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Slow Research: Science

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If we ask around what science is, in most cases the answer will likely be some sort of example related to mathematics, computer science, astrophysics, biology or medicine. In any case, the answers will identify the word 'science' with what has been classified as experimental science. Most of those answers, in all likelihood, will mistake science for technology, confusion nevertheless frequent among our political and academic authorities. If the same question were to be asked in a faculty of *arts*, the answer would probably be similar. If it were asked in a faculty of *sciences*, the identification of experimentation with science by means of technology would probably appear in 100% of the answers. *Social* sciences would then note that in order to verify these statements, a survey of a sample *x* within a population *y* would be necessary... However, our media, social, political and economic environment is quite clear. The current predominant thinking determines that not only those involved in science believe so, but also those who have nothing to do with it take it for granted: in the faculties of *sciences* they make Science, and not such thing is done in the faculties of *arts*.

In order to approach the subject of scientific research in universities I will start off on the premise that **Science** encompasses everything that extends knowledge in the present, either as a means to face the future (for example, communications) or to reveal the past, either recent (for example, the *Ancien Régime*) or remote (for example, the birth of a star). I will not engage in the debate on the scientific method, the bibliography is abundant since all scientific disciplines use a method: their own. That is the next aspect that should be specified: each discipline has features of its own simply because its subject of study is specific to that discipline. And that is the only requirement we can impose, that is, the suitability of the technological, methodological and/or conceptual tools to the object of analysis. Just as we cannot measure wavelength with a tape measure, we cannot require of a sociologist to analyse populations in culture, as a biologist would do, or of an art historian to replace the variable *style* with that of atomic weight. The practitioners of each field of knowledge are well aware of how inaccurate the tools we use can be. However, that should not question Science, it simply allows, or should allow, diminishing the importance of the absolute value of measurements in each field of expertise, and not the relative value of the knowledge produced.

Therefore, to each field of the complex *dispositif* [1] of human knowledge, correspond a sphere of action and a level of demand that are in turn mainly based on the level of development of the analysis tools. Hence, what is frequently called scientific production, and should probably be called instead generation of knowledge, cannot have a uniform growth rate. If that cannot even be demanded within a same field of study, just imagine when dealing with different disciplines!

The present note intends to emphasize a by-no-means innocuous fact, which affects the generation of knowledge in research centres, especially in universities. The current technologization of information management has entailed the acceleration, and the demand for further acceleration, of the production of papers and results related to research. This has led, for example, to the assessment of the *scientific* relevance of a given text against a list of several formal criteria which only reflect the objective quality of the journal –the regularity of the journal, its advisory committee, accessibility, blind peer review, etc.–, and against parameters related to the innovative nature of the proposal or to the impact of the text on the scientific community.

In our current context, books survive only with difficulty. Thus, from this standpoint, the edition of a book, which can be delayed several years between research, writing and publishing, is obsolete even before it starts; therefore, only papers, and only in certain journals, make some kind of sense. We do not question the fact that for some disciplines that is a valid approach. Unfortunately, though, it is starting to prevail, or at least is starting to be imposed, among all disciplines, and we are already seeing some of its problematic results.

Needless is to say that this system is based on the false premise that knowledge areas which are not in accordance with these demands are not Science. Actually, such kind of approach assumes that the best author is the one who publishes in the most read and cited journals, which would be as much as assuming that the best-selling novel on St. George's Day, which is frequently the most read and cited, is the best literary work. In the same way, this system presumes that the author who publishes in the best journal, the journal providing greater reliability and guarantees, is the best researcher. Which is in turn comparable to assume that the driver of a Ferrari is a better pilot than the driver of a Renault. The problem, in all those cases, is based on the full importance attached to the container and the very little significance attributed to the content. I would like to add that, in all those cases, innovation, that is, the kind of innovation specific to each field of knowledge due to its own characteristics, is a consequence and not a goal.

Time

As in almost all the processes analysed by Science, the determining variable in the analysis of the scientific system is time, **t**. And hence we come to the essence of the present note. How much time is needed to generate knowledge? How much time is required to increase the threshold of knowledge?

[1] I use this term in a Foucauldian sense.

Those questions are overall absurd, since time is a very discipline-related variable. For classical physics, time has a specific nature, which is different from that of quantum physics; in molecular biology or biochemistry the ordinary timeframe is infinitesimal; sociology usually deals with periods of weeks, months or years, whereas in history we are always tangled up in centuries, and for philosophy or theoretical mathematics time can either be non-existent or mean everything.

In that sense, I would dare to say that, given the essential logical divergences between the objects of study, the major difference that must be established is not between *sciences* and *arts* or between 'hard' and 'soft' sciences, a distinction currently in vogue (as if we were dealing with the alkalinity of water). The distinction must be drawn instead between experimentation, let us say experimental sciences –or better still, basic sciences–, and reflection, let us call them sciences of reflection –or better still, complexity sciences–.

In many scientific fields, the acquisition of data is essentially related to experimentation through the application of mathematical models, or the use of high or very high accuracy equipment, which, depending on the subject of study, allows for data collection within tightly controlled and usually short timeframes.[2]

In the case of most of these fields of knowledge, data collection is grounded in a well delimited theoretical corpus as well as in the 'updates' provided by the most recent papers published in well controlled journals, which guide research teams through the eventual innovations regarding interpretation of data, sampling or the nuances –or breaks– within the aforementioned theoretical corpus. The scientific production in those fields can be quite hierarchic. That is maybe the reason why it works as a sort of mechanism, in which each team member knows, at least approximately, how and when their contribution to the global project will be accomplished. It is not uncommon in these fields to complete a doctoral dissertation, which frequently consists of a series of several relevant papers headed by an introduction, in three years. Probably such a system optimizes energy, but beware: it promotes experimentation only in limited areas within the possible spectrum, and therefore presents a high risk of rewarding dogmatism. In such a rigid system the main problem is that dissident thought could end up being residual, and how can knowledge be generated without a general methodological and conceptual conscience that remains critical?

In many other fields of study, data collection relies on unstable theoretical frameworks, either due to the youth of the discipline, or to reasons specific to the subject of study. Data collection is here often related to a documentary survey without a clearly defined pattern. Technology usually plays only a minor role in the obtainment of these data, and only their management has experienced substantial changes in recent years. The generation of knowledge in these fields could only

[2] Of course, this will only happen as long as the laboratory conditions can be reproduced. In case we depend on a specific event, we are at the mercy of such event. It is obvious that a laboratory culture works within very controlled and short timeframes, whereas a series of eclipses happens within a controlled although very long timeframe.

allow for timeframe predictions on the grounds of a fragmentation of the objects of study, which, in the end, would nullify them. It is certainly a system with little energy optimization and it certainly has problems, since the lack of planning can lead to a dispersion of efforts and a lack of achievement of both results and project.

What we must understand, however, is that neither the pseudorandom nature of the data search and collection, nor the volume of the information at hand and its analysis, should be constrained by too rigid and short deadlines. As any geologist knows, slow crystallization produces larger crystals whereas rapid crystallization produces smaller crystals. Which are better, the larger crystals or the smaller ones? Geologists are barely concerned about that, because both kinds provide data regarding certain processes and conditions, and renouncing ones or the others would entail the loss of fundamental information about the geological history of a particular environment. What is interesting then in a paper, a thesis or a book, the time span required for their production or their actual results?

The only undeniable fact is that changing the **t** variable of the disciplines of complexity to adapt it to that of basic disciplines will only lead to a lack of research in the first field, albeit very swiftly. Should we consider a classification of research into slow research and fast research, independently of the field of knowledge within which it is developed? This would possibly enable a better classification, provided that we do not place all our trust in it, on the understanding that both kinds of research are essential for the generation of knowledge and that, furthermore, as every geologist knows, both large and small crystals can be found in the same mineral.

As the director of IRCVM, I can only wish that this journal, designed with an exquisite formal rigour, displays the crystallization of quality pieces of research without taking into account the time required for their materialization.