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The Twilight of the Scientific Age

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There are some symptoms which indicate a decline of our scientific culture. First, our society is drowned in huge amounts of knowledge. Most of it is about research of little importance to progress our world view or produces no advances in the basic fundamentals of pure science. Instead, we invent countless technical applications or investigate secondary details. Second, in the few fields where some important aspects of unsolved questions have arisen, powerful groups of administrators of science control the flow of information. They have inherent biases resulting in a preference for consensus truths, rather than having objective discussions within a scientific methodology. This process gives few guarantees that we are obtaining solid new truths about nature. Finally, should the current scientific process continue the way it is, individual creativity is condemned to disappear. Indeed, truly creative scientists are substituted by large corporations of administrators and politicians of science specialised in searching ways of getting money from States in megaprojects with increasing costs and diminishing returns.

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> "Yes, yes, I see it; a huge social activity, a powerful civilization, a lot of science, a lot of art, a lot of industry, a lot of morality, and then, when we have filled the world with industrial wonders, with large factories, with paths, with museums, with libraries, we will fall down exhausted near all this, and it will be, for whom? Was man made for science or science made for man?" [Miguel de Unamuno — *Tragic Sense of Life* (1913) [1]; original in Spanish; Translation into English made by myself]

This quotation reflects quite accurately the main theme of the present pages. Read it carefully, twice or thrice, think about it for some minutes, and then begin to read the following pages as a musical piece whose leitmotiv is Unamuno's assertion. Just a few minutes, or even seconds, may be enough for the reader to realize the most important message that I want to develop, and its connection with the title of this article. The idea is simple: our era of science is declining because our society is becoming saturated with knowledge which does not offer people any sense of their lives. Nevertheless, in spite of the simplicity of this idea, its meaning can be articulated in a much richer way than through one sentence, as in the case of a music which develops variations on a folk melody.

There are several reasons to write about this topic. First of all, because I feel that things are not as they seem, and the apparent success of scientific research in our societies, announced with a lot of ballyhoo by the mass media, does not reflect the real state of things. Also, because the few individuals who talk about the end of science, do so from relativistic or antiscientific points of view, not believing that science really talks about reality, or they relate the scientific twilight to the limits of knowledge. However, there is a lack of works which question the sense itself of the pursuit of the truth among present-day thinkers. Of course, there are many humanistic approaches which simply ignore science, but ignoring is not the same as considering its sense or lack of sense. There are many well-prepared scientists or journalists who move in the world of science and consider it in their interactions with the rest of society, but usually they focus too much on the scientific and technical details and do not go deeply enough into existentialist or subjective approaches. A wider vision of both worlds, those of the humanities and science, is necessary to undertake the task. I feel I am able to offer something of this sort, given my experience as both scientist and philosopher. It is not a matter of virtuosity in either scientific knowledge or other areas but a matter of being able to integrate a global view of the fate of our societies. Normally specialists are too focused in their narrow or biased views to offer a global analysis and feeling.

When we talk about the sense of something, we cannot undertake a pure analysis in objective terms as in a scientific study. The professional activities on those who dedicate their lives to natural or social sciences usually overlook the fact that, after all, human beings do not move because of *reasons* but because of *emotions*. As psychoanalysis claims, most of our actions are determined by unconscious impulses. And science itself is not an exception: It is made by men whose motivations stem from factors other than a mere pursuit of knowledge. We are not machines, we are not gods; we are just animals, very peculiar animals and very intelligent and curious, that make scientific enterprises work, but subject to multiple internal and external conditions.

Societies as a whole are also sensitive to motivation. As a matter of fact, not all societies developed science. And, as it is known, even civilizations which developed that world-view and that methodology of observing phenomena can decline and lose their interest for continuing the scien-

tific activity. That happened in Western Christian countries in the Middle Ages. Were the Middle Ages a dark age? Possibly, from some intellectual points of view, but it was not the end of civilization. It was an era with plenty of resources to create magnificent things, such as cathedrals. There were means to carry out great advances in many areas. Christianity was not intellectually underdeveloped with respect to Muslim countries, and basic knowledge of Greek science was also present; however, with very few significant exceptions, there was not a great development of sciences in Christian Europe during nearly the ten centuries of the Middle Ages. Why? Maybe because people were not motivated enough to think about nature. Surely, religious context had something to do with this, and the philosophy associated with religion which was ordered to follow faith above all. But possibly this is not the full explanation: The great revival of science in the Renaissance took place within similar religious creeds; also, the Muslim religion was not so different to Christianity and allowed in the Middle Ages a higher development of sciences, declining later when science in Christian countries began to dominate.

In our era, the conditions are very different to the Middle Ages. Nonetheless, in a not very far future, societies embroiled in a lot of survival problems (overpopulation, lack of energy resources, economical crises, global warming and other ecological disasters, wars, plagues, etc.) may begin to see research as an activity that is not profitable enough and may abandon pure science research. At the beginning, people will trust scientists to solve all their problems, as it happens now, but they will realize that science cannot satisfy all those expectations, and that the returns of hyper-millionaire investments are smaller and smaller, nations will reduce more and more the titanic economic efforts necessary to produce some tiny advances in our sciences, to a point where scientists will say that they cannot continue their activity with such small budgets; consequently, the research centres will begin to close, one after another. Is this the prophecy I want to develop? No, I do not want to talk about prophecies. The future is uncertain and what I have described is only one possibility among many others. I want to speak about our present society, and the trends that can be observed now.

Normally, throughout History, thoughts occur in advance of acts. What we are observing around us now are the effects of an ideology which was in some minds many decades or centuries ago. There is a slow inertia in societies which makes them move at the rhythm of impulses that originated some generations back. Geniuses are in advance of their time; what is famous at any moment is representative of a tradition of old, worn-out ideas. Religions gained their maximum power and influence a long time after they were developed: Popes and priests in the Renaissance, embedded in corruption and malpractice, with much less idealism than the conceivers of the religious ideas, were dominant in a time in which the most important creators were pointing to other directions. Today, science and some of its priests occupy an important status in our society, and gargantuan amounts of money support them. A superficial view may lead us to think that we live in the golden age of science but the fact is that the present-day results of science are mostly mean, unimportant, or just technical applications of ideas conceived in the past. Science is living on its private income.

My interest is to lift the curtains behind the stage of science, and see what is going on in the engine room. If we want to ascertain which will be the next performance on the stage, it is better to see the organization from inside rather than just assisting with the show. In any case, I insist, I am not a prophet and it is not my mission to say how the future will be. Also, it is not my mission to give a report of all the observed trends and ideas around the world of science. What I will

offer is my personal view, not necessarily reflecting the views of all conformist and non-conformist present-day thinkers.

The *leitmotiv* is a simple melody. Its harmonization with other melodies and rhythms and the orchestration which integrates all the voices is a more complex thing. As in Wagner's operas, we pursue an infinite melody: A continuous flow where the main melody gets lost among instrumental and human voices. The question of the sense or non-sense of the human endeavour called science must take into account many circumstances. The exhausting of important ideas to explore, the limit of knowledge, is part of the matter. The excess of information is another part. But there are more questions to tackle. The question about the sense of all this stems from those different sources, like a river that takes water from its tributaries, and also from the need for introspective reflection. From time to time, it becomes necessary to go away from the river and contemplate it from the shore. Where does the river go? To the sea, we shall answer. And what for? Is it to achieve Truth? Is it to dominate Nature? What for? For whom? Was man made for science or science made for man?

Thinking about the role of science in present-day society is thinking about the past and the future of humanity. Human beings must question from time to time all their principles and their usual ways of life. There is nothing sacred and untouchable. The missions that science had in the past have been totally accomplished, or almost totally. Now, it is time to reflect anew on our society for the future, not only science but also many other activities or concepts: Art, religions/sects, History, universities, economic systems, political systems, human rights, etc. Very few things are permanent, and all of them are biological, such as taking food and water, sleeping, having sex, etc. All cultural things are subject to change; there is nothing eternal in them. From an anthropological point of view, all the characteristics of our civilization are simple features of the human specie in a given period of time and a given geographical localization. Certainly, the success of Western culture, with the subsequent annihilation of other cultures, has expanded the geographical location of our civilization to the whole planet, and this might lead us to think that our concepts, such as the so-called human rights, are absolute and universal. A mirage, an illusion! We just live our moment of glory, such as those of many empires which have absorbed great portions of land. The Roman Empire and the Egyptian civilization were greater than us; they lasted longer periods of time, dominating relatively large portions of land for that era. They were perhaps as proud as we are of our Western culture but they eventually declined. Now, it makes no sense to us to bury and embalm the pharaohs under pyramids. Possibly, future civilizations will not see any sense in building huge particle accelerators or telescopes.

You may think that the pharaohs were wrong in their belief that they could preserve life after death, whereas we are right in our scientific truths. I agree. I am not a stupid cultural relativist: Of course, atoms exist and they are constituted by subatomic particles; of course, galaxies and stars exist. But the question is not about the truth of scientific assertions but about the place these truths occupy in our lives as human beings. In the Egyptian civilization or in our civilization, we are moved by our beliefs about what are the high values for our lives. The pharaohs believed that the great architectonic efforts of their people were worth it because that would allow them to be closer to eternity after death, and to show their status on earth too. Scientists believe that dedicating their lives to scrutinizing the laws of nature and making a complete catalogue of all the existing forms of matter, either inert or alive, will bring them closer to something eternal: truth; and make some

profit on earth too... But then a question like that of Unamuno arises: "when we have filled the world with industrial wonders, with large factories, with paths, with museums, with libraries, we will fall down exhausted near all this, and it will be, for whom?".

Behind the search for something permanent in our lives, something eternal, something absolute, there is most likely some fear of death. Death is an unavoidable topic if we are going to talk about the sense of some activity for our lives, or the sense of life itself, because precisely our certainty of the finiteness–and indeed very short compared to our aspirations–of our lives pricks our need to search for a sense. We waste our time: we will never find any sense in terms of eternity, but culture is fed mostly because of these aspirations, so the belief is not a bad business at all. Indeed, culture might be understood as the attempts of a civilization to alleviate the tension of the uncertainty which produces our certainty that we are going to die. From this psychological point of view, science is just one of the performances of this tension on stage among many possibilities.

History shows us many dawns and twilights in the different facets of human beings. Looking at the past we can date and understand the reasons for the birth of science. We do not know when its twilight will occur, but the reasons for it are already in the air: after a very hot summer always come the season for the drop of leaves.

Horgan[2] or myself[3] follow Spengler's[4] ideas on the end of history and the decline of the West, but focused on the world of science by making further observations and reflections on what might be called decadence, decay or the decline of science. My book *The Twilight of the Scientific Age*[3] discusses at length some of the problems of science nowadays, which constitute some symptoms of the decline. Basically, they are:

1. Society is drowned in huge amounts of knowledge, most of it being about things of little importance for our cosmic vision, or producing no advances in the basic fundamentals of pure science, only technical applications or secondary details.

2. In the few fields where some important aspects of unsolved questions have arisen, powerful groups control the flow of information and push toward consensus truths rather than having objective discussions within a scientific methodology; it gives few guarantees that we are obtaining solid new truths about nature.

3. Individual creativity is condemned to disappear in favour of big corporations of administrators and politicians of science specialized in searching ways to get money from States in megaprojects with increasing costs and diminishing returns.

We can use one adjective to describe the status of science at present and in the near-future: *decadent*. It is only a subjective perception. Possibly other people will think the opposite thing, that we live in a golden age of science. There are plenty of reasons in favour of the first thing (see in Ref. [3] many examples of malpractices, and of hyper-millionaire investments to get insignificant results in comparison with the greatest ones in the classical science). Rather than a question of pure argument, it is a also question of sensitivity, of being able to perceive the sense or nonsense of the major enterprises which are nowadays called science from a human point of view. The quantity of publications, the quantity of big instruments and the technology created, the number of jobs created in research, the accurate control of our science in comparison with past times, etc. might

be arguments to show that science is presently living in a wonderful epoch. However, I would reply, the spirit of science is being lost. And how do you measure the quantity of spirit? No, it is not a measurable quantity; forget about creating a new *scientometric* method to determine the amount of scientific spirit. It is a question of sensitivity: just look around; just talk with some leading scientists and observe their lives, their work. Technocracy is replacing the joy of scientific creativity.

Science is becoming a nonsense for humanity. During the last century, science has advanced more and more in technical terms, more and more in its investment in very expensive experiments, in the amount of information it generates, but it has gone backwards with regard to its motivation. The force which pushed humanity to walk towards knowledge, enlightenment and reason is now pushing very weakly. Now, science continues to work because of its inertia but is subject to some friction because to its erosion. Our science is tired, exhausted. It walks entangled with economic forces rather than with human dreams. Science has lost its first attractiveness; only simple technical operations remain.

Our science has become an animal without a soul, or it might be better to say, a colony of animals, a group of organisms which devour human efforts and do not offer anything but growth for the sake of growth. Scientific organizations behave like a colony of bacteria which reproduce as far as the available food/money allow. The more you feed them, the more they grow: more Ph.D. students, postdocs, staff researchers, supercomputers, telescopes, particle accelerators, papers, etc. And, if the money tap is closed, the people dedicated to science and their by-products are proportionally reduced. Almost everything in present-day science is reduced to find a small fiefdom of nature to analyse–whether there is any fundamental question to solve in this analysis does not matter–, and publishing papers on it and getting citations from colleagues with the aim of getting jobs and extra money for expenses. Getting money to employ more Ph.D. students, postdocs... and when these students and postdocs grow up, they become new senior researchers who ask more money, and so on. The sense of all this industry is one of primitive life: just a struggle for survival and spreading (intellectual) genes.

The role that pure sciences (apart from technological applications) will occupy in the culture of the humanity in the future is unknown now. Let us hope it will retain our tradition of understanding how nature behaves, but in a different way from what we have known up until now. Let us wait and see if future generations keep the best of it.

References

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[2] J. Horgan, *The end of science. Facing the Limits of knowledge in the twilight of the scientific age*, Addison Wesley, Reading (Massachusets, US) (1996).

[3] M. López Corredoira, *The Twilight of the Scientific Age*, BrownWalker Press, Boca Raton (Florida, US) (2013).

[4] O. Spengler, *Der Untergang des Abendlandes*, 2nd ed. (1923). Translated into English in: *The Decline of the West*, Oxford UP, New York (1991).