The Web Image:

Organic, Mechanic and Digital

Yoav Ben-Dov

1. THE SPIRIT OF TIMES

It is a question to what extent one can speak of "the spirit of time" (*Zeitgeist*) - some common character supposed to unite different and sometimes disparate domains of thought and creation, which happen to take place at one and the same historical period. On one hand, such a concept raises the temptation to group together things that actually have nothing fundamental in common, because it is always possible to find some superficial analogy or resemblance. On the other hand, it is reasonable to claim that no practice or research is conducted in "empty space", so to speak. The common historical environment- social, cultural, technological and so on -of different human activities gives rise to links and connections between different domains, and can reinforce similar or analogous developments.

For example, a way of thinking which motivates some major technological advance may thereby gain power and prestige, so that people will be more ready to apply it in other domains, the more so as their self assurance and social status grows with the material gains generated by the new technology. The inverse can also be true – for example, a socio-cultural trend that influences the thought of inventors, so that new technological products are conditioned by the social and cultural conditions. It is even possible to think of "positive feedback loops", whereby parallel ways of thought and action in different domains reinforce and serve to justify each other. In this way, a new situation is created in which the different domains are interconnected by common concepts and thought procedures. Analyzing these common elements in the different domains and mapping their links may thus help better to understand the dynamics of the historical evolution, and the deep structure of its products.

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2. THE WORLD AS A MACHINE

In these terms, it is perhaps possible to identify a fundamental image, not to say a universal metaphor, which made its appearance in western culture from the later part of the middle ages, and became dominant from the 17th century onwards. This system is of basically technological origin.

YOAV BEN-DOV. Cohn Institute for the History and Philosophy of Science and Ideas Tel Aviv University, Israel. Profesor del departamento de Física, Universidad del Valle, Cali, Colombia. www.yoavbendov.com

In broad terms, this historical period is characterized by the replacement of organic images, which are typical of traditional societies, by a new set of mechanistic images. In this context, the most significant machine was the mechanical clock that appeared in Europe around the 14th century, and was developed and improved in the following centuries.

The influence of the mechanical clock on western culture, not only as a time measuring tool but also as image and metaphor, can be perceived under different aspects. It is possible, for example, to study the way in which the clock exceeded its original function, a tool for precise measurement of time, and became a central factor in the re-defining of the human experience of time, thus adapting it to a uniform system of work and production relations.

Thus, the factory clock guarantees that all the workers get up at the same hour in the morning, come to work, have their lunch break and so on in a regulated set of fixed hours, dictated by the objective "machine time". This way of organizing the temporal aspect of labor contrasts with the "organic" rhythms of traditional and agricultural societies, where the time to get up, eat, rest etc. is generated from the specific circumstances and the internal human cycles (for example, a peasant taking his lunch break when he gets hungry, and not because an objectively-defined "lunch hour" has arrived). It is as if the human being is required to replace his organic and personal sense of time with a mechanic and objective one, as part of his integration into the huge "production machine" of modern industry.

Another important aspect of the mechanical clock concerns not its direct role as a time-keeping device, but rather its structure, which became the image of the machine *par excellence*. The clock exemplifies the possibility of a mechanism -a collection of material parts that act on each other by precise mathematical laws that (ideally) render its motion completely predictable. This feature was taken from the "mechanism" (i.e. the clockworks) of the clock to become the central image of the new "mechanism" in philosophy and science.

Thus, we find this image of a clockworks predominant in the thought and writing of Descartes, the first philosopher to define explicitly the new mechanistic philosophy: the world is like a giant clockwork, and should be studied as a clockwork. Whole generations of scientists and philosophers, from the 17th century onwards, have followed Descartes both in embracing the mechanistic world view, and in citing the clockworks as its central image, so that "a clockworks universe" has become a common expression of this way of thinking.

Basically, as Descartes put it, this means that any system in the perceived universe, including the bodies and brains of humans, is to be regarded as a mere collection of material parts pushing and pulling each other according to precise mathematical rules. Once the problem of understanding the world was put in these terms, the actual finding of the mathematical form of the rules looks like the obvious next step. This step was actually achieved by Newton, who did not fully share Descartes' mechanistic vision. But later French scientists like Laplace united the philosophical principles of Descartes' mechanism with the mathematical equations of Newton. In this way, the world-view of modern Newtonian mechanism was introduced as a precise mathematical application of the clockwork metaphor to the whole universe, and it was quickly accepted as the mainstream vision of science until the beginning of the 20th century.

In a sense, the role of the exact form of the equation is secondary. Modern mechanism is not only a theory of the world's motion. Primarily it is a method of investigating the world. In this vision, the role of the scientist is to identify the laws by which the world machine works. To do this, he should take apart the machine (at least conceptually), and analyze it in terms of its most fundamental constituents, like the wheels and springs of the clockworks: atoms and particles in physics, individual humans in society, DNA molecules in the living body and so on. The scientist should discover the properties of these basic parts, and then deduce the laws of the complete machine from knowledge of the structure and properties of its basic parts.

Descartes and his followers saw this method of research - "reduction", or analysis into basic constituents - as the only method capable of giving true knowledge. Indeed, this is the adequate way to understand the working of a clock. In contrast to the living organism, in which the separation of parts from each other disrupts their connections and thus alters their properties, dismantling the clock does not change the relevant properties of its parts. A dismantled clock can be put back together into a complete and functioning clock, while the living organism, once dissected into its separate organs, is dead and cannot be brought again to life.

This difference is rooted in the degree of interconnectivity of the constituent parts.

With very few exceptions, in a clock each part is in contact only with two others: the one that moves it, and the one that it moves. In the organism, on the other hand, there is a complex web of interconnections and interactions, in which any part is linked to a huge multitude of other parts. This means that the clock can be understood or constructed in a linear process, which advances step by step in a unique and predetermined line, from the first wheel that sets the clockworks in motion, to the last wheel that moves the clock's hand.

A living organism cannot be constructed in this manner, since it does not have "a first part" and "a last part". The very existence of each part is dependent on the functioning of all the others, and when it is disconnected from them, its life processes are disrupted in an irreversible way. The central role of the machine image thus implied that linear methods of thought, that proceed step by step in a fixed and predetermined order, became dominant in the modern western era. The clearest expression of such linear methods is the mathematical proof, that proceeds step by step from first assumptions to last conclusions. Indeed, mathematics and mathematical logic were considered by many modern thinkers, including Descartes himself, as an expression of the most developed and reliable form of thought.

3. AFTER THE MODERN?

Our reference here to the modern era in the past tense implies some acceptance of the much debated "postmodern" position, which maintains that somehow today we are already past it, "after the modern" as the name implies. Indeed, notwithstanding the question whether one thinks it is a positive development or not, it is impossible to deny that such a position does become today accepted in wide domains of society, culture and academic research. Thus, in the general atmosphere prevailing in many fields, there is some significant change happening, with postmodern ideas replacing the earlier conceptions, which took the superiority of modern ideas almost for granted.

One of the most important elements of postmodern thinking is the rejection of linear ways of thought as the only legitimate procedures of knowledge. Mechanical and linear explanations, which proceed in a fixed one-dimensional chain from the first cause to the last effect, are no more accepted as satisfactory in many applications. Instead, a growing attention is centered around the image of a web with a huge multitude of nodes and interconnections, so that there is no single predetermined and necessary trajectory. Conceptual and explanatory trajectories can still be taken, to be sure, but each of them is now regarded as "user-dependent", so that none has an objective primacy over the others. In such a conception, whole systems have important properties that cannot be reduced to the collection of individual and conceptually independent constituents. Understanding these properties, which emerge from the myriad of interconnections, calls for a new way of observation and conceptualization, in which linear and mechanistic explanations are perceived as partial and context-relative representations.

Thus, for example, postmodern thinkers reject the idea of the historical narrative, that purports to present a historical process as a linear, one-dimensional and necessary chain of well defined events. In its place, they suggest an image of a multitude of ways to tell the story, each one of which has its own point of departure and proceeding along its unique trajectory in the web of interrelated events and accounts. Another example is the very perception of scientific knowledge. Modern philosophers tried to present the advancement of science along a linear chain of necessary steps. In their view, knowledge was to be achieved by a logical and necessary chain of procedures for accumulating facts, such as, for example, mathematical proofs or refuting experiments.

However, since the 1960's there appeared new conceptions of science that see it as a system of "paradigms", which are multi-connected networks that weave together experimental facts and mathematical arguments with personal, cultural, societal and institutional aspects. These paradigms encompass much more than the linear list of assumptions and propositions constituting the classical notion of "a theory". Instead, the dynamics of their evolution, as one paradigm replaces another as the consensus of the scientific community, can be perceived only in terms of whole systems including not only the "internal" logic of the theory but also the wider circles of the conceptual and social context.

4. BODIES AND COMPUTERS

In a sense, these new conceptions, which present a web-like image in place of the fixed necessary line of the machine, express a return to organic ways of thinking. The image that they give is of a complex web of interconnections and influences, that combine with each other so that they cannot be fully analyzed into linear causal chains. Such an image reflects the complexity of living systems at all their levels of organization - from the molecular interactions inside the cellular organelle, through the collaboration of cells and organs that constitute the living body, and up to the web of group interactions giving rise to communities of social animals and humans. Thus, the holistic web image takes as its primary metaphor the organic world of living systems, as much as the linear and analytic image is modeled after the clockworks of a modern machine.

Holistic conceptions, that refer to complete systems and not only to their individual constituents, are indeed becoming more popular today, both in large domains of academic and scientific activity, and also as general trends in society and culture. For example, in recent years there is a significant rise in the interest and demand for alternative medicine methods and ways of thinking, that are perceived as an "alternative" to the scientific, rational and largely mechanistic world view of the modern west. These "new age" views represent in some sense a return to the past, as their holistic and organic visions are similar in many ways to traditional ways of thinking, like those of pre-modern Europe or non-western societies today. Indeed, they express this similarity in popular themes like "archaic revival" and "back to nature", and with sources of inspiration from non-western societies like the Far East, Africa or indigenous cultures in America. Through these links, the post-modern is connected back to the pre-modern.

But the web image represents not only a return to the past, but also a huge and dazzling leap into the future. In today's context, the three concepts "network", "information" and "computer" are strongly interlinked. The clearest example is, of course, the internet, whose structure and mode of operation are far removed from any linear machine that Descartes could have imagined. The web exists only in the full complexity of the myriad links between all the different sites. This is what distinguishes it from a mere collection of data files stored on different computers. The dynamics of the internet is obviously related to this interconnectivity. Take a wheel out of a clockworks, it is still a wheel. Disable all the links to and from a major website like "yahoo.com", and nothing remains.

It is also possible to mention here the new "non-linear" (in more than one sense) sciences of chaos, fractals and complexity, that break apart from mechanistic causality and reductionism, and attract a growing attention both within the research communities and from the general public. These new sciences rely on the use of computers, and were not possible without them. For example, in several domains in the study of complex system, researchers construct computer simulations of a network of many virtual "cells", constantly interacting with each other through a huge web of local connections that link each cell to its close neighbors.

From these simulations, the researchers try to draw conclusions on the organization of complex systems in nature – from sand piles, bacteria colonies or the brain to ecological species populations, social communities and even human constructs like the economy. In the focus of this research are collective patterns and structures, which characterize whole systems and cannot be fully analyzed into properties the constituting parts. Instead, these patterns emerge from the collective behavior of the interconnected web of links. In this manner, the web image finds an expression that can be studied with exact scientific tools, although this kind of research does not satisfy some of the criteria of "solid science" that were modeled after the mechanistic sciences.

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5. THE DIGITAL WEB

If it is possible to speak of "the organic human", that was both the product and the creator of technologies like land agriculture and animal domestication, and of "the mechanic human" of the modern era and the material machine, then the re-introduction of the web image through computers and electronic communication may perhaps be seen as announcing a new form of human life: "the digital human" of information technology and society. This human is no longer a "machine operator" that has to adapt itself to the predetermined and fixed sequence of a machine. Instead, he or she is a "user", navigating (or "surfing") in an open and multiconnected web of information, so that whatever they may come up with is the product of their own trajectory, which is generally unpredictable and dependent on personal and group "user preferences".

In one sense, it is possible to refer to the personal computer and the internet as "machines" - evidently, they are the descendents of the material machines of the modern era, and they rely on the technological achievement of modern western science. But it is also possible to distinguish between the old "material machines" and the new "information machines", because there are fundamental differences between them. These differences exist not only at the level of the technological product itself, but primarily in the interaction between humans and technology (or, as it is called now, "user interface"). In other words, the human experience of the technology is different, and through the influences that we admitted in the first section, this means that new times have arrived for all the domains concerned - technology, ideas and social structures now pushing each other into new spaces.

The difference in human interaction with the new technology is so sharp, that is sometimes seen as creating a "generation gap" in present-day society. The young (and very young) are quickly adapting to the new technology, while their elders have difficulties adapting to it. One of the factors behind this divide may be the fact that the clockwork metaphor is no longer valid in the new context. Navigating in the multiconnected web of information, the user is not confined to a single, predetermined and linear trajectory. Instead, it is possible to reach any given point (for example, a file or any piece of data) from many different directions, and also to proceed from it to as many directions.

In terms which are becoming popular today, it is the user (or "observer/participant", or "player") who decides in which direction to turn at any moment, and what wave to surf, hoping that it leads to something worthwhile - again, by the user's criteria. Thus, the web image gives a vision of an open world, which always keeps its features of unpredictability and uncontrollability. This world re-connects at the same time both to the material machine, from which it grew up, and to the organic images typical of traditional and non-European societies. It is therefore possible to see the web image as the opening of a new space, that integrates both the mechanic and the organic, and in doing so enables us to go beyond their opposition.

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