

# The last quitters: nobody's science and physics

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## Abstract

This article highlights our growing concern with the course of science in general, in particular with the course of physics. The analysis carried out is based on the experiences lived by the authors and on the reports of several fellows scientists who are honestly concerned with the role of science in the social development of nations. The message conveyed here is, above all, a warning against behaviors and practices that threaten humanity's constructive-creative potential, a potential that will soon be decisive for the perpetuation of the species. Here we emphasize the situation of science in Brazil.

**Keywords:** Science, Physics, Two Cultures.

## Resumen

Este artículo destaca nuestra creciente preocupación con el curso de la ciencia en general, en particular con el curso de física. El análisis realizado se basa en las experiencias vividas por los autores y en los informes de varios científicos becarios que se preocupan honestamente por el papel de la ciencia en el desarrollo social de las naciones. El mensaje que aquí se transmite es, sobre todo, una advertencia contra los comportamientos y prácticas que amenazan el potencial constructivo-creativo de la humanidad, potencial que pronto será decisivo para la perpetuación de la especie. Aquí destacamos la situación de la ciencia en Brasil.

Palabras clave: ciencia, física, dos culturas.

## I. INTRODUCTION

In Brazil, there is a frequent confusion between academic roles in addition to a certain taboo regarding the designation "scientist"; here, we are "researchers", not "scientists". Furthermore, careers overlap, as the researcher is often forced to teach for survival reasons and not as a transitory outcome of his work. At first glance, it may seem that these features are only peculiarities of the culture and the local socio-economic situation, but this confusing context has unpleasant consequences. For example, a good researcher is not always a good teacher; a physics graduate individual is not necessarily a physicist in the sense of being a daily scientist. As there are no clear boundaries between specific competences, it follows that a large number of unqualified professionals for the required skills are raised to the doctoral academic post. At the same time, teaching hours are required from those who should be working full-time doing scientific activities; under constant demand for publications, these academics end up producing fragmented works of little or no significance for the global community. Moral of the story: low quality science and low quality learning. This is certainly not a problem only in Brazil; every colonial-based society — where there is political favoritism and prioritization of personal interests — suffers from the same evils. Under the conditions described above,

one should not expect much creativity and interest in innovation.

There is a clear difference between "teaching" or "studying" physics and "doing" physics. It is obvious that the same type of difference applies to other areas. But in theoretical physics something quite different is going on. The needs for abstraction are tremendous; there are many formal tools to dominate and a wide range of concepts and definitions linked to well-established laws. The price of productive dedication is very high; sometimes, the physicist has to give up good ideas that just don't work; many things are given up, even some feelings. It is, to a large extent, a steppe wolf life.

It is evident that to get to do physics it is necessary to dedicate many years to the study of this science. However, if such a study is not conducted by a judicious and logically selective mind, capable of capturing what really matters, leaving aside everything else that is superfluous for the desired goal, it shall be overwhelmingly probable that the physicist shall find himself walking in circles; he shall get lost in redundancies and purely mathematical exercises, since physics presents itself as a practically inexhaustible discipline in its offer of themes and problems, some of which can consume a whole life without resulting in conclusive answers. No need to go far to realize this;

mechanics of solids, for example, presents an expressive collection of unresolved problems.

Several physical concepts would deserve in-depth critical studies well conducted by philosophical thought on representation, language and meaning. Time, for instance: we are always dealing with it, confused mainly because few are willing to discuss it in depth; one-dimensional time is accepted as inevitable in equations and models and we transmit this attitude of tacit acceptance to young students.

Also, we circumvent or cover topological singularities without even questioning whether we are ignoring important physical facts or whether we are dealing with wrong math tools. Furthermore, Ivainer and Lenglet recognized in 1996 the strangeness of admitting gravity as a perfectly clear phenomenon for most of the public, even for physics teachers and students, when in fact, of the four fundamental forces, it remained the only one to refuse a consistent quantum representation, not to mention the question of whether we can really consider it as a force in the conventional sense, and the question of whether it is truly possible to quantize gravity. That hasn't changed since then, even though gravitational waves have been discovered. Several similar examples could be given elsewhere. There are many crucial problems in contemporary physics that remain open. We've been stuck, so to speak, for some time now. We fear that most of these problems are due to the fact we continue to insist on old ideas and concepts, perhaps trying to save models to which we cling too much. More than that, we may be too limited due to language problems. Of course, we can believe that if we know the interactions and symmetries involved in a theory, then we understand the physics represented. We have had considerable successes thinking that way. However, we do not believe that we can go much further without opening up a more creative thinking. But, as it was said in Brazil, creativity and originality are pursued with thwacks in the halls of the academies.

To develop a creative physics is not easy, especially in economically dependent countries. The education system needs to train selective minds and encourage to question and to risk new concepts. Notwithstanding, from the way things have worked out in the world, it seems that no one wants this, or at least no one who is in power.

A decisive factor in inhibiting creativity is the "publicism" that we talked about earlier and that prevails among teaching and research institutions. As observed Moreira (2018),

*"Publication is important for the growth of any area, but today there is a publicist culture in which what matters are articles published in 'well-indexed' journals with a high 'impact factor'. The publication is trivialized, commercialized and even predatory. In science, this publicism is putting an end to creativity, because researchers do not take chances on projects that may not generate papers, and it is creating a false science, because many published results are not reproducible."*[12] (authors' free translation).

Hermes-Lima also makes a pertinent comment in particular on Brazilian scientific production:

*"...the industrial scale production of academic studies has reduced the quality of science, which is an artisanal activity."*[13] (authors' free translation).

To understand this strange context, this systematic opposition to one of the most wonderful virtues of the human being — the ability to transform simple curiosity into an obstinate search for satisfactory answers —, it is necessary to appreciate the current world situation of science in general, highlighting some examples and particularities of physics. By means of forensics we hope to alter the *status quo* because real-time has real meaning for humanity's future; because of people's intellectual capability, for human beings there can never be a true bioshell *status quo*. Only mad-scientists and crazed architects, our 21st Century imitators of those hated stereotypes in the James Bond movies, seem intent on restructuring the real-world into some hideous model of a bizarre commercialized Paradise [1]. Virtually all funds earmarked for research in Brazil comes from the Government, unlike countries like United States and China, where the private sector is primarily responsible for research and innovation. In Brazil, there is no dialogue between academia and the business world, a feature that puts the country in a kind of Middle Ages of science and technology. In addition, the public structure is archaic and full of loopholes for corruption. In this scenario, although the media wants to show the opposite with well-starched clothing and chrome shoes, there is no reason for optimism.

## II. THE WORLD AS IT IS (ONLY GRAVITY AND DEATH)

Let's start with a little realism. The idealistic view that there is a science free from corruption and interests far from human well-being is out of fashion in an increasingly materialistic world. During the first decade of the 21st century and the first half of the second decade, much of the Brazilian science and technology has been harnessed by a damaging and retrograde ideological bias orchestrated by the governmental control program in force. An unfortunate composition of functional illiteracy and corruption pervaded all institutions and left us a trail of abuses with public funds, in addition to the complete abandonment of education. This harnessing threw Brazil into an even greater scientific backwardness. Physics was certainly one of the first to suffer, since in such circumstances, in a fundamentally agrarian country and with the worst indicators in basic scientific education, few people are interested in physics.

For our misfortune, those in power control how the 'science' goes, and power is now so associated with corruption that, going right or wrong, science has been forsaken by many good and honest researchers completely disgusted with reality; they were gone, giving up the ship, because the system — institutional cultures and almost obscene societal influences — is morbid as a whole. The current situation is, in fact, a news media-hyperbolized

replay of previous widespread outlooks that reminds us of the ridiculous conceit 19th Century Europeans exhibited when many supposedly knowledgeable, formally well-educated persons foresaw the "end of Geologic Time" [2].

Although there is still some fleeting curiosity, there is a deep disregard for issues that do not promote immediate practical results. This is the case with General Theory of Relativity, Astrophysical Cosmology, Quantum Gravity and so many other branches of physics. It is a natural consequence of a society focused on repetition (mass production), not on creation. It would be enough for the education system to show that knowing a little about the immensity that surrounds us would enlighten us a lot about the immensity of our ignorance; that this enlightenment would place us in a completely different perspective on life; that this perspective, in short, would free us from mediocrity and make us less susceptible to grotesque socio-technical projects and influences. But this is exactly what most desire those who are philosophically blind and are willing economic and sociologic "hostages" to popular culture: to have totalistic control of all obvious routes of humanity's future shifts in the real-world. Only market productive systems are of interest; any creative effort outside the sphere of production outputs and consumption inputs does not deserve due attention.

Furthermore, a daily philosophical stance would make us more critical and restrained about our habits, a fact that sooner or later would ruin the warped prevailing commercial market model. To avoid this danger, powerful untouchable elitists use aggressive news-media resources to create fantasy world-future scenarios which facilitate mass control of society by immersion of laypeople in messy worlds of silly geophysical [3] and cultural distortions, full of dragons, superstitions and other rubbishes. Bringing a new and better real-world into existence remains an act of faith as well as one of designed school curriculums ("design" as a verb signifies the act of interplay, projecting, but as a noun it specifies its outcomes). We seek new courses of action aimed at changing existing unsatisfactory situations into preferred ones. We realize, however, that we have no other practical options in our work-lives at the intersection of the globalized popular news-media and Earth's bioshell. Still, science and technology does permit the miniaturizations of Michelangelo's DAVID via Additive Manufacturing [4]; this means we can, by using our imaginations at a different geo-spatial scale, to conceptualize new potential transformational actions in order to change our world thoughtfully and with love. Yet, only gravity and death are complete certainties [5]!

Many academic institutions (fortunately not all!) are full of corruption and obscure ideologies, and when we speak of corruption, we also refer to the immoralities of many conducts within academic environments. As a colleague Editor said, "what is desired or wanted is 'process' — the spending of money and supposedly doing something called 'research'." Travels promoted by the congress industry, financial incentives for 'research' devoid of any relevance, purchase of tablets and software, that is what really matters. Also, most of government grants are corrupt, and several

journals, magazines and other media are corrupt. Lies are taught in schools, and concepts are said to be 'important' without presentation of the reasons why they must be considered important (probably to conveniently direct thinking according to someone's ignorance!). A myopic vision prevents recognition of efforts that eventually only yield fruit for the generations to come. There is less and less interest on basic science, unless it serves to develop some revolutionary technological component for cell phones. Yes, this is the way things work! In Brazil things are even worse. Almost all physics practised in graduate courses dates back to the 1960s; there are not enough financial resources, and the public academic environment is largely feudalized, creating increasingly hurdles for those who wish to pursue an academic career.

### III. THE ESSENCE OF MIND DEPRECIATION

In fact, we are gradually depreciating our mental capacities, fascinated by technological conveniences. We believe that the main ferment of this situation is the dichotomy that was created between the "two cultures", greatly facilitated by post-modernism: on one hand, the "well-read uncultured", on the other the "ignorant cultured". Most physicists are apathetic with respect to the humanities, literature and philosophy; this is also true for other scientists. At the other extreme, we have humanists almost completely ignorant of the exact sciences, even expressing an aversion to them. In both situations the human dimension of knowledge and its objectives is completely lost. In socially underdeveloped countries, such separation is endemic. The educational system itself feeds this distance, trivializing logical-formal disciplines and depreciating variegated reading as the basis for the formation of the individual for life and for professional practice. We note that, for many years, physics has constantly been targeting of trivializations, being quantum mechanics and general relativity perhaps the most requested subjects. Here the literary activity is delusional: "quantum awareness", "quantum healing" and other nonsense are common terms on self-help shelves. From Irigaray's ridiculous claims about Einstein and general relativity to Latur's confused ramblings about special relativity, going through Feyerabend's lack of seriousness, we have a hard-post-modern barrier to overcome in order to reconnect the two cultures. In confluence with academic institutional feudalism, the separation between the cultures becomes even more destructive.

Academic feudalism has diverse origins, including mythical motivations. For example, the aura that involves field theories; of course, we are enthusiasts of field theories par excellence, but we recognize how much Maxwell's success has directed physicists to prefer field theories as being the best. This type of influence, which should be healthy if we kept our minds open to other possibilities, has fuelled the rise over decades of the feuds in public academies, creating obstacles for anyone who wanted to follow a different way. It is as if opaque patches were deliberately placed over our collective physics-focused

minds, humankind's "teletroscope" [6], and, thus, our visionaries trained only to observe the real-world by means of mirrored conference auditoriums and controlled environment lecture halls, rooms filled with mysterious, confusing reflections projected by the self-aggrandized elites through the popular news-media mechanism!

In economically dependent and socially backward countries, academic feudalism has a curiously psychological component based on the somewhat presumptuous myth that "our institution is an island of efficiency and modernity". This statement, although it might have some real ballast, should at least serve to spread socially inclusive actions to those who wish to follow standards that are surely well referenced, and not act as a background for the perpetuation of closed elites. In addition, there are also internal disputes over prestige and funding, not always conducted within the limits of common-sense, courtesy or codified professional ethics. Recently, in Brasilia, an elitist novelty in public academic environment has been widespread for some postgraduate courses, namely that candidates will no longer be accepted from undergraduate courses that do not confer a bachelor's degree! How so? The reasons for this arbitrariness are the most absurd, but in truth they translate nothing more than a reductionist workload strategy for researchers who guide students and are too lazy to guide them, since all that matters is the famous 'stability of employment', whether or not there is work. We sincerely hope this is just a false alarm, otherwise we will be witnessing one of the obscenest acts of academic segregation never seen before in Brazil.

Obviously, there are exceptions to the general rule, but, unfortunately, such exceptions are few and, in most cases, with little active voice. The end of the day, most settle and live their lives the way the world works. Continuing in this way, soon there will be no one else to leave the platforms, as those who remain will have been completely absorbed by the system. In 2015, Vessuri [14] painted the picture of Latin American reality in an irrefragable way, a vision that still lingers today:

*"Recognizing lost opportunities and talents is often painful. The historical record of many countries outside the OECD (Organization for Economic Cooperation and Development) shows us well-trained researchers who have either abandoned their countries to the North or surrendered to their countries' conservative elitist apparatus, accepting the status quo instead of participate in a modest portion of public funds and without the prestige of appearing as vectors of modernity." (authors' free translation).*

All of this is very disappointing and only increases the number of good scientists who leave the scene to do something better with the warmth of their families. Yes, this is the way things work! From what is perceived in human history, we have already made our choice to keep things as they are, today and always. There is no desire to change; everything must be consumed, and human life comes down to it: corrupting ideas, systems and beliefs in order to obtain immediate material results and alienation. We are passively replacing science with technology,

satisfying ourselves with collages of technological acquisitions that promise amenities and comforts that feed the minds without critical capacity. The interest in basic science is losing ground to a technocracy of insatiable material vanities, the superfluous above all; the more superfluous and disposable technology we introduce into our lives, inventing empty justifications for doing so, the more we become mindless, and the more garbage we return to the environment that stubbornly sustains us. It is as our esteemed chemist colleague Balasubrahmanyam in India said: "The next stage of Evolution of humanity should be 'clean up your mess!'."

#### IV. BARRICADES OF THE REAL WORLD

A civilization of disposables: nothing else is made to last, even scientific articles. Three to five years is the bureaucratic validity of a paper, at least in Brazil. It is true that a lot can change in five years. The problem is the generalization; there are seminal works that certainly remain valid for a long time, but institutions want mass production; they are not concerned with the nature of the publications, but with the counting of publications. If all articles are treated on an equal footing, with expiration dates after being opened like pate cans, this leaves us with little hope for the taste for reading the great classics.

Post-modernism, with its hollow literature and pedantic counter-scientific language, promoted the proliferation of bad taste, the belief in pseudo-sciences and the search for empty promises of a better world in self-help books. In addition, in the context of the industrialization of scientific articles, it was strengthened by the abandonment of reading science classic works in face of a new cyberculture with rapid production of disposable publications. Self-help "canned" literature doesn't really help; some books revere the "liberating habit of only having opinions based on facts", a very commendable act, this is sure. However, the questions are: 1) what real facts? and 2) what are the reliable sources of such facts? Those who control the direction of investments in science and technology are also those who have control over information and not only over it, but also over the technological devices to present it to the public.

It is not enough to say that the world has improved because we discovered penicillin and because we have cell phones. It is also necessary to measure each improvement potential by confronting them with the extent of the benefit from the historical set of anthropogenic facts. The fiasco of a better world in the current circumstances only gains strength as the two cultures are kept separate, and as the illusion of quality of life is fuelled by technological comfort. If the kleptocrats and technocrats who now defend the market culture understood that investments in environmental physics research and in preserving the environment can also generate profits through a creative industry based on recyclables and ecological education, we could rather wait for better days. But things do not go there; the world continues to be devastated.

## V. WHAT CAN BE EXPECTED

In Brazil, education is far removed from social responsibility, which is confirmed by the clientelist view of private education, by the anachronism of higher education and by the generalized negligence of public education. Major changes in these circumstances can take generations; they are essentially changes of philosophical base, starting with the reunion of the two cultures with the rescue of civism and letters. Connections between different areas of knowledge need to be spelled out in order to stimulate creativity. In fact, it is not necessary to charge a person for creativity; it arises spontaneously from the perception of these connections.

The reversal of the bad Brazilian indicators in science demands serious revisions in the actions chain of the teaching / learning process. For instance, in fundamental mathematics it would be of utmost importance to show the precedence of ordinality over cardinality from the early stages of human evolution to the cultural conquests that made possible to construct the scientific method. Still, in the scope of the exact sciences, we should teach geometry through physics, seeking to increase interest in both insofar as their natural relationship becomes explicit. Basic teaching of physics should also be strongly linked to environmental problems, so that students understand more effectively the importance of this science in the context of human survival. And so on, always displaying the connections of knowledge.

In countries that suffer from the abandonment of education, such as Brazil, a wide-ranging revision of teaching plans and course menus at all levels is necessary. Such reviews must be made by professionals recognized as qualified in education and endowed with the right skills in their respective disciplines, and not by improvised teaching impresarios, who, by political influence, assume decision-making chairs in education. Functional illiterates should definitely be removed from the decision-making sphere of education, and they should not even be allowed to give opinion on teaching strategies and content adequacy. Counterproductive evaluation processes such as multiple choice tests, which attend to bureaucracy rather than education, should be replaced by the recording of the results achieved during the development of abilities to recognize problems, to correctly formulate these problems in current and formal languages, and to provide creative solutions by detecting transdisciplinary interconnections. In short, it is a long journey, a trip that only the collective will to realize and win can make us take it.

## VI. FINAL REMARKS AND CONCLUSION

It is not necessary to be an economist to realize that the world economy has been growing in stagnation since the 1970s, a result that is not surprising due to the exhaustion of the automotive model and the weakening of speculation around oil production mainly in view of the growing call

for renewable ways of obtaining energy. There is a deceptive renewal effort seeking to make innovation and sustainability things to be sold as "marks". This is nothing more than a replication of the capitalist model since the "marks" do not reach who they really should. In fact, social differences have widened in the least favored countries; it is also a fact that in these nations science and technology are not managed to produce benefits for all people. Successes are forged for the media, feeding the false sense of prosperity. Once again Vessuri [14] is right:

*"In the historical context that I have outlined, it is clear that in countries with insufficient capacity and unstable political and social institutions, higher education and science and technology have not managed to reduce social and economic disparities - if they have not contributed to their increase. Some groups, institutions and countries are occasionally presented as successful stories in the developing world because investors, governments and experts need successful stories, not because they indicate positive and lasting structural changes."* (authors' free translation).

The conclusion that can be reached is very lamentable, mainly because the few true wise intellectuals who still manifest themselves are very close to the line of withdrawal. With respect to physics, there is a large number of primary school physics teachers in Brazil who abandon teaching, precisely because of students' total lack of interest in physics, low salaries and students' lack of education, the latter being one of the "great" achievements of the Brazilian populist management during the first 15 years of the current century. They finally succeeded in bringing the famous Brazilian impunity to secondary school students. Sad tropics!

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