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The twilight of the scientific age (Martin Lopez Corredoira, Brown Walker Press, Boca Raton, 2013)

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Martin suggests in this book, with compelling arguments, that science is in decline. I would say more: the scientific research is decaying, the scientists are deteriorating themselves on both professional and moral side and science is lost. The cause resides in the lack of control of the money and democracy. Unlike others, I view this social phenomenon as a natural one, and would not try to give advice for changing the course; it would be naive, unrealistic, presumptuous and ridiculous. I still believe, with Leibniz, that we live in one of the best possible worlds. Martin's book reminds me of the impressive Spengler's "Der Untergang des Abendlandes" from the 1920s.

To start with and put the things in perspective Martin gives a short account of the history of natural sciences. Along the centuries science gradually became important because it taught us the difference between necessity and arbitrariness, it taught us geometry, astronomy, it taught us that Earth rotates about its axis and turns round the Sun, and it is not the centre of the Universe; it taught us about numbers and how to represent things in the mathematical mode. All these are spiritual things, of no direct practical importance, but they were much appreciated, due to their surprising way of giving knowledge. On the other side, much practical, empirical knowledge has been accumulated during history, which led to what we call today physics, chemistry, biology, medicine and science in general. I emphasize two things: first, this practical knowledge was of great importance for human life and, second, it was not discovered by science, but it led to science; it was discovered by a series of inventors, innovators, sort of visionary people with little scientific training, if any, but with an insightful grasp of the things. I would like to try to remove from our common acceptance this confusion between science and empirical discovery.

When Newton explained the motion of the planets and the motion in general he did a spiritual thing, of no direct practical relevance or usefulness. The same when Descartes put numbers in geometry, when Galilei measured the fall of a stone; when Maxwell explained with fields the Faraday's experiments with electrical currents and magnets, when Boltzmann became aware that we are governed by chance, when Einstein "suspected" that the time is not absolute; when the quantum physicists understood that small things move to a great extent in an indefinite way; when physicists understood that this world is only a change of nothing, like energy; we have the cat's smile, but no cat. Similar spiritual visions have been put forward during history by the other sciences, like chemistry, biology, medicine, etc. Science is counterintuitive and there was a continuous quest for the perplexing things the scientific inquiry may offer.

On the other side, the practical knowledge built its own history in parallel with the scientific history. For instance, the heat engine was in the mind of many, until Carnot has taken up the subject more seriously. Nevertheless, his "Reflections on the motive power of fire" are far

from the second law of thermodynamics, the heat loss or the famous efficiency quotient of the Carnot cycle. On the contrary, the interest in this practical matter contributed to the initiation of the development of thermodynamics. Edison and Tesla knew nothing about Maxwell equations, Marconi had little knowledge, if any, of oscillating, resonance circuits, people became aware of the nuclear fission only after Otto Hahn found that uranium bombarded with neutrons splits into barium and something else, similar with barium, the semiconductor science appeared only after the curious and unexpected transistor effect was shown, etc. Such discoveries were not based on scientific knowledge, or at least not on the relevant scientific knowledge. On the contrary, they stimulated the development of the scientific theories, on one hand, and, on the other, they were turned into useful things by a systematic engineering work. Science, technology and engineering, which is the art of transforming empirical knowledge into useful things, are quite independent of one another; of course, there could be points of contact, but I am not sure whether there are more such points between science and technology than between technology and art, for instance; I am not sure whether da Vinci's "technological" constructions respond more to scientific rigour than to artistic beauty. It could very probably be that Vannevar Bush's ideology, which is still prevalent, claiming that science discovers things by theory, checks them by experiment, transfers them to the applied science which makes prototypes out of them, then engineers intervene and transform them into finite technological products, all this theoretical, scaffold-like construction, could, very likely, be simply wrong. It is funny that such an accomplished engineer, who, obviously, knew nothing about fundamental science, puts such a great emphasis on pure science, viewed as the originator of all good things! I incline to think that the adjective "scientific" has been inappropriately extended to technology, engineering, empirical knowledge, and is used today even for such things as marketing, sports or medicines, in an exaggerated effort to enhance respectability, dignity and loftiness. Today, almost every thing is "scientific"; there is nothing "useful, suitable, appropriate, good, nice, interesting or attractive" anymore.

All these observations above are meant to discourage the requirements made too often, too stubbornly and too stereotypically by various science managers and science politicians to science to produce welfare and comfort. Science does not produce welfare, comfort, money, pleasure, or fame; on the contrary, science produces problems, worries, responsibility; it does not point at all to the "wonderful powers of the human mind, which equals that of God"; on the contrary, science teaches us modesty, humility, often it points to the tragedy of the human condition; and only sometime it gives a little hope.

If society wants to be rich and satisfied, then it should cultivate engineers and innovators; this way, it may expect new, practical, useful things and even new discoveries of this order; though such things have their own logic, rhythm and measure, and nobody can tell what they would be, when or where. As regards science and scientists, if society is curious about spiritual things, it may cultivate science; if it is not, science will decay; but asking science and scientists for prosperity, success and fame is a futile perversion. By science we try to "accommodate our ideas (if we have any) to our sensations (if we feel something), which is helpful in the battle for existence".

In the old times the scientific inquiry was done by university professors, or members of learned societies, driven (pushed, forced) by the force of curiosity; curiosity about God, human being, life, existence, nature, etc, etc. Such scientists were sustained by kings, emperors, princes and, in general, local rulers and society; often by the church. There was more wisdom in those times, due to the regulatory force of the rulers and the church. The times have changed. People multiplied, life became more comfortable, as a consequence of acquiring practical knowledge, of developing communication and transportation. But above all, science has shown, more and more convincingly, that God may not exist, that human life may be governed by blind chance, that all our acts are mechanical, or chemical, or physical; that, in general, life has no meaning, no sense, that there is

no hope, that everything is allowed and all that matters are welfare, money, pleasure, here during our brief passing on this Earth; that there is no life after death, no resurrection and no salvation. "A dream of eternal night is the life of the entire world". Consequently, people made revolutions, killed the kings and forgot the church. The church, the kings, society at large were in fact very disappointed with the findings of science: everybody expected something honorable, elevated, lofty from science, while it came up with such a disappointing teaching. During this big transformation of the society everything received a use value; beauty, justice and truth were disregarded, honor and responsibility were thrown away. Science started to be estimated according to its use value.

Nowadays scientists are in universities, research institutes or governmental and industrial laboratories. Everywhere they are required to produce discoveries of practical use; they are transformed into engineers, innovators; they were trained for something else, and cannot respond to inappropriate requirements; under such circumstances their professional output is irrelevant. Also, one of the most common requirements formulated to science is to bring fame. That means the scientists should publish many scientific papers, in good journals, and these papers should enjoy a large number of citations. Various scientometric tools have been invented to this end, as the well-known Hirsch index. A scientific publication is a means of communicating scientific results; the aim of the scientific research is to get scientific results. Asking for publications is to mistake the means for the aim, which is a grave error with damaging consequences. A good journal today is that journal which publishes poor papers, capable of being discussed by many, in their usual poor way, sensational or aberrant or, simply, illiterate texts, because only such publications can reach the masses and bring many subscriptions. Schwinger might have been singular and aristocratic with his idiosyncratic calculations, but Feynman "brought the calculus to masses", as a true democratic icon. Unfortunately, science is aristocratic, not democratic. Many citations are only assigned to poor papers, *i.e.* papers which are wrong, or incomplete, or trivial or plagiarized, because only about such papers the many can tell something. A good paper enjoys a few (proper) citations over a long period of time.

From these adverse circumstances and great pressure the scientists invented escape routes. All of them are fraudulent. First, they publish poor papers, with old, wrong, trivial or sensational results; they made them serial papers, usually plagiarized from other papers, theirs or others', or compiled from common, popular texts from the net. To protect themselves from possible reproaches usually they add a long list of co-authors, preferably from among those with a high social or professional position (who gladly accept to be enrolled; often asking to be included); or they put on the co-author list young people, women, minorities, disabled, sometime children, etc, in accordance with prevalent, influential political views (soon enough, I expect to see the names of their pets in the list of co-authors). Democracy prevails today in scientific matters, to such an extent that the neutron mass, for instance, was once established by vote; while the scientific truth is established by consensus. Next, these scientists, who are all so cunning, organize themselves in gangs, very much alike the criminal mobs. According to the democratic rules, the editors of the scientific journals ask (anonymous) referees for their opinion about the submitted papers; the editors decline any scientific competence. Now, it is easy to see that I may act as a referee for your paper and you may act as a referee for my paper, so that our organization acquires a huge number of published papers. The more numerous and more disciplined we are, the stronger our organization is! Similarly, you cite my paper, I cite your paper, so we accumulate a huge number of citations! Including the improper citations, *i.e.* those which bear no relevance upon the contents of the paper; nobody checks. I cite your paper just, simply, because it is yours, and we are both members of the same fraternity! Usually, the success is celebrated in many touristical conferences, symposia, workshops, meetings, where the solidarity and the fraternity spirit are forged and consolidated.

The use of (anonymous) referees, the so-called peer review practice, is one of the most unfortunate habit in the publishing process of scientific papers. Einstein complained to an American editor for having sent his submitted paper to a referee, because it would be completely inappropriate, for obvious reasons, to show a paper not yet published to another person, especially when that person is an expert in the field and an anonymous person. Einstein was concerned about honor, dignity and responsibility, things the scientific community of today does not care of anymore. This practice of anonymous referees was imposed by the force of democracy, with the obvious aim of favouring the poor publications of the many, identifying and favouring the most influential gangs of scientists, sustained by big funds.

The fraudulent practices of the scientific communities are even of a larger ambitus. A usual habit for governmental, managerial and political bodies in scientific research is to award financial, funding grants for research projects; it is claimed that the allotting process is based on competition and merit, much weight being put on competitiveness, excellence, performance, record breaking and, in general, adventurous, mind-bending and sensational concoctions (which attract the stupid, illiterate society and politicians). In these circumstances the scientific gangs are enlarged with administrative, managerial and political characters, who help falsify the awarding process; the funds are, of course, shared. By this practice there are researchers who get 4-5 times the normal salary of their colleagues, in a systematic way extended over years, with a corresponding return for their highly-positioned connections, in a generalized and deep corruption. Moreover, the output of such projects, which is null from a scientific standpoint, is usually awarded a prize, *i.e.* money; with such money the politicians and administrators are bribed. In a country which I know well, scientific papers are awarded money prize which, according to the regulations, are shared equally by the co-authors from that country; but if you have co-authors from abroad, you take the whole prize and do not share anything with these foreigners. It is easy to see what sort of arrangements can be made with your friends from abroad!

The organized crime in scientific research is very active, with huge amounts of money, in the big and famous international research institutes and organizations. For instance, one such institute plans to publish a few hundred scientific papers per year (100 to 500) every year. Each of these papers may have the following logic: "we analyzed all the events in the energy window from...to... with a lifetime greater than...; we found none"; the dots are filled with different numbers from paper to paper. Or "we have measured the magnetic properties of alloys of the chemical elements from the atomic number of ... to ...; interesting differences have been found, not exceeding 0.00...01%"; or "we have recorded the radio emission of the star clusters from the sky zone from ... to ..., with a resolution higher than ...; we found nothing above the noise"; or "we measured the electric dipole moment of the electron with an accuracy...; if it exists, it is smaller than..."; etc, etc. Each paper has a list of a few hundred co-authors (for instance, 15 hundred co-authors!), because the collaboration is big and international. And now is the surprise: each co-author place costs a few thousand euros! (like a place in a graveyard). If your institute or university is part in such a collaboration, it is sufficient to recommend you, and you will be automatically included in the co-author list of such international papers, without, of course, contributing any scientific work to those papers; you become overnight co-author to a few hundred scientific papers you were contributed nothing to, just because you pay the ticket! Your institute or university will pay the bill, according to the number of its members who were enlisted as co-authors on those papers and the number of papers on which their names appeared; these points are negotiable. This way, your institute or university gain great fame and international recognition! The country which I know well pays annually a few good million euros for such affairs; its fame and international recognition in science is very big! That country is a big nuclear power, a big spatial power, a big high-energy power, a big astronomical and astrophysical power and a big international, if not planetary, optical

power in atomic lasers! In fact, there is a group of directors, projects leaders, ministers, managers who get a sufficient amount of fringe money from that huge main amount involved. In addition, the national co-authors are awarded the due money prize for taking the national fame and pride to the highest levels, and the bribe works again.

On this occasion and in this process, basic notions of science are fully distorted, the old physical theories, for instance, surrender in turns under the assault of the powerful imagination whetted by money; these people impose their truth by the brute force of the administrative and political authorities and by the democratic rage of the heated mob. In a country which I know well the audience of scientific seminars is forbidden to speak, comment, or ask questions in seminars; in exchange, it is required to applaud at the end of the seminar, and to rejoice. The scientific commissions and committees which approve the scientific truth, projects, reports, doctoral theses are named by directors, from among those which are reliable; it is also not recommended to speak about undesirable scientific issues, or to express a negative, or, at least, doubtful opinion about the scientific discovery of a colleague, or a good person; in general, there is a list of accepted and recommended scientific subjects and a list of people with clearance for speaking about them; usually, the best is to go see the directors in order to get guidance in the complicated scientific matters and practices, and to be reassured as to what is good and what is not to do; for the dissident and the disobedient the silence is the reward, and the anonymity (and, of course, the ban to publish, to get projects, to get promoted, etc). As we know, corruption is secured and perpetuated by dictatorship.

Of this sort are the practices of nowadays in the scientific research, and this is why Martin says the science is in decline and I say that it is lost.

One may say that I put only dark colours in the picture above, while it is well known that science and the scientific research have great success, impressive achievements, that they fly with widely spread wings to the highest levels of progress. These are great and empty words. The big projects of scientific research are scheduled to be completed in 5-10-20 years with prolongations, when nobody can control anything anymore, when the promoters may have disappeared from this world, when conditions will have changed considerably and everybody will have forgotten the magnificent intentions. For instance, one such big international project started in 2010 (after decades of preparation!) and it is scheduled to be completed in 2027! During these big projects a lot of money is spent, in fact wasted, and the involved scientists make plans of what they would be doing with the project's output, when the project will be completed (if ever!); "she'll be coming around the mountains, and be driving six white horses". These plans are called "tdr" in jargon, *i.e.* "technical design reports", and for such sort of paper work cohorts of scientists are paid big salaries, during almost an active life! For instance, in a big international research institution there are one thousand scientists who, in the last 30 years, are studying a subject known in physics as supersymmetries; no need to say that no trace whatever of such phantasies. In the scientific research of today we have replaced the work toward a finite, definite, well-defined output by our desire and phantasy, which we call "project". Moreover, in those rare cases when a project, or part of it, is finished, it necessarily produces a discovery, according to the plan; such discoveries are planned, known before in detail, the project is only a confirmation of our planned research, nothing new is allowed and does not appear. Practically, there is no need for a project as it only confirms our prior knowledge. Leaving aside that the discovery is unique, nobody could possibly repeat it, duplicate it, because the project is so big that we have only one, it is impossible to have two or more. A singular fact revealed to some and forbidden to others is not science, it is dogma and a matter of belief. Now I think you may see better why I say that science is destroyed in our epoch.

Similar things happen with smaller projects, at a smaller scale. Of course, there still are a few

scientists who deal honestly with science; usually, they do not make discoveries, it seems that there is a historical logic behind the scientific discoveries; probably, they endeavour to connect science with the sensibility of their own epoch. They are a few and anonymous, and surrounded with the usual conspiracy of silence; they do not matter, and it is of no interest to speak about them anymore.