

Chapter 2

Sphere 0 (or the Earth)

Homo sapiens' Conquest of the Land Surface

It is a fact that within a few tens of thousands of years after leaving Africa, that is about 70,000 years ago, *sapiens* came to supersede all other species in the genus *Homo*, driving them to extinction, but not before cohabiting for a while and acquiring a bit of genetic material, let's say that 2 % of Neanderthal that is in all of us and which can still occasionally leap out rather unexpectedly.

And so *sapiens* begin to explore and populate the entire surface of the Earth, what we call here "Sphere 0". He is already an artist and a thinker 18,000 years ago when the small *Homo floresiensis*, the last remaining species, other than sapiens, of the genus *Homo*, extinguished. And 15,000 years after the disappearance of the last Neanderthal, we find *sapiens* celebrating the fact that that he was the only remaining representative of the genus *Homo* left on Earth by painting the caves at Lascaux. We can find there drawings of bears, bulls and horses, but also one injured man and some things mysterious that we shall never understand.

The conquest of the Earth's surface took place at an amazing speed. Eurasia and Oceania were almost completely occupied within a few tens of thousands of years, that is by 30,000 years ago. The Americas from Alaska to the southernmost tip of Chile were colonized in a time span of perhaps 2000 years, from 16,000 to 14,000 years ago. All this took place at the incredibly high average speed of more than a kilometre per year.

An extraordinary thing about the speed of this expansion is that it was, in fact, an expansion, not a migration. Migration as we understand it today is, for example, more akin to that of the Lombards in Italy. Perhaps more correctly, migration is a cyclical phenomenon as exemplified by the African wildebeest, or eels, or salmon, where populations travelled for reasons linked to reproduction or climatic conditions or other reason not yet understood.

With *Homo sapiens*, this expansion was truly a large-scale phenomenon. It does not refer to the transfer of a particular people; rather, it was a spread or the expansion of a range seeking for new areas to inhabit. It was an expansion

especially “out of Africa”, which occurred perhaps several times in response to climatic variations and some of their consequences such as the changing levels of the oceans.

What drove *sapiens* to expand their range and seek new horizons? I do not know how to give a definite answer to this phenomenon. However, what we do know is that *sapiens* alone, among his many relatives within the genus *Homo*, undertook this global expansion, which was, in short, the exploration and conquest of the world. Where there were no predecessors, such as in Australia and the Americas, *sapiens* could easily settle without competitors. In other areas where related species were already present, such as in Europe, Asia and in Africa itself, *sapiens*’ potential competitors soon faced extinction. Today, ethologists and ecologists agree on a technical definition that classifies *Homo sapiens* as an “invasive cosmopolitan” species. It is not really a compliment: it is a definition that applies equally well to rats or cockroaches, as well as to us, i.e. the only species that since the dawn of history appeared to have dominated the world.

The expansionist ambitions of *sapiens* may have genetic reasons: a variant (7R) of a gene called DRD4, which is responsible for the controlling of dopamine, a substance essential in the functioning of brain. The DRD4-7R variant seems to be present in about 20 % of all *sapiens*, and it might be the substance that gives us the impetus to look for new sensations, new in all senses, including food or sex, but also pushes us to take all the risks involved.

However, the discoverer of the 7R variant is himself the first to warn us about simplistic interpretations.

If it is true that 20 % of humans are inclined to risk and are in continuous search for novelty (including, e.g. cheating on spouses...) and that this could explain the rapid and violent expansion of a new species, it is also true, as Kenneth Kidd of Yale University says, that a single gene, or a variant of a gene, is not a sufficient cause.

It is equally true that several complex factors should to be taken into account: the genetic ones responsible for physical changes, as well as the environmental ones, and more. In short, motivation alone is not enough (although necessary): occasions are needed as well.

And so we arrive, about 10,000 years ago, at the end of the long phase of the Palaeolithic. The beginning of the Neolithic sees that *sapiens*, well established in all continents, the inventor and master of languages, able to produce and gather food and thus no longer forced only to hunt—in short, ready to move into the future.

And so the age of prehistory ends in an ideal fashion with Oetzi the Iceman, found preserved in an Alpine glacier at an altitude of more than 3,000 mt. He was well equipped to venture into the mountains with his leather shoes lined with hay to keep his feet warm, gloves, a hood, etc. He died from being shot with an arrow—perhaps while exploring he found himself in someone else’s territory. Who knows? The detail is not now important since *sapiens* the explorer has won and in a flash has populated the whole Earth. The rest, as they say, is history, because it is from here on in that history begins.

“My Dear Jules, what do you say? Did you know the story of *sapiens the explorer*?”

“No, I admit that I did not know this—but—well—I had imagined some of it. In fact, if I could, we should now write a book... how about ‘Around the World in Eighty Thousand Years’?” he replied.

“It would be one of your greatest hits... You know, shortly after your death we tried reading some of an American author’s work, a certain Jack London who wrote ‘Before Adam’ (1907), which is full of adventures and primitive men with sabre-toothed tigers; but alas, he had not your pen.”

The history of the recent exploration of Sphere 0 begins, symbolically, with Oetzi the Iceman. However, it is a difficult story to tell simply because the greater, the bravest and intelligent explorers are unknown to us and will probably remain so forever. History from our “Western” perspective generally tends to present the geographical discoveries and explorations as all having been due to white men and to be related in some way to the formation and spreading of the great empires: for example, those early empires born in the Mediterranean, such as the Egyptian, Persian, Macedonian empires, and later the Romans, whose maps were annotated “hinc sunt leones”, just lions beyond these boundaries, or to the later oceanic and colonial empires of, for example, Spain, Portugal, and Britain.

Schools today teach us that Asia was “explored” by Marco Polo and that America was “discovered” by Columbus and so on. Yet few in Europe (or at least outside China), know of the great admiral Zheng He, one of the most important explorers in history. From the year, we call 1405 under the reign of the second emperor of the Ming Dynasty (but which was, of course, a different date for Zheng He) over a period of more than 30 years, Admiral He explored thoroughly the Indian Ocean, navigated the entire coast of India and explored the east coast of Africa from Somalia as far south as Zanzibar. Zheng He was equipped with magnificent oceanic-class ships, although not as manoeuvrable as the caravels of Columbus a century later. Some argue (especially in China) that Zheng He rounded the Cape of Good Hope and then crossed the Atlantic to discover America... but experts say there is no evidence for this and that his ships could not have managed such a voyage. However, the Chinese could certainly have gone up the west coast of Africa and then end up in Spain, thus discovering and, why not, colonizing Europe... Thinking upon the real possibilities of such a voyage opens up fascinating scenarios of history fiction.

From the sixteenth century to the eighteenth century, after the great explorations across the oceans during the establishment of the Spanish, Portuguese, and British empires, and thanks to the Dutch trade routes too, we come to the great continental explorations of the nineteenth century, such as those in Africa by Henry Morton Stanley (1841–1904), the journalist–adventurer–explorer. While he did not find the source of the Nile, he did find David Livingstone (1813–1873) whom he had been rather vaguely instructed to look for as he was then “missing” “somewhere in Africa”. The quest ended in that famous meeting between the two of them, the only white people for thousands of miles, when Stanley is reputed to have said,

“Dr. Livingstone, I presume?” They then proceeded to “explore” the course of the River Congo, led, naturally, by the “natives” who already knew the way.

Another interesting case is that of the exploration of the North American continent at the beginning of the nineteenth century. Between 1804 and 1806, Meriwether Lewis and William Clarke “explored” from the Missouri to the Pacific, where “no one” had yet arrived. They were acting on the instruction of the great American president Thomas Jefferson, (whose face is on the now endangered \$2 bill), who wanted the newly formed Union to establish a trade route to Asia. But they did not go alone: they had with them an Indian girl of fifteen, Sacajawea, who was already a mother and the wife of an ambiguous French trapper. She knew the way as well as the various languages of the Indian populations that had long inhabited the area. She suggested the most natural passage through the Rockies, the Bozeman Pass (Interstate Highway 90 now passes through it), since she mysteriously knew that buffalo herds migrated through that pass.

Many of the great explorations that have been recorded and celebrated in our history, such as the circumnavigation of the globe by Magellan’s fleet from 1519 to 1522, were in fact required to complete and possibly confirm the politico-religious vision that was, from time to time, prevalent in the Western world. Such explorations, however, were also pursued for commercial purposes: for example, finding the best route to the Spice Islands in 1500 promised yields on invested capital that amounted to profits comparable to those arising today from trafficking street drugs. The Spanish and Portuguese empires, in fighting each other over the Spice Islands, “discovered” that Africa and South America were not connected to Antarctica (which no one knew at the time), but that the southern tips of these continents could be navigated around, albeit with some danger and difficulty. After all, Africa and South America could have been joined to Antarctica, with just a slight change in the drifting of the continents, or a minor change in the form of Pangea, that ancient place where all the continents of today were combined in a single landmass before they began to separate and spread at about the speed at which fingernails grow. On second thought, for the same reason, the American continent might not have existed to divide the Atlantic and Pacific. Forget “*buscar el levante por el poniente*”; Columbus and his ridiculous caravels would have disappeared into the blue of a single Ocean joining Europe and Asia, just as the wise geographers of Queen Isabella had always said, since for them the Americas did not exist.

There were also embarrassing, even if unintentional, “rediscoveries”. In 1512, Magellan, before being the first to pass through the strait that was later named after him, had been heading out of the Indian Ocean when he found himself in the archipelago we now call the Philippines. Then in 1521, coming from the Pacific, he rediscovered them without realizing it (and eventually even died, there, in a minor skirmish with natives onshore).

The islands finally took their current name when they were again “newly discovered”, 20 years later, by Ruy Lopez de Villalobos during the reign of the son of Charles V, precisely Philip II. However, it should be said in everyone’s defence that the Philippines are an archipelago comprising over 7000 islands, scattered over almost 2,000 km² of ocean.

Of all the wonderful stories of those great explorations, one that perhaps stands out above all others is recorded in the diary of Antonio Pigafetta, the Italian nobleman whom Magellan took with him as secretary–interpreter during his trip around the world. Although loyal to the end to his Commanding General, he was mainly interested in the new geographical, environmental and anthropological disciplines. He noted, with passion and with a lot of imagination, such things as the vital statistics of the inhabitants of Patagonia, (who according to him were the tallest of peoples) or some seemingly impossible characteristics of penguins and seals. He even began to write a multilingual dictionary simply by pointing to known objects and writing in phonetic Spanish the names the natives gave in their own language. In short, he was a refined intellectual, but also one who was at ease at sea in the turmoil of a caravel of the year 1500, on which he sailed for months.

But when Pigafetta meets the Patagonians, one must ask: who explores whom? After all, the Patagonians had already arrived safely in Patagonia, perhaps driven by an earlier “Magellan” who remains unknown to them or us, and moreover, they went on foot, starting from the Bering Strait, or even farther afield. The same holds true for the sources of the Nile, which were well known to generations of the native inhabitants long before Livingstone tried to get there or to the hills of Montana, which the Sioux had long since explored and where they had lived undisturbed until General Custer arrived.

In short, the greatest explorers were those who first came to rest their eyes on landscapes that no *sapiens* had seen before. These people will never be known to us, but they certainly existed. Perhaps they were less individualistic than Christopher Columbus or Louis Antoine de Bougainville, who went around the world in 1769 and brought to European gardens the beautiful Bougainvillea flowery plant; or James Cook, who, like Magellan, circumnavigated the globe and was also killed by the natives on a Pacific beach; or of Alexander von Humbolt, who, as a scientist–explorer, studied and understood the physical geography and hydrology of South America.

“Our” history, however, does not say who led the Viking ships to the shores of North America, or who first explored and populated Easter Island and Hawaii in the Pacific between 3000 BCE and 800 CE, when they were really “discovered” for the first time. The ancient Europeans frequently explored lands that were already known to others. They did so for reasons of commercial expansion, sometimes so nefarious that they were often disguised as missions to spread religious belief. But what drove the ancient inhabitants of Taiwan in 3000 BCE to undertake long and dangerous sea voyages in fragile boats and so spread their culture and their language across the immensity of the Pacific?

It was probably exploration for expansion, simply driven by the need for living space. For people living on an island, with its clearly defined boundary, any increase in population would imply a depletion of scarce resources, such as agricultural land, and a consequent decline in the quality of life. Future Polynesians did not put a canoe in the ocean to go in search of gold or to convert someone else to their own beliefs, but did so for the most basic need of a growing population: to search out new land to live in and for their descendants to continue to inhabit.

The great continental and oceanic explorations of our Western history culminated in the late 1800s, the century of Jules and his book *The Children of Captain Grant*. In this beautiful novel—in which a Scottish Lord with the help of Paganel, a slightly potty geographer, takes around the world Captain Grant's children and a few other companions looking for their father—Verne uses a beautiful literary ruse. To justify travelling around the world from continent to continent, always in exotic, unexplored places, Verne uses a variant of the classic “message in a bottle” theme, which gives the story plenty of suspense. In this case, the message is found in the stomach of a shark. The message, apparently written in three languages by Captain Grant, asks for help and provides the coordinates of their position. But seawater and shark stomach juices have partially deleted the content of the message. Throughout the book, Paganel tries to interpret the erasures and guess what the missing data might be, but he is always wrong. Thus, Verne takes us around the world, forever chasing a new interpretation of the text.

By the end of the nineteenth century, there were few places left to explore on our Sphere 0. In reality, only those truly difficult or inaccessible places, such as the polar ice caps and the highest mountain ranges, remained unexplored. In the following years, up until the first half of the twentieth century, the last part of our history of exploration takes place. It is a fascinating period, because the drive to explore now comes from a desire for knowledge and from an individual's or country's striving to be the first to achieve the particular hard-won goal; that is, exploration for pride and glory rather than for practical or commercial purposes and its concomitant material rewards.

The race to the North and South poles was certainly a spectacular example. It became a sort of obsession for individuals and countries, including *fin-de-siècle* France old Verne who, of course, wrote a novel about the exploration of the North Pole in 1864: “*Les Aventures du Capitain Hatteras*”. The hero of the novel, Hatteras, is an Englishman, who, with a handful of faithful companions, finally and after many vicissitudes comes close to the Pole. One of their parties is a doctor who knows all the answers, including how to make fire from ice. Right on the geographic pole, they discover an island with an active volcano. Its crater is in the exact position of the Pole, and Hatteras does not hesitate to go down it. At this point in the first version of the novel, Verne contrives an heroic death for Hatteras, but his tyrannical publisher, Hetzel, instead insists on imposing an ending in which Hatteras survives but loses his mind. Back in England, Hatteras is condemned always to walk only northwards.

In 1909, after numerous expeditions from different countries, the real North Pole in the middle of the Arctic Ocean was reached by an engineer in the US Navy, Robert E. Peary. Today, there remains some doubt as to whether he reached the exact Pole; but maybe it does not matter since Peary reached the Pole mainly due to a large company of Inuit who went with him, and who had, perhaps, already been there before without realizing it nor giving the location any particular importance. Certainly, they knew how to handle dogs, sleds, boats and how to survive. As always, even on the inhospitable shores of the Arctic Ocean, *sapiens* were happily

settled, having long since become adapted to the conditions and having learnt how to survive in the most difficult of the ecological niches that remained free.

But the real challenge in the early twentieth century was the South Pole. There were no native Inuit there to act as guides, and it was not possible to get there by boat. This point of the Earth's axis is to be found on a plateau at 2,800 mt. of altitude, in the middle of a continent twice the size of Australia, visible from a distance and yet totally unexplored at the time. The South Pole could only be reached on foot, crossing glaciers and mountain ranges with skis, crampons, snowshoes and sleds. In 1911, two competing attempts were made: a British team led by Robert Falcon Scott, and a Norwegian team led by Roald Amundsen.

This was exploration in the purest sense of the word, very similar to that of space. No one had ever before been to the interior of the Antarctic continent, and no relief or rescue was realistically possible in the event of a disaster, nor of course communication of any kind. The Norwegians won the race, as is well known, in the sense that they reached the pole first and moreover returned alive. It was a fantastically impressive feat, helped by the fact that they were excellent cross-country skiers and they knew how to manage their dog sledges. Moreover, as some dogs became unnecessary as the load decreased, they had the courage to kill them for food (for the surviving dogs, but who knows...). The British led by Scott did reach the South Pole soon after Amundsen, but all died of hunger and cold on the way back. They had no dogs (which they would never have killed, of course), and thus, they were slow, since they had to pull the sledges themselves. They were also mediocre skiers and they miscalculated their supplies. Even heroes can get it wrong.

By a curious coincidence, in the years 1926–1928, both poles saw a new kind of exploration that Jules Verne would have been madly excited about. In 1926, the Italian Air Force general, Umberto Nobile, managed a spectacular achievement. He had designed and had built the airship *Norge*, a project which was paid for by Roald Amundsen himself, who was in fact on board when it departed from Rome's Ciampino airport. It headed north and flew over Europe, Norway and the Svalbard Islands and then northwards, flying over the Pole on May 12. They finally landed in Alaska, after an uninterrupted flight of 5,300 km in about three days. Two years later, Nobile attempted to repeat the journey, this time from Milan with another airship, *Italia*. Although the airship had reached the Pole, it crashed on the return journey. The subsequent agony on the ice, with casualties, some fatal, was a tragedy that affected Nobile, the great explorer, for the rest of his life.

In 1928, Admiral Richard E. Byrd of the US Navy established a base on the coast of the Antarctic continent in preparation for a memorable attempt to fly, on 29 November 1929 on a three-engined Ford plane in less than one day to the South Pole and back. To get to the Pole at more than 3,000 m above sea level, he had to lighten the plane, by throwing everything out—even the emergency food supply. Had Verne's imagination invented the stories of Nobile and Byrd, nobody would have believed them.

Verne certainly would also never have dared to imagine the following incredible feat, which falls halfway between exploration and an endurance test. In 1989–1990, Reinhold Messner and Arved Fuchs crossed the entire Antarctic continent in

92 days, on skis and with no outside help. In what was perhaps the greatest and most authentic feat of exploration undertaken in Antarctica since that of Amundsen in 1911, they made only one stop at the US Polar Base to celebrate the New Year.

In some sense, mountaineering is symmetrical and similar to polar exploration, especially those climbing expeditions that involve some element of research and exploration. Such adventures among mountain ranges began during the eighteenth-century enlightenment, continued into the romantic nineteenth century and culminated in the troubled twentieth century. Within Europe, the summit of Mont Blanc was, for centuries if not millennia, in clear view to those in the fully explored and civilized areas of Italy, France and Switzerland, yet its summit was only reached in 1786. During the next century, especially thanks to English mountaineers, all the great peaks of the Alps were reached and then the great mountain ranges of the other continents of Africa, Asia, the Americas and Antarctica—almost all less than a century ago, although such achievements were often gained by explorers and climbers only with support from local guides.

Symbolically, the exploration of the Earth's surface, the 'Sphere 0', ends on 31 May 1953 when Edmund Hillary and Tenzing Norgay conquered Everest and Hillary says: "Above us, the sky". The news, and the phrase, arrived in London just in time for the coronation of Queen Elizabeth II, who still reigns at the time of writing this.

It seems that, in the mountains, each of us can be part of a real process of exploration, not only when we find a new route up a mountain, but also simply by putting our hands on a rock that nobody has ever touched before. Even when I climb a mountain along a route that someone else has climbed before, I put myself voluntarily and for no apparent practical reason in the path of the unknown and of danger—why on earth do I do it?—I ask myself. Sometimes, deliberately and yet with a certain level of detachment, one heads out to a climb simply by looking at the mountain, without following someone else's route, as if one were the first man (or woman) in the world to do so. In short, there are always new ways to be discovered, and it is enough simply to have the desire to do so.

When Walter Bonatti, who was one of the greatest mountaineers in history, realized that he was no longer able to "write new pages in the mountains" as he put it, meaning that he would no longer be able to establish new routes or climb virgin peaks, he became an explorer of distant places, about which little or nothing was known. A spectacular proof of the link between mountaineering and exploration.

In the 1920s, an American journalist (who understood little about mountaineering) asked George Mallory, why he wanted at all costs to climb Mount Everest (where he eventually died), Mallory answered: "Because it's there". Such an elegant reply went down in history. In the 1950s, another great climber, the Frenchman Lionel Terray, who in 1952 conquered and explored mountains like Mount Fitz Roy in wildest depths of Patagonia, admirably summed up the spirit of alpinism in the title of his famous book that, once again, would be the envy of Jules Verne: "*Les Conquêteurs de l'inutile*". These conquerors of the useless are well exemplified today by the twenty climbers (a group whose number is growing rapidly) who have reached the summit of all 14 mountains with peaks higher than 8,000 mt.

It is a very small club whose first member was, of course, Reinhold Messner, in 1986, and which today is growing in a similar way to the number of astronauts who landed on the moon or have otherwise left Earth's gravitational pull (currently 27, as we will see later).

It is not only the mountains but the sea too, which has tested the true nature of *sapiens'* modern taste for exploration. For example, in 1947, a group of anthropologists led by Thor Heyrdahl set off from Callao, Peru, on the Kon Tiki—a raft of balsa wood—and successfully navigated across the Pacific to the Tuamotu Islands in French Polynesia. They wanted to show that the Polynesians' ancestors could have done so thousands of years before and so populated the Pacific. It is not clear if the Kon Tiki crew were right, but the adventure would almost be even more beautiful if it were now proven to have been “useless”. The Kon Tiki expedition has now been beautifully echoed, more than 60 years later: Alex Bellini, an Italian mountaineer from Valtellina, rowed alone across the Pacific Ocean, again starting from Callao. He arrived in Sydney, Australia, in 2008. If it was not madness, it was certainly pure exploration.

Alex certainly does not only have an outstanding physique, but also a good quantity of the 7R variant of the DRD4 gene, the one that pushes you towards the unknown no matter the conditions.

Another important event in the modern history of exploration, which is also splendidly useless, falls halfway between Sphere 0 and Sphere -1 (the exploration of the oceans). It is the entirely submarine circumnavigation of the globe, following the route of Magellan. This was completed by the nuclear submarine, *Triton*, of the US Navy, in 1960. The undertaking must be considered in a sense to be almost a sport, since it is an end in itself. In fact, it was accomplished during the Cold War and thus was kept secret by the US Navy. Leaving from the secret base of New London, Connecticut, the *Triton* was first brought to its ideal starting block, represented by the St. Peter and St. Paul Rocks, which are remote, uninhabited rocks off the coast of Brazil, and which were first sighted by Magellan in 1520.

On February 24, the *Triton*, always submerged, took a route to the south-west, arriving off Cape Horn on March 7. The *Triton* then had to divert, rather than navigate submerged, as might have been wished for historical completeness, through the strait found bravely by Magellan in 1520. The official reason for this single deviation was that the Magellan Strait is in Chilean territorial waters and asking for a permission to the Chilean authorities would have compromised the secrecy of the mission. The real reason, we say maliciously, and without any foundation, was that to plumb the tortuous depths of the Magellan Strait, which were certainly not charted in detail, would have been perhaps too much for the submarine's commander to contemplate, since a US nuclear submarine run aground or sunk in the Strait of Magellan would have not made great propaganda for the US Navy.

Our heroic divers entered the Pacific and went on to Easter Island, which Magellan had missed. From the periscope, they could see and photograph the mysterious stone statues, just to prove that they really had been there. It was then on to the Philippines, approaching dangerously the coast of the island of Mactan, on

whose shore Magellan was killed by the natives. In another rare moment at periscope depth, the commander permitted the officers on the bridge to see through the eyepiece the monument to Magellan erected on the beach. By coincidence, they also saw the only human being spotted throughout the mission: an unknown Filipino quietly paddling his canoe. History does not record whether he saw the periscope, and if so, what story he then told at home. Then the *Nautilus* sailed on to Borneo, Indonesia, the Indian Ocean, the Cape of Good Hope and back to St. Peter and St. Paul, where they arrived on April 10.

In total, the *Triton* had travelled 26,723 miles, always submerged, and had circumnavigated the world in 60 days and 21 h on the route which took Magellan nearly three years to complete.

“What have you got to say about that, Jules?” I ask my friend, “Impressive, although Captain Nemo with his *Nautilus* in “*Twenty Thousand Leagues Under the Sea*” is still unbeaten (2000 leagues correspond to 60,000 nautical miles)”, and Jules continued “*Eh oui, mon amis, ces américains...* less than a century after my book. And in reality; not in fantasy! I admire them very much, *pas question*. But, maybe they got a little inspiration from me” And I am happy to say this to him: “Of course, Jules, the first American nuclear submarine, in 1954, was named *Nautilus*, in great honour of Captain Nemo. Viceversa the *Triton* has also gone around the world quicker than your Phileas Fogg in “*Around the world in eighty days*” “Sure,” Jules replied, “but you want to compare the poetry of my balloon with that iron pipe of the Americans, always under the water?” “Well, today, you can fly around the world in an aeroplane in less than 80 h, if you want to; and, if you keep on reading, soon you will see that by staying just above the atmosphere, it is achievable in little more than 80 min”.

How many people have lived on Earth from the time since the first *Homo sapiens* appeared, about 200,000 years ago? Seven billion people are currently living, but since the beginning of *sapiens*’ adventure, (according to a necessary rough estimate) 107 billion men and women have lived on Earth, all within less than 10,000 generations. Is this too few or too many? Is it a significant figure in the evolution of life on our planet? Absolutely not, if we compare it to the numbers of individuals of those species that were around for hundreds of millions of years—species such as the trilobites or even the dinosaurs whose demise allowed the rise of the first mammals, since the *Tyrannosaurus* was no longer around to eat with gusto our very small, warm-blooded, hairy, marmot-like mammalian ancestors.

Or, to put it in another way,—if the total human population today were spread like jam on the surface of the Earth, how thick would that layer be? Actually, it would be about the same as if 2.5 kg of jam were spread uniformly over a square kilometre, i.e. 0.0025 mm/m². And even if we multiply that figure by fifteen, to include all those 107 billion *sapiens* who have ever lived, it still would not be very much thicker, we would always be invisible.

Another way, more romantic but even more significant, to see the role of human species, not only on our planet but in the context of the whole Universe, is as follows. The one hundred billion (10¹¹ in scientific notation, i.e. 10 followed by 11 zeros) of successive *sapiens* on Earth have been and are made of “stardust”, that is

“baryonic” matter, matter with a mass, as everybody now knows. But what fraction of stella matter in *sapiens*? Easy: together, we humans represent one part in 10^{41} (10 followed by 41 zeros) of this type of matter in the universe.

It is a very, very small fraction. How small? Well, to give an idea let us say that in all the Oceans of the Earth there are 10^{46} water molecules and that we humans compared to the universe are like a hundred thousand molecules of water, that is an infinitely small and totally invisible fraction of a drop.

Too hard? Let us try instead to think that this infinitely small fraction of the matter in the universe, over a time scale of less than a millionth of the life of the universe in which it lives, is able to understand such universe, its size, its content of matter and energy, its evolution and much more.

Nearer to us, the energy, *sapiens* have used in 150,000 years that have passed while forming our history, has mainly been the metabolic energy of muscle power (i.e. biochemical energy). Later came the discovery that the combination of certain elements, such as carbon, with oxygen in the air, above a certain temperature is violently exothermic, giving off heat: that is to say, it warms you. *H. sapiens* did not know that he lived immersed in a sea of oxygen or that wood is made of carbon, but once he discovered fire, learning that mammoth steaks are better grilled than raw was a simple experimental observation. As the story unfolds, an increasing number of energy sources are used, all available directly from Mother Nature. As well as wood and coal, there are wind mills and sails, the sun to dry meat and figs, the water of rivers for mills and transport, and the metabolic biochemical energy of domesticated animals.

Much later, i.e. from a few centuries ago to the present day, we, the modern version of *sapiens*, have used and still mainly use the thermal energy derived from fossil fuels. It is a small step then, with respect to the grilled mammoth, to move forward to those other great discoveries by *sapiens*—the electric pile by Alessandro Volta in 1800, and nuclear energy by Enrico Fermi in 1942.

Remember, however, that burning a gram of gasoline releases about 11 kcal, that is the highest concentration of energy per unit mass of chemical material that exists, except for that released in the formation of the water molecule. It is even higher than chocolate or butter, although these are much tastier than petrol. Of course, in some cases, the chemical energy contained within gunpowder, or the electro-chemical energy within batteries, has come to the support of *sapiens*’ explorations. However, it also came in handy to settle other little internal affairs of that warlike roughneck whom *sapiens* has always been, culminating in the end, of course, with the use of nuclear energy.

<http://www.springer.com/978-3-319-17003-9>

The Mystery of the Seven Spheres
How Homo sapiens will Conquer Space

Bignami, G.

2015, V, 118 p., Softcover

ISBN: 978-3-319-17003-9