11-year cycles of ozone thickness and cloud seed attenuation are anti-correlated, when either one becomes extremely thick, such as at the maximum or minimum point of solar activity, UV radiation is over-attenuated, and human vitamin D deficiency is globally increased. This finding explains the coincidence of pandemic outbreaks with the extrema of the sunspot numbers.”

**This study may allow one to suggest, being based on strong grounds, that Wolf solar minimum (1280-1350) would be the critical factor contributing to the pandemic of the Black Death (1357-1350). And Maunder minimum (1645-1715) would be the contributor of 1666 pandemic.** Other waves of pandemic can also be correlated to the chain of solar minima that existed from 1040 to 1820.

However, it must be noticed that the Little Ice Age started in 1303, while its stronger part occurred from 1560 onward.

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The first bank appeared in 1157 in Venetia, but most of the banks in Italy appeared after 1400 and extended to France, Netherlands, England, Germany, and Spain. **The creation of the financial system represented the ignition of the marketplace-economy and incorporated information in monetary and asset values.**

After the Black Death Plague (1347-1351) that brought a change in mentality, in the following decades the Renaissance began to manifest in Florence with Dante Alighieri (1265-1321), Boccaccio (1313-1375), Petrarch (1304-1374), and Giotto di Bondone (1267-1337).

Many experts considered that **turning art** (from paintings to sculptures and to music) **into assets was the real reason that generated the Renaissance** (that reached its peak in 1490-1520). It produced the first vast increases in information by rediscovering and reintroducing the cultural values of Antiquity. It brought back the Ancient Greek logic, changing the thinking system.



In fact, the **genetic changes developing new means of linearity** favored resurfacing many religiously drowned values of the past history.

**Turning products into monetary values within a well-organized economy was the first significant process of mass quantification that ever occurred in human history.**

Thus, during the period AD 1150 to AD 1450 **a new way of thinking began to manifest, as “quantification.”** It revived also other ideas of Greek Antiquity, like democracy.

However, while in England developed a sense of accountability by implementing Magna Carta in 1215 (a charter of rights) during the rule of King John, a parliamentary democracy emerged in the Kingdom of Leon (Spain), and a religious change in thinking occurred in Germany as a result of the Protestant Reformation (1517).

In the opposite sense the Catholic establishment reacted by introducing the Inquisition (1478).

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Besides many upside downs, **new thinking succeeded in producing the Scientific Revolution that created science by the means of quantification.** Here I will quote from Britannica:

“Scientific societies sprang up, beginning in Italy in the early years of 17<sup>th</sup> century and culminating in the two great national scientific societies that marked the zenith of the Scientific Revolution: the Royal Society in London, created by a royal charter in 1662, and the Academie des Sciences of Paris, formed in 1666.”

**“The growing flood of information that resulted from the Scientific Revolution put heavy strains upon old institutions and practices.”**

New thinking brought with it the appetite for discovery that in fact was mostly motivated and associated with financial prosperity generated by the nascent marketplace-economy and the blocking of the commercial routes to Asia by the Ottoman Empire and the Mongol invasion.

The first attempts to exit Europe in other directions outside the Mediterranean basin and eastern North Atlantic Ocean were successfully made in 1492 when occurred the first voyage to the Americas, in 1497 when the first seafaring around Africa took place, and in 1519-1521 when Magellan expedition succeeded for the first time to reach the Pacific Ocean and to travel around the world. In less than 30 years the Western Europeans were able to expand exponentially their knowledge about the world.

These **successful achievements in reaching new markets with low-cost-high-resources and high profit helped local European’s marketplace to prosper** because they provided **rapid financial accumulation with high profit** that was used for the needs of a massive local development. New financial accumulations with high profit also provided supplementary financial resources to be spent on majestic architecture and high art expressions, a new popular favorite.

The Era of Discovery inspired people to search for the past achievements, and Greek Antiquity became another favorite domain of researchers.

All previously mentioned occurrences organically led to the Industrial Revolution (1750-1900). Some researchers indicate that **establishing colonies around the Atlantic environment set up the right conditions which organically led to an Industrial Revolution in Western Europe.**

In the meantime, this **colonial environment prevented Western Europe to fall into an economic collapse generated by the “the Little Ice Age”** that was generated by the mentioned cluster of solar minima.

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Five distinct grand solar minima have been identified as the Oort (1040-1080), Wolf (1280-1350), Sporer (1460-1550), Maunder (1645-1715), and Dalton (1790-1820).

They can be identified as large peaks in the past C14 content of tree rings.

However, the 860-year C14 record indicates four episodes when sunspots were almost absent: AD 1040 (Oort), AD 1282-1342 (Wolf), AD 1416-1534 (Sporer), and AD 1654-1714 (Maunder). The calculated C14 production rate shows that, during such sunspots absence, the cosmic ray flux penetrating to the ground was maximal while the C14 atmospheric concentration was the highest.

In sum, **during the era 1040 to 1714, the C14 atmospheric concentration was intermittently high, and thus, it intermittently increased the rates of human neurogenesis.** It means that from a total of 674 years of this era, 238 years (almost one third of the time) had higher than normal C14 atmospheric concentration and were subject to high bursts of neurogenesis.

The mentioned eventful era gives a full picture of the amplitude of such accumulated events on the society of that time.

Was it a mere coincidence?

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However, the changes in human “linear thinking” encountered another change **in the era that followed after WWII**. It **generated the Technological Revolutions** which produced distinctly oriented “generations.”

Let’s see this novel aspect changing human thinking.

Technological revolutions originated in Industrial and Scientific Revolutions which culminated with electrification and radical changes in transportation.

The technological revolutions, developed after WWII, brought changes manifested like artificial computation based on exogeneous sources and an associated storing and distribution of data. Overall, it affected the very means of communication.

The psychologist defined a particular stratification occurring among the people who participated in these technological revolutions.

-The “boomers” were those people born between 1945 and 1964.

-The generation “X” represents people born in 1965-1980.

-The “millennials” are born in 1981-1996.

The “Z” generation is born 1995-2010.

The “Alpha” is born after 2010.

I would say that the original “qualitative” (nonlinear) approach was a comparison between various sensorial experiences. It is said the

emotional thinking was “intuitive” and dealt with the “emergent.” It was a scalability applied to personal experience.

“Linear thinking” used the same scalability behavior, but here the sense of experience was associated with quantitative evaluation.

Thus, quantification rescales “emotional perception” analyzed by bottom-up neural processes (that composes the raw sensorial data into wholes named “context,” and which are nonlinear) into “quanta of data” generated by top-down neural processes. Linearization breaks wholes into parts, which are those mentioned “quanta” or “quantities”, but which are generated by comparing the elements displayed on a particular scale with one of them becoming the base or etalon of such scalability.

This is called **analysis** or breaking of natural complexities into components. The opposite process, where the components resulting from breaking are rearranged in distinct modalities is called **synthesis**.

Thus, **analysis and synthesis are the elements that assemble our “logic thinking” that is artificial in nature.**

I said “artificiality”, because the initial process of bottom-up assembles raw perceptual data into complexities which are similar with natural complexities. But then, such complexities, generating an “emergent,” are breaking down by the top-down process that seeks to “analyze” such complexity in the form of its components or parts. Thus, the sense given by “emergent” is lost, being dismantled into parts, which are not similar with the “emergent.”

But in the above-mentioned way, linear thinking is able to generate “linear” products which also are “artificial.” Some of them try to mimic natural products and processes.

In the '20s and '30s the piling of new “quantitative data” was significantly increased by the developing science and technology. It imposed the development of “**artificial computation**” that was introduced after WWII by generating exogeneous sources of computation, which assist mental computation by speeding up the computation in itself.

In a more general expression, the **end result of linear approach is the “quantification of data.”** Each product we create has characteristics and performs proportional to such quantified data, and thus, it embeds and stores this data.

In the meantime, a “**quantity**” involves “**predictability**”, because the etalon (the reference base) is selected to be predictable by removing most variables.

The storage of data (information) in products affects our perspective on information because it interferes with mental processing and influences behavior.

**Each “generation’s” behavior is affected by each era of accumulated storage of information.** In plain words, each technological revolution or each combination of such revolutions occurring during an epoch with an approximate length of fifteen years influences the behavior of the people mentally embedded in that generation. These are the people who apply and practice such new technology generated during their time. Their experience changes their behavior.

However, the **technological revolutions manifest as a fractal**, where each scale is self-similar with previous scales. In the meantime, **each scale has a distinct technological environment with distinct functional law and rules.**

**Each scale expresses chaos characteristics and manifestations,** where the order is hidden into the apparent disorder.

The production of quantified data has a natural tendency to complexify on its own because it self-organizes, generating some complexities where we are not aware of such presence and evolution. This “unseen” evolution intermingles with the rest of natural evolution.

In terms of information, **only the “emergent” generates new information** because it is very distinct and apparently unrelated with its composing parts.

Each generation is mentally influenced by the complex evolution described above and must adapt to its content and meanings.

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Emerging multidisciplinary and interdisciplinary research show that top-down cognitive processes seem to influence the most basic components of perception from an almost initial phase, affecting how and what we see.

Our high-order cognitive processes such as beliefs, desire, and motivations show a significant top-down influence, altering our basic visual perception. There is known that the most basic components of visual perception lead to high-level cognitive processes related to categorization and memory storage.

For example, a rainbow is a continuous band of wavelengths, but humans perceive colors categorically because we break down (by top-down processes) the continuous spectrum up into blocks of distinct color groups. This influences cognition and reflects how we see the world. hence, cognitive processes develop in the early stages of perception (being it visual or provided by other senses). It

means that all perception is nonconceptual, and there is no thought into it. (Brian Scholl, professor at Yale University, Perception and Cognition Laboratory).

In sum, **our brain alters the perception in its early stages** (or low-level visual perception) **before any mental processes will occur.** (“It is a visceral thing that does not require much thought at all”- Brian Scholl, 2019). Thus, decision-making is correlated with this initial level of perceptual alteration (John McGann, Professor at Rutgers University, 2019). “After each perceptual trial, the value of each chosen feature is updated and adjusted to reflect any prediction errors, while all other values are decaying toward zero.” (Yael Niv, Professor at Princeton Neuroscience Institute at Princeton University).

In the above paragraph I quoted from an article of Alexandra Michel published on January 29, 2020, in Observer under the title “Cognition and Perception: Is There Really a Distinction?”

In my opinion, the mentioned review article indicates that “linearization, as a result of top-down neural processes, occurs in the early stages of perception, and possibly, the previous nonlinearity of human thinking also developed in the early stages of perception.

Thus, the switching from primary linearity (70 ka) to nonlinearity in the following era until 30 ka, and a new switching, back to linearity, but in its advanced form, occurred all in the initial stage of perception.

In this case, our celebrated **“cognition” is none-conceptually evolved, while it represents a “mechanical result of direct perception”** that can be switched back and forth (linear to



nonlinear to linear) by particular processes occurring in the human brain. It means that the thoughts process the reality only after an image of reality is already given by perception. Or one can say that **there is no significant distinction between perception and cognition.**

We know that short-range neural circuits process data nonlinearly, and long-range neural circuits process data from greater neural distances in a linear mode and contribute to high-level cognitive tasks. It is known that the right brain hemisphere controls the bottom-up processes, and the left hemisphere controls the top-down processes. However, this said segregation is not functionally obvious because both hemispheres control the hemispheres simultaneously, while still some hemispheric dominance manifests.

One can postulate that switching from nonlinear to advanced linearity occurred as a switching of the hemispheric dominance. But what generated the primary linearity that existed prior to nonlinear manifestation? One can postulate that primary linearity reflected the none-hemispheric dominance.

From the physical point of view, the mentioned dominance must be related to changes in the energetic consumption of the brain that is connected to an increase in the number of neurons. Everything shows a direct dependence on the intensity manifested by processes of neurogenesis.

I said that the mentioned generations are scales of fractal evolution of humanity. Each scale is the manifestation of chaos, while chaos is a system with many components that behaves unpredictably. But chaos is order within disorder, and order can be found hidden within disorder. What can generate order to reappear within disorder? As it

seems **period doubling** (a slight change in a system causes a new periodic trajectory to emerge from an existing trajectory, and the new one period doubles) **is present in very many scientific domains**, and in all of them **an exogeneous excitation can produce the return of an aperiodic system to periodicity**. This periodicity is order.

I can assume that amongst those mentioned “generations,” each one manifests at inception like an aperiodic system. It depends on societal ability to reroute or stimulate each generation toward periodicity.

Are these generations irreconcilable? Not if society can bring them back to periodicity, but then, that generation will lose the outcome of its potential nonlinearity.

In the meantime, we have coexisting “generations”, where each one tends to behave distinctly because each one develops its own but separated culture. Thus, we have multi-culturability, where the rules are made for a culture that ceased to exist decades ago.

How can we deal with such a discrepancy?

As it appears, according to period doubling, each generation runs from aperiodic to periodic evolution, but here each new periodicity would be different than from other existing periodicities.

Nevertheless, the current marketplace economy is vastly outdated even for a more conservative audience. We deny for political reasons the dialectics, but they existed and continue to work in the Eastern Culture for at least twenty-five hundreds of years or even more. Dialectics deal with existing while competing opposite views and allows them to cooperate and interact without significant social disturbances.

Another significant aspect is the social accumulation of data. The large corporations and financial institutions tend to accumulate a large chunk of a nation resources (data), and the quantity of resource /data remaining for the rest of the society diminishes.

A Pew Research center's study indicates that the US, in the years after 1970, tilted toward upper-income households, and the middle-class (which once comprised a clear majority of Americans) is shrinking. A greater share of the aggregate income now goes to upper-income households. After 1970 inequality in the US increased by more than 30% (10% from 1970 to 1980, and 20% from 1980 to 2016).

Another survey shows that the share of wealth held by the top 1% rose from 30% in 1989 to 39% in 2016, while the share held by the bottom 90% fell from 33% to 23%.

One can conclude that globalization brought an increase of 25% of wealth to the top 1% but diminished by 50% the wealth of the bottom 90%.

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Returning to the main subject that is the influence of high atmospheric concentration of C14 on human neurogenesis I cannot neglect a last event that was generated in the epoch 1950-1963 by the **atmospheric testing of the atomic bombs**.

During this epoch the **atmospheric concentration of C14 gradually increased reaching its apogee in 1963, when it represented the doubling of the concentration recorded before 1950**. This concentration, according to geological records, **was similar to values reached during the geomagnetic excursions in our prehistory**, and eventually during the epoch with solar minima.

However, the **high concentration of C14** generated by the atomic bombs blasts in the atmosphere **remained elevated until the beginning of '90s** that is another 30 years after the international ban on such experiments.

In total, the **high concentration of C14 existed in terrestrial atmosphere for some 40 years.**

Thus, one can say it should be there an influence on human neurogenesis for the generations born in this time interval.

According to previous definition and stratification of generations, **this epoch should have affected Boomers, Millennials, and generation "Z."**

Now, considering the effect generated in our prehistory, and its distinct outcome on various hominins, one would assume that **the effect varies from one individual to another.** In some cases, like in most Homo sapiens, the effect was positive. But, we also have the situation of the rest of hominins who disappeared around 40-30 ka, meaning that the gradual effect on them brought their extinction. Here, I hypothesized that the negative effect manifested as mental diseases, and during that prehistoric time, the spread of mental diseases within a community makes many members disable to perform their regular activity and impedes the normal functioning of the entire community. An increased severity in this phenomenon certainly would cause extinction.

Returning to the mentioned modern era, the **impact of high concentration of C14 would probably show positive and negative results.** The **positive ones imply creation of talent or even geniuses, while the negative outcome will be an increase over the average in mental diseases.**

Considering the increase rate of technological revolutions after WWII, but also an increased rate in mental illnesses, it seems that this would be the work of high concentration of C14 in the epoch 1950-1963 that lasted until 1990.