

Review of Yuval Harari's *Sapiens: A Brief History of Humankind*.

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The biological title *Sapiens* is intended to give the impression of a work of hard-nosed science in the Darwinian tradition. Human history is presented as 'the next stage in the continuum of physics to chemistry to biology', and our ultimate destiny, and not so very ultimate either, is to be replaced by intelligent machines. It is a summary of human cultural and social evolution from stone age foraging bands through the agricultural revolution, writing and the rise of the state and large-scale societies, through the gradual process of global unification through empires, money, and the world religions, to the scientific revolution that began the modern world and its consequences.

As an anthropologist who has trodden roughly the same path as Harari in a number of books (Hallpike 1979, 1986, 2008, 2016) I was naturally curious to see what he has to say, but it soon became clear that its claim to be a work of science is questionable, beginning with his notion of culture. Language is obviously the basis of human culture, but one of the central themes of the book is the idea that not just language but what he calls 'fiction' has been crucial in the ascent of Man:

...the truly unique feature of our language is not its ability to transmit information about men and lions. Rather it's the ability to transmit information about things *that do not exist at all* [my emphasis]. As far as we know, only Sapiens can talk about entire kinds of entities that they have never seen, touched or smelled...But fiction has enabled us not merely to imagine things, but to do so *collectively*. We can weave common myths such as the biblical creation story, the Dreamtime myths of Aboriginal Australians, and the nationalist myths of modern states. Such myths give Sapiens the unprecedented ability to cooperate flexibly in large numbers (27).

The claim that culture is *fiction* is not an important insight, but is simply a perverse way of stating the obvious fact that culture is a set of shared ideas, and ideas by their very nature can't be material objects. Language has been revolutionary because it has allowed human beings to be linked together by shared ideas into roles and institutions. One cannot *see* or *touch* the Prime Minister, for example, but only a human being, and someone who does not know what 'Prime Minister' *means* has to be told. This can only be done properly by explaining how this role fits into the British Constitution, which in turn involves explaining parliament, cabinet government, the rule of law, democracy, and so on. This world of roles, institutions, beliefs, norms, and values forms what we call culture, but just because the components of culture are immaterial and cannot be seen, touched or smelled does not make

them *fiction*, like Santa Claus and the Tooth Fairy, or the myths of Genesis or the Australian Aborigines. We can't see, touch, or smell truth because truth is not a material object, but that does not make it unreal or fictitious either.

If Harari's test of reality is only what we can see, touch, or smell then mathematics, like truth, should also be a prime example of fiction. Maybe simple integers might just pass his reality test, since we can see groups of different numbers of things, but how 'real' in his sense are zero, negative numbers, irrational numbers like π or imaginary numbers like the square root of -1? And if mathematics is fiction, then so is the whole of science including the theory of relativity and Darwinian evolution, which Harari would find very embarrassing indeed because he loves science. He is just in a philosophical muddle that confuses what is material with what is real, and what is immaterial with fiction. But the opposite of fiction is not what is material but what is true, and what is fictional and what is true can both only exist in the immaterial world of thought.

When it comes to the task of explaining social institutions, the idea of culture as fiction is about as useful as a rubber nail:

People easily understand that 'primitives' cement their social order by believing in ghosts and spirits, and gathering each full moon to dance together round the campfire. What we fail to appreciate is that our modern institutions function on exactly the same basis. Take for example the world of business corporations. Modern business-people and lawyers are, in fact, powerful sorcerers (31).

Really? He takes the Peugeot motor company, with its image of a lion, and tries to argue that the company itself is no more real than an ancient tribal totem, but nevertheless can form the basis on which large numbers of people could co-operate:

How exactly did Armand Peugeot, the man, create Peugeot, the company? In much the same way that priests and sorcerers have created gods and demons throughout history...It all revolved around telling stories, and convincing people to believe them...In the case of Peugeot SA the crucial story was the French legal code, as written by the French parliament. According to the French legislators, if a certified lawyer followed all the proper liturgy and rituals, wrote all the required spells and oaths on a wonderfully decorated piece of paper, and affixed his ornate signature to the bottom of the document, then hocus pocus - a new company was formed (34).

Harari seems unable to distinguish a belief from a convention, presumably because neither is a material object. Beliefs in ghosts and spirits may be shared by members of particular cultures, but derive from the nature of people's experience and their modes of thought: they did not sit down and deliberately agree to believe in them. Conventions, however, are precisely the result of a collective decision, consciously taken to achieve a certain purpose, and as such are completely different from myths in almost every respect.

Peugeot SA rests on the legal convention of a limited-liability company, which performs a very useful social function, and another very useful social convention is the rule of the road by which in Britain we all drive on the left. Neither beliefs in spirits nor social conventions are material objects, but they are still quite different sorts of thing, as are legal documents and magical rituals, and Harari achieves nothing by confusing them.

More unsustainable claims do not take long to appear. It may well be true that by about 400,000 years ago Man became able to hunt large game on a regular basis, and that in the last 100,000 years we jumped to the top of the food chain. There also seems little doubt that after humans migrated out of Africa in the last 70,000 years or so they exterminated large mammals in Australia, the Americas, and other parts of the world. But part of his explanation for this is that:

Having so recently been one of the underdogs of the savannah, we are full of fears and anxieties over our position, which makes us doubly cruel and dangerous. Many historical calamities, from deadly wars to ecological catastrophes, have resulted from this over-hasty jump (12-13).

No, we're not full of fears and anxieties about our position in the food chain, and never have been, because a species is not a person who can remember things like having been the underdog of the savannah tens of millennia in the past. Knowledge of our life on the savannah has only been vaguely reconstructed by archaeologists and anthropologists in modern times.

He then describes us as 'embarrassingly similar to chimpanzees' and claims that

Our societies are built from the same building blocks as Neanderthal or chimpanzee societies, and the more we examine these building blocks - sensations, emotions, family ties - the less difference we find between us and other apes. (42)

In fact, however, if we study the research on the differences between human infants and chimpanzees, such as Tomasello's *Why We Co-operate* (2009), the *greater* we find the differences between us and other apes. Tomasello's studies of pre-linguistic human infants between 12-24 months and chimpanzees showed marked differences in behaviour related to co-operation, for example. Human infants start co-operating at about 12 months, and when 14 - 18 month infants were put in situations where adult strangers needed help with problems, the infants, unlike chimpanzees, spontaneously provided it. Even before speech develops human infants will try to provide information to adult strangers who need it by pointing, whereas apes do not understand informative pointing at all. Infants also have an innate grasp of rules, in the sense of understanding that certain sorts of activities, like games, should be

done in a certain way, whereas apes do not. 14 - 24 month old infants also collaborate easily in social games, whereas chimpanzees simply refuse to take part in them, and infants can also change and reverse roles in games. Human collaborative activity is achieved through generalised roles that can potentially be filled by anyone, including the self. This is the basis of the unique feature of human culture, the institution, which is a set of practices governed by rules and norms. 'No animal species other than humans has been observed to have anything even vaguely resembling [social institutions]' (Tomasello 2009: xi - xii).

For Harari the great innovation that separated us from the apes was what he calls the Cognitive Revolution, around 70,000 years ago when we started migrating out of Africa, which he thinks gave us the same sort of modern minds that we have now. 'At the individual level, ancient foragers were the most knowledgeable and skilful people in history...Survival in that area required superb mental abilities from everyone' (55), and 'The people who carved the Stadel lion-man some 30,000 years ago had the same physical, emotional, and intellectual abilities we have' (44). Not surprisingly, then, 'We'd be able to explain to them everything we know - from the adventures of Alice in Wonderland to the paradoxes of quantum physics - and they could teach us how their people view the world' (23).

It's a sweet idea, and something like this imagined meeting actually took place a few years ago between the linguist Daniel Everett and the Piraha foragers of the Amazon in Peru (Everett 2008). But far from being able to discuss quantum theory with them, he found that the Piraha couldn't even count, and had no numbers of any kind, They could teach Everett how they saw the world, which was entirely confined to the immediate experience of the here-and-now, with no interest in past or future, or really in anything that could not be seen or touched. They had no myths or stories, so Alice in Wonderland would have fallen rather flat as well.

Harari's belief that the Cognitive Revolution provided the modes of thought and reasoning that are the basis of our scientific civilisation could not therefore be further from the truth. We may accept that people became able to speak in sentences at this time, and language is certainly essential to human culture, but anthropologists and developmental psychologists, in their studies of primitive societies, have found that their language development and their modes of thought about space, time, classification, causality and the self have much more resemblance to those of the Piraha than to those of members of modern industrial societies. The Piraha are an extreme case, but the Tauade of Papua New Guinea, for

example, with whom I lived only had the idea of single and pair, and no form of calendar or time-reckoning. Harari clearly has no knowledge at all of cross-cultural developmental psychology, and of how modes of thought develop in relation to the natural and socio-cultural environments. The people who carved the Stadel lion-man around 30,000 years ago and the Piraha had the same ability to *learn* as we do, which is why Piraha children can learn to count, but these cognitive skills have to be learnt: we are not born with them all ready to go. Cross-cultural developmental psychology has shown that the development of the cognitive skills of modern humans actually requires literacy and schooling, large-scale bureaucratic societies and complex urban life, the experience of cultural differences, and familiarity with modern technology, to name some of the more important requirements (see Hallpike 1979).

While Harari recognises that we know almost nothing about the beliefs and social organization of ancient foragers, he agrees that the constraints of their mode of life would have limited them to small-scale groups based on the family without permanent settlements (unless they could fish), and with no domestic animals. But then he launches into some remarkable speculations about what they might nevertheless have achieved in the tens of thousands of years between the Cognitive Revolution and the beginning of agriculture.

These long millennia *may have witnessed* [my emphasis] wars and revolutions, ecstatic religious movements, profound philosophical theories, incomparable artistic masterpieces...The foragers may have had their all-conquering Napoleons who ruled empires half the size of Luxembourg; gifted Beethovens who lacked symphony orchestras but brought people to tears with the sound of their bamboo flutes...' and so on (68-9).

Er, no. They couldn't. All these imagined triumphs of the hunter-gatherers would actually have required a basis of large populations, centralized political control and probably literate civilisation, which in turn would have required the development of agriculture.

This is normally regarded as, after language, the innovation that made possible the extraordinary flowering of human abilities. As Harari correctly points out, agriculture developed independently in a number of parts of the world, and tribal societies based on farming became extremely common, many of them surviving into modern times. But he describes the Agricultural Revolution as 'history's biggest fraud' because individuals in fully developed farming societies generally had an inferior diet and harder work than foragers, and their food supply depended on a limited range of crops that were vulnerable to drought, pests, and invaders, unlike the more varied food resources of hunter-gatherers. These criticisms of agriculture are, of course, quite familiar, and up to a point legitimate. But if agriculture was really such a bad deal why would humans ever have gone along with it? Harari begins by

suggesting that wheat and other crops actually domesticated us, and made us work for them, rather than the other way round, but this doesn't get him very far in explaining the persistence of agriculture, and instead he argues that wheat offered nothing to individuals, but only to the species by enabling the growth of larger populations. But since it is actually individuals who have to do all the hard work of sowing and reaping this won't do either, so finally he says that people persisted in the agricultural way of life because they were in search of an easier life, and couldn't anticipate the full consequences of agriculture.

Whenever they decided to do a bit of extra work - say, to hoe the fields instead of scattering the seeds on the surface - people thought, "Yes, we will have to work harder, but the harvest will be so bountiful! We won't have to worry any more about lean years. Our children will never go to sleep hungry." It made sense. If you worked harder, you would have a better life. That was the plan. (97)

It didn't work out that way, however, because people didn't foresee population growth, poor diet and disease. Since it would have taken many generations to realise all the disadvantages of agriculture, by that time the population would have grown so large that it would have been impossible to go back to foraging, so the agricultural trap closed on Man for evermore.

The change from foraging to agriculture as principal mode of subsistence would have actually taken hundreds of years in many cases, and there are many important advantages of agriculture which he ignores. It is likely that one of the primary attractions of planting crops was that it allowed people to live in fixed settlements for some or all of the year, for a variety of reasons. Some favoured locations would have provided access to a plentiful supply of food or water; a whole series of craft activities are all more conveniently carried out in permanent or semi-permanent settlements; and these are also very convenient for holding ceremonies such as initiations and feasts. We also know that the food surplus from agriculture can be used in systems of exchange and competitive feasting, for trading with different groups, and for feeding domestic animals. A larger population also has many attractions in itself: it permits a much richer social life than is possible for small foraging bands, with more impressive ceremonies, a larger labour force for social projects such as irrigation and communal buildings, and more effective defence against local enemies. Agriculture would therefore have had many attractions which would have been obvious to the people concerned, (see Hallpike 2008:52-65).

Agriculture with the domestication of animals, then, was the essential foundation for the growth of really large populations which are in turn essential for the development of complex cultures and social systems in a new 'tribal' form of social organization. Land

ownership became closely related to kin groups of clans and lineages, which were in turn the basis of formal systems of political authority based on elders or chiefs who could mediate in disputes and sometimes assume priestly functions. A whole variety of groups sprang up based not only on kinship but on residence, work, voluntary association, age, and gender and these group structures and hierarchical organization made it much easier to co-ordinate the larger populations that developed (see Hallpike 2008:66-121). This tribal organization was the essential precursor of the state, particularly through the development of political authority which was always legitimated by descent and religious status. By the state I mean centralised political authority, usually a king, supported by tribute and taxes, and with a monopoly of armed force. Although it has been estimated that only about 20% of tribal societies in Africa, the Americas, Polynesia, New Guinea, and many parts of Asia actually developed the state, the state was almost as important a revolution in human history as agriculture itself, because of all the further developments it made possible, and a large literature on the process of state formation has developed (e.g. Claessen & Skalnik 1978, Hallpike 1986, 2008, Trigger 2003).

Unfortunately, Harari not only knows very little about tribal societies but seems to have read almost nothing on the literature on state formation either, which he tries to explain as follows:

The stress of farming [worrying about the weather, drought, floods, bandits, next year's famine and so on] had far reaching consequences. It was *the foundation* [my emphasis] of large-scale political and social systems. Sadly, the diligent peasants almost never achieved the future economic security they so craved through their hard work in the present. Everywhere, rulers and elites sprang up, living off the peasants' surplus food. (114)

The reader might well wonder how peasants worrying about next year's possible famine could possibly have been the foundation of any major political developments, and why in any case they would have meekly allowed their crops to be plundered, as well as where these rulers and elites suddenly sprang from. If Harari knew more about tribal societies he would have realised that the notion of a leader imposing his will on his followers misses the whole point of leadership in pre-state societies, which is that the leader has to *attract* people by having something to offer them, not by threatening them, because he has no means of doing this. To have power over people one must control something they want: food, land, personal security, status, wealth, the favour of the gods, knowledge, and so on. In other words, there must be *dependency*, and leaders must be seen as benefactors. In tribal societies, where people are not self-sufficient in defence, or in access to resources or to the supernatural, they will therefore be willing to accept inequality of power because they obviously get something

out of war-leaders, or clan heads, or priests. Political authority in tribal society develops in particular through the kinship system, with hereditary clan heads, who are also believed to have the mystical power to bless their dependents. When states develop we always find that the legitimacy of kings is based on two factors: descent and religion. It is only after the advent of the state can power be riveted on to people by force whether they like it or not, and when it is too late for them to do anything about it except by violent rebellion.

Anyway, what was needed here to control these much larger populations were networks of mass co-operation, under the control of kings, and Harari takes us almost immediately into the world of the ancient empires of Egypt, and Mesopotamia, and Persia and China. But how were these networks of mass communication created?

He recognises, quite rightly, the importance of writing and mathematics in human history, and claims they were crucial in the emergence of the state:

...in order to maintain a large kingdom, mathematical data was vital. It was never enough to legislate laws and tell stories about guardian gods. One also had to collect taxes. In order to tax hundreds of thousands of people, it was imperative to collect data about people's incomes and possessions; data about payments made; data about arrears, debts and fines; data about discounts and exemptions. This added up to millions of data bits, which had to be stored and processed (137).

This was beyond the power of the human brain, however.

This mental limitation severely constrained the size and complexity of human collectives. When the amount of people in a particular society crossed a critical threshold, it became necessary to store and process large amounts of mathematical data. Since the human brain could not do it, the system collapsed. For thousands of years after the Agricultural Revolution, human social networks remained relatively small and simple (137).

But it is simply not true that kingdoms need to collect vast quantities of financial data in order to tax their subjects, or that social systems beyond a certain size collapsed until they had invented writing and a numerical system for recording this data. If Harari were right it would not have been possible for any kingdoms at all to have developed in Sub-Saharan Africa, for example, because there were no forms of writing systems in this region until quite late when a few developed under European or Islamic influence (Ethiopia was a special case.) Nevertheless, pre-colonial Africa was actually littered with states and even empires that functioned perfectly well without writing.

They were able to do this because of the undemanding administrative conditions of early kingdoms. These are based on subsistence agriculture without money and have primitive modes of transport, unless they have easy access to river transport like Egypt,

Mesopotamia or China. They also have a simple administrative structure based on a hierarchy of local chiefs or officials who play a prominent part in the organization of tribute. The actual expenses of government, apart from the royal court, are therefore relatively small, and the king may have large herds of cattle or other stock, and large estates and labourers to work them to provide food and beer for guests. The primary duty of a ruler is generosity to his nobles and guests, and to his subjects in distress, not to construct vast public works like pyramids. The basic needs of a ruler, besides food supplies, would be prestige articles as gifts of honour, craft products, livestock, and above all men as soldiers and labourers. In Baganda, one of the largest African states, with a population of around two million, tax messengers were sent out when palace resources were running low:

The goods collected were of various kinds - livestock, cowry shells, iron hoe-blades, and the cloths made from the bark of a fig-tree beaten out thin [for clothing and bedding]...Cattle were required of superior chiefs, goats and hoes of lesser ones, and the peasants contributed the cowry shells and barkcloths....the tax-gatherers did not take a proportion of every herd but required a fixed number of cattle from each chief. Of course the hoes and barkcloths had to be new, and they were not made and stored up in anticipation of the tax-collection. It took some little time to produce the required number, and the tax-gatherers had to wait for this and then supervise the transport of the goods and cattle, first to the *saza* [district] headquarters and then to the capital. The amount due was calculated in consultation with the subordinates of the *saza* chiefs who were supposed to know the exact number of men under their authority, and they were responsible for seeing that it was delivered (Mair 1962:163). (Manpower was recruited in basically the same way, and in Africa generally was made up of slaves and corvée labour.)

Nor do early states require written law codes in the style of Hamurabi, and most cases can be settled orally by traditional local courts. No doubt, the demands of administering early states made writing and mathematical notation very useful, and eventually indispensable, but the kinds of financial data that Harari deems essential for a tax system could only have been available in very advanced societies. As we have just seen, very much simpler systems were quite viable. (Since the Sumerian system of mathematical notation is the example that Harari chooses to illustrate the link between taxation, writing, and mathematics, it is a pity that he gets it wrong. The Sumerians did not, as he supposes, use a 'a combination of base 6 and base 10 numeral systems'. As is well-known, they actually used base 60, with sub-base 10 to count from 1 - 59, 61 - 119, and so on. [Chrisomalis 2010:241-45])

When the Agricultural Revolution opened opportunities for the creation of crowded cities and mighty empires, people invented stories about great gods, motherlands and joint-stock companies to provide the needed social links. (115)

The idea of people 'inventing' religious beliefs to 'provide the needed social links' comes out of the same rationalist stable as the claim that kings invented religious beliefs to justify their oppression of their subjects and that capitalists did the same to justify their exploitation of their workers. Religious belief simply doesn't work like that. It is true, however, that what he calls universal and missionary religions started appearing in the first millennium BC.

Their emergence was one of the most important revolutions in history, and made a vital contribution to the unification of humankind, much like the emergence of universal empires and universal money (235)

But his chapter on the rise of the universal religions is extremely weak, and his explanation of monotheism, for example, goes as follows:

With time some followers of polytheist gods became so fond of their particular patron that they drifted away from the basic polytheist insight. They began to believe that their god was the only god, and that He was in fact the supreme power of the universe. Yet at the same time they continued to view Him as possessing interests and biases, and believed that they could strike deals with Him. Thus were born monotheist religions, whose followers beseech the supreme power of the universe to help them recover from illness, win the lottery and gain victory in war (242).

This is amateurish speculation, and Harari does not even seem to have heard of the Axial Age. This is the term applied by historians to the period of social turmoil that occurred during the first millennium BC across Eurasia, of political instability, warfare, increased commerce and the appearance of coinage, and urbanization, that in various ways eroded traditional social values and social bonds. The search for meaning led to a new breed of thinkers, prophets and philosophers who searched for a more transcendent and universal authority on how we should live and gain tranquillity of mind, that went beyond the limits of their own society and traditions, and beyond purely material prosperity. People developed a much more articulate awareness of the mind and the self than hitherto, and also rejected the old pagan values of worldly success and materialism. As one authority has put it: 'Everywhere one notices attempts to introduce greater purity, greater justice, greater perfection, and a more universal explanation of things' (Momigliano 1975:8-9; see also Hallpike 2008:236-65).

One of the consequences of this new cultural order was a fundamental rethinking of religion, so that the old pagan gods began to seem morally and intellectually contemptible. Instead of this naively human image of the gods, said the Greek Xenophanes, 'One God there is...in no way like mortal creatures either in bodily form or in the thought of his mind...effectively, he wields all things by the thought of his mind.' So we find all across the Old World the idea developing of a rational cosmic order, a divine universal law, known to the Greeks as Logos, to the Indians as Brahman, to the Jews as Hokhma, and to the Chinese as

Tao. This also involved the very important idea that the essential and distinctive mental element in man is akin to the creative and ordering element in the cosmos, of Man as microcosm in relation to the macrocosm.

Intellectually, the idea that the universe makes sense at some deep level, that it is governed by a unified body of rational laws given by a divine Creator, became an essential belief for the development of science, not only among the Greeks, but in the Middle Ages and the Renaissance. As Joseph Needham has said, '...historically the question remains whether natural science could ever have reached its present stage of development without passing through a "theological stage" ' (Needham 1956:582).

Against this new intellectual background it also became much easier to think of Man not as a citizen of a particular state, but in universal terms as a moral being. There is the growth of the idea of a common humanity which transcends the boundaries of nation and culture and social distinctions of rank, such as slavery, so that all good men are brothers, and the ideal condition of Man would be universal peace (Hallpike 2016:167-218).

Harari tries to create a distinction between 'monotheistic' religions such as Judaism, Christianity, and Islam, and 'natural law religions', without gods in which he includes Buddhism, Taoism, Confucianism, Stoicism, and the Epicureans. From what I have said about the concepts of Logos, Hokhma, Brahman, and Tao it should be clear that his two types of religion actually had much in common. In Christianity, for example, Jesus was almost immediately identified with the Logos. The Epicureans, however, do not belong in this group at all as they were ancient materialist atheists who did not believe in natural law of any kind.

One of the most obvious facts about states in history is that they all were hierarchical, dividing people into different classes with kings and nobles at the top enjoying wealth and luxury, and peasants or slaves at the bottom in poverty, men privileged over women, some ethnic groups privileged over others, and so on. Harari attributes all this to the invention of writing, and to the 'imagined orders' that sustained the large networks involved in state organization.

The imagined orders sustaining these networks were neither neutral nor fair. They divided people into make-believe groups, arranged in a hierarchy. The upper levels enjoyed privileges and power, while the lower ones suffered from discrimination. Hammurabi's Code, for example established a pecking order of superiors, commoners and slaves. Superiors got all the good things in life. Commoners got what was left. Slaves got a beating if they complained (149).

But since these sorts of hierarchies in state societies are universal in what sense can they have simply been 'make-believe'? Doesn't this universality suggest that there were actually laws of social and economic development at work here which require sociological analysis? Simply saying that 'there is no justice in history' is hardly good enough. In particular, he fails to notice two very significant types of inequality, that of merchants in relation to the upper classes, and of craftsmen in relation to scholars, which had major implications for the development of civilisation, but to which I shall return later.

Harari says that religion and empires have been two of the three great unifiers of the human race, along with money: 'Empires were one of the main reasons for the drastic reduction in human diversity. The imperial steamroller gradually obliterated the unique characteristics of numerous peoples...forging out of them new and much larger groups (213)' These claims have a good deal of truth but they are also quite familiar, so I shall not go into Harari's discussion of this theme, except for his strange notion of 'Afro-Asia', which he describes not only as an ecological system but also as having some sort of cultural unity, e.g. 'During the first millennium BC, religions of an altogether new kind began to spread through Afro-Asia' (249). Culturally, however, sub-Saharan Africa was entirely cut off from developments in Europe and Asia until Islamic influence began spreading into West Africa in the eighth century AD, and has been largely irrelevant to world history except as a source of slaves and raw materials. And as Diamond pointed out in *Guns, Germs and Steel*, Africa is an entirely distinct ecological system because it is oriented north/south, so that it is divided by its climatic zones, whereas Eurasia is oriented east/west, so that the same climatic zones extend all across it, and wheat and horses for example are found all the way from Ireland to Japan.

Harari says that at the beginning of the sixteenth century, 90% of humans still lived in 'the single mega-world of Afro-Asia', while the rest lived in the Meso-American, Andean, and Oceanic worlds. 'Over the next 300 years the Afro-Asian giant swallowed up all the other worlds', by which he actually means the expanding colonial empires of the Spanish, Portuguese, Dutch, French and British. But to refer to these nations as 'Afro-Asian' is conspicuously absurd, and the whole concept of Afro-Asia is actually meaningless from every point of view. The general idea of *Eurasia*, however, does make a good deal of cultural as well as ecological sense, not only because it recognises the obvious importance of Europe, but because of the cultural links that went to and fro across it, so that the early navigators of the fifteenth century were using the Chinese inventions of magnetic compasses, stern-post

rudders, paper for their charts, and gunpowder, and were making their voyages to find sea-routes from Europe to China and the East Indies rather than relying on overland trade.

Harari's next major turning point in world history he refers to, reasonably enough, as 'The Scientific Revolution'. Around AD 1500 'It began in western Europe, a large peninsula on the western tip of Afro-Asia, which up till then played no important role in history.' (272) This is a unconvincing assessment of a region that had been the seat of the Roman Empire, the Christian Church, and Greek science which was one of the essential foundations of the Scientific Revolution. Harari's opinions about how this got started are even less persuasive:

The Scientific Revolution has not been a revolution of knowledge. It has above all been a revolution of ignorance. The great discovery that launched the Scientific Revolution was the discovery that humans do not know the answers to their most important question. (279).

This is a statement whose truth is not immediately obvious, and he justifies it as follows:

Premodern traditions of knowledge such as Islam, Christianity, Buddhism and Confucianism asserted that everything that is important to know about the world was already known. The great gods, or the one almighty God, or the wise people of the past possessed all-encompassing wisdom, which they revealed to us in scriptures and oral traditions (279-80).

These traditions may have claimed to know all that was essential to salvation and peace of mind, but that kind of knowledge had nothing whatsoever to do with pre-modern traditions of *science*. In Europe this meant Aristotle and Greek natural philosophy but about which, astonishingly, Harari has nothing at all to say anywhere in his book. Apart from a willingness to admit ignorance and embrace new knowledge, science

...has a common core of research methods, which are all based on collecting empirical observations - those we can observe with at least one of our senses - and putting them together with the help of mathematical tools (283).

This is a nineteenth-century view of what science does, whereas the really distinctive feature of modern science is that it tests theory by *experiment*, and does *not* simply collect empirical observations. On why modern science developed specifically in Europe Harari has the following explanation:

The key factor was that the plant-seeking botanist and the colony-seeking naval officer shared a similar mindset. Both scientist and conqueror began by admitting ignorance - they both said 'I don't know what's out there.' They both felt compelled to go out and make new discoveries. And they both hoped that the new knowledge would make them masters of the world (316-17).

Botany was actually of quite minor importance in the early stages of modern science, which was dominated by studies of terrestrial and celestial motion (Copernicus, Galileo, Kepler, and Newton), and by chemistry which involved the revival of Greek atomism. And Columbus, to

take a useful example of 'a colony-seeking naval officer' knew quite well what was out there. He knew that the earth is round, and concluded that if he sailed west for long enough he would find a new route to the East Indies. So when he reached the islands of the Caribbean he was convinced that their inhabitants were 'Indians' and never changed his mind. I think we can perhaps do a little better than Harari in explaining the European origin of modern science.

Greek science was dominated by the belief that reason, and particularly mathematics, was the true path to knowledge and its role was to be the tutor of the senses, not to be taught by them. The idea of performing an experiment did not really exist, and the great Alexandrian engineer Hero, for example believed that water pressure does not increase with depth. He defended this belief with an ingenious theory from Archimedes, but ignored the practical experiment of taking a glass down to the bottom of a pool where it could easily have been seen that the water rises higher inside the glass the deeper it is taken. Aristotle's theories of terrestrial and celestial motion, and Ptolemy's elaborate geometrical model of the heavens, for example, were seen as triumphs of reason, and were inherited by the medieval European universities who began a critical study of them. The importance of Greek science, however, was not that it was right - it contained fundamental errors - but that it presented a coherent theoretical model of how the world worked that stimulated thought and could be tested.

The Islamic world had transmitted much of Greek science to medieval Europe, and Aristotle in particular was greatly admired by Muslim scholars as 'The Philosopher'. But under the influence of the clerics Islam eventually turned against reason and science as dangerous to religion, and this renaissance died out. In rather similar fashion, the Byzantine Emperor Justinian closed the philosophy schools of Athens in 529 AD because he considered them dangerous to Christianity. But while in the thirteenth century several Popes, for the same reason, tried to forbid the study of Aristotle in the universities, they were ignored and in fact by the end of the century Aquinas had been able to publish his synthesis of Aristotelian philosophy and Christian theology in the *Summa Theologica*.

This illustrates a vital difference between Europe and the other imperial civilisations. Whereas the Caliph and the Byzantine Emperor had the authority to impose intellectual orthodoxy, in Europe the Popes could not enforce their will on society, and neither could the secular authorities, because there were too many competing jurisdictions - of the Holy Roman Emperor, of kings, of free cities, of universities, and between church and state themselves. Another vital difference was that in the other imperial civilisations there was that basic gulf

between scholars and artisans and between merchants and the rest of the upper classes to which I referred earlier. Medieval European towns and cities, however, were run by merchants, together with the artisans and their guilds, so that the social status of artisans in particular was very much higher than in other cultures, and it was possible for them to interact socially with learned scholars. This interaction with scholars occurred in the context of a wide range of interests that combined book-learning with practical skills: alchemy, astrology, medicine, painting, printing, clock-making, the magnetic compass, gunpowder and gunnery, lens-grinding for spectacles, and so on. These skills were also intimately involved in the making of money in a commercially dynamic society.

It is highly significant that this interaction between scholars and artisans also occurred in the intellectual atmosphere of 'natural magic', the belief that the entire universe is a vast system of interrelated correspondences, a hierarchy in which everything acts upon everything else. Alchemy and astrology were the most important components of this tradition, but by the thirteenth century Roger Bacon, for example, was arguing that by applying philosophy and mathematics to the study of nature it would be possible to produce all sorts of technological marvels such as horseless vehicles, flying machines, and glasses for seeing great distances. It was not therefore the admission of ignorance that was truly revolutionary, but the idea that science could be *useful* in mastering nature for the benefit of Man.

By the time of Galileo, whom Harari does not even mention, the idea that science should be useful had become a dominant idea of Western science. Galileo was very much in the natural magic tradition and was a prime example of a man of learning who was equally at home in the workshop as in the library - as is well-known, when he heard of the Dutch invention of the telescope he constructed one himself and ground his own lenses to do so. But Galileo was also enormously important in showing the crucial part that experiment had in the advancement of science. He was keenly interested in Aristotle's theory of terrestrial motion and is said to have tested the theory that heavier bodies fall faster than light ones by dropping them from the leaning tower of Pisa. This is somewhat mythical, but he certainly carried out detailed experiments with metal balls by rolling them down sloping planks to discover the basic laws of acceleration. He did not simply observe, but designed specific experiments to test theories. This is the hall-mark of modern science, and it emerged in the circumstances that I have just described so that reason and the evidence of the senses were thus harmonized in the modern form of natural science. (On the origins of science see Hallpike 2008:288-353; 396-428).

Science, then, is not exactly Harari's strong point, so we need spend little time on the concluding part of his book, which is taken up with speculation about where science and technology are likely to take the human race in the next hundred years. He concludes, however, with some plaintive remarks about our inability to plan our future: 'we remain unsure of our goals', 'nobody knows where we are going', 'we are more powerful than ever before, but have very little idea what to do with all that power' (465-66). He has just written a book showing that mankind's social and cultural evolution has been a process over which no-one could have had any control. So why does he suddenly seize upon the extraordinary fiction that there ought to be some 'we' who could now decide where we all go next? Even if such a 'we' existed, let us say in the form of the United Nations (!), how could it know what to do anyway?

Throughout the book there is also a strange vacillation between hard-nosed Darwinism and egalitarian sentiment. On one hand Harari quite justifiably mocks the humanists' naive belief in human rights, for not realising that these rights are based on Christianity, and that a huge gulf has actually opened up between the findings of science and modern liberal ideals. But on the other hand it is rather bewildering to find him also indulging in long poetic laments about the thousands of years of injustice, inequality and suffering imposed on the masses by the great states and empires of history, and our cruelty to our animal 'slaves' whom we have slaughtered and exterminated in such vast numbers, so that he concludes 'The Sapiens reign on earth has so far produced little that we can be proud of'. But a consistent Darwinist should surely rejoice to see such a fine demonstration of the survival of the fittest, with other species either decimated or subjected to human rule, and the poor regularly ground under foot in the struggle for survival. Indeed, the future looks even better for Darwinism, with nation states themselves about to be submerged by a mono-cultural world order, in which we ourselves are destined to be replaced by a superhuman race of robots. It has been rightly said that

Harari's view of culture and of ethical norms as fundamentally fictional makes impossible any coherent moral framework for thinking about and shaping our future. And it asks us to pretend that we are not what we know ourselves to be - thinking and feeling subjects, moral agents with free will, and social beings whose culture builds upon the facts of the physical world but is not limited to them (Sexton 2015:120).

Summing up the book as a whole, one has often had to point out how surprisingly little he seems to have read on quite a number of essential topics. It would be fair to say that whenever his facts are broadly correct they are not new, and whenever he tries to strike out

on his own he often gets things wrong, sometimes seriously. So we should not judge *Sapiens* as a serious contribution to knowledge but as 'infotainment', a publishing event to titillate its readers by a wild intellectual ride across the landscape of history, dotted with sensational displays of speculation, and ending with blood-curdling predictions about human destiny. By these criteria it is a most successful book.

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