Are there any unwritten rules in scientific research?

Alfredo de la Lama García*

Translator. Pablo Contretas Fresán
E-mail: deepcolearning@gmail.com

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*PhD in Sociology, uam-i Universidad Autónoma Metropolitana, Iztapalapa. sni Member level I.
E-mail: adela2422@yahoo.com.mx

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Resumen

Este artículo es una exploración sobre las reglas del juego de la investigación científica, que por lo general permanecen ocultas para los no iniciados. Para develar su existencia se levantó un trabajo de campo de carácter exploratorio, durante el mes de octubre de 2010, mediante una técnica denominada recordación espontánea, a los investigadores de tiempo completo de la UAM Iztapalapa. Los resultados sobrepasaron las expectativas, pues aunque la mayoría de los científicos entrevistados, de las tres unidades académicas, reconocieron la existencia de dichos acuerdos (88%), sólo una minoría (9%) recordó alguno de manera espontánea. En tanto que, cuando se les enunciaron cuatro acuerdos relacionados con cierto tipo de actitudes, aptitudes y disposiciones, la mayoría las reconoció como reglas propias de los científicos.

Palabras clave:

- Acuerdos sociales
- Investigación científica
- Ciencia
- Metodología

Abstract

This paper presents an exploration of the rules of engagement for scientific research, which usually remain hidden to the uninitiated. To reveal their existence, an exploratory field work was undertaken using a technique called spontaneous recollection. The results exceeded our expectations, because although most scientists interviewed (basic and engineering sciences, life and health sciences, and social sciences) recognized the existence of such rules (88%), only a minority (9%) was able to recall any spontaneously. While, when four of these agreed upon rules –associated to specific types of attitudes– were mentioned, between 91 and up to 97% of scientists recognized them as ground rules for scientific activity. This discovery represents a step towards understanding the systems of inquiry.

Key words:

- Social agreements
- Scientific research
- Science
- Methodology

Research problem

The challenges confronting societies in the early 21st century are increasingly complex and involve risks that were unthinkable a few decades ago. In looking for solutions to these problems, resorting to empirical solutions or the unreflected importation of methods should be outmoded, appealing instead to more general solutions that may be provided by scientific research; hence the scientific research system, as such, has become a key ally in developed societies.

These future challenges invite us to enrich the learning of scientific methodologies in turn multiplying the number of people desiring to take part in scientific research. In this sense, G. Holton (1988: 200), sociologist of science, proposed resorting to: "Good teaching materials to show that there are processes at work in the creation of science, being that these are acts of reason, they may not be forced into the analytical-logical framework." This idea transforms the way in which science is perceived, for it deems to accept it as a creative endeavor of man, full of surprises, failures and achievements. Only if scientific research is effectively assimilated the possibilities of applying it may expand for solving the relevant challenges of our time.

The enrichment of science contributes to acknowledging that many of the actions –even the production of significant scientific research–, are of subjective and unorthodox origin, and are rarely made explicit. The scientist François Jacob (Brezinski, 1993: XI) wittily argues that this facet belongs to the realm of *nocturne* science "as opposed to the *diurnal* science, that is contained in manuals and articles." Russian physicist Budker (s/f, 129) also sees this second nature of scientific practice, but warns of the difficulty of explaining it by saying: "A scientific school also includes a set of elements for each day and each hour of work that are not exposed in manuals nor monographs, nor can they even be described in themselves." Another physicist, Leprince-Ringuet (1993: 29), reveals what he considers the secret of scientific learning: "The key is that it may not be found in books but instead, what may be discovered side by side with a teacher, a true measurement of things [...] As for what is important and what is only accessory." Brezinski (1993: IX and XI), a mathematician specializing in numerical analysis, meanwhile, is convinced that there are actions that are difficult to identify, that represent obstacles to the apprentice scientist:

> I realized a long time ago that the young researcher wastes time early on in his thesis, trying to acquire by himself certain techniques that are almost never taught, and also how easy it would be to remedy these shortcomings [...] Often he does not even know what is research about and what are its rewards and difficulties. He knows nothing about international scientific activity, contacts and collaborations among colleagues, about scientific communities, conferences, journals...

If the above statements are taken into account, there are aspects of scientific practice that are the result of informal habits or practices, but still academic –everyday chores–, which have not been made explicit, that is, are the product of a hidden curriculum, what G. Holton (1986: 228) called the informal component of science.

The fact that part of the rules of engagement of scientific research are learnt in an unconventional way affects the training of human resources, for carrying out scientific research is an art that is usually learnt through exercising the craft and thus, some precious codes are transmitted only through practice and example. The goal of this research is to help *identify and explain the informal components of scientific research* or put in a more playful way, we seek to understand *what are the game rules in scientific research.*

Theoretical Framework

The idea of the existence of agreements or informal rules of engagement in the scientific community was suggested by Nobel Laureate, E. Schrödinger (1997: 80), when noting the importance of one of the scientific tenets –discovered by the Ionian philosophers– he stated: This principle "to this day, constitutes the fundamental attitude of science. To us, it has become such a common attitude *as to the point of forgetting that someone had to raise this issue, turn it into a program and engage with it"* (author's emphasis).

Why is it that something so vital to scientists is not part of their formal education? It is possible that this phenomenon is due to the work style of schools and laboratories, where the learner is incorporated into a working group led by a teacher in a research program, these circumstances involve a process of the teaching and the non-formal learning of the basic rules of work that are particular to each school. If the case is that the teacher and the school environment promote working with passion, intellectual fecundity and creative imagination (Spirin, s/f: 154), then the rules of engagement in science may be naturally internalized by the engaged learner. These good schools, as they are known, encompass a "group of elements in each day and each hour of work, that may not even be described" (Budker, s/f: 129), identified by having "productive programs," able to identify new facts (Lakatos, 1983, 14 -15). Social permanence of such rules is determined by the success of this formula for solving complex problems that are relevant to the scientific community and also to certain important sectors of society. When a culture, community or individual does not consider these a priority, they simply decline and even disappear (De la Lama, 2005: 29).

When did these rules emerge? The history of social arrangements in science is yet to be written, its emergence dates prior to the consolidation of the classical model of scientific knowledge in the seventeenth century for these are its preconditions. For example, it is recorded that the first relationship between master and apprentice in which an interest in *a critical attitude* is expressed was when Copernicus mentioned to his disciple Rhaetian, in 1534, to feel frustrated with the *ancients*, who "had not shown unbiassness but had arranged a multitude of observations so that they would fit their personal theories about the movement of the planets" (Koestler, 1963: 199). Such rules are spread due to the success they have had in making scientific research a project capable of solving problems of enormous complexity that no other system may match. It is up to the historian to track the origin, development and consolidation of the rules of such a fascinating human activity.

Is it possible to identify these rules? The answer seems to be yes. The first rule that is considered essential for science to exist is that scientists have to accept that i*nsight into the world is possible through observation* (Schrödinger, 1997: 80). Yet this *first rule* –despite the qualitative leap it represents over any other form of knowledge– may not by itself, explain the problems of the natural world and must necessarily resort to the other rules to operationalize this human aspiration. The *second scientific rule* encompasses and describes, in one category all those everyday chores that are carried out in laboratories, workshops and schools, among others: the calibration and use of the instruments, care of inputs, energy consumption and the implementation of procedures (different whether they are practiced in a laboratory of molecular biology or physics, engineering or in field work in agriculture, demography, sociology, etc., but in all of them predominates a mastery of the use of tools and techniques, and theoretical knowledge relevant to their respective disciplines). This category includes the advice and examples by teachers, discussions with colleagues, and attendance and presenting papers at seminars, conferences and forums, not to mention the study of papers related to the problem being addressed by each researcher, issues as Budker says, (s / f: 129) that have not been described in the manuals of methodology, since they do not need to pass from the intuitive to the conceptual in order for them to be applied (Haveman, 1967: 62-76).

All of the experience and academic discipline described above is synthesized in the scientist developing a *methodological aptitude*, for being able to prove, by controlling the observation, the assumptions he or she makes about reality. As Feyerabend (1975, 52-53) notes: "The compatibility [of theories] [...] requires the scientist to focus on the facts that, after all, are the sole acceptable judges of a theory. "This rule would only be achieved through the development of professional skills and good academic acuity, which enables the use of procedures, tools and techniques with the common denominator of the capacity to be verified, regardless of the scientific discipline concerned.

Merton, in his famous paper *Sociology of Science* (1973) mentioned that the scientific community had standards that were different compared to other activities, which suggested that there was an ethos (universalism, communism, disinterestedness and organized skepticism) that safeguarded science from the shortcomings of other institutions; he thought, for example, that science left no room for fraud, and if there was one, this constituted an exception. This optimistic view has been criticized because, above all, it represents a regulatory program, before explaining how scientific communities work (Freeland, 2006: 50-55).

In current scientific practice although developing methodological competence is essential for any researcher, not even the most able and intelligent person becomes a scientist only by putting this agreement into practice. The requirement of publishing results, constant academic competition and the pursuit of prestige, among others, are cause for objectionable behaviors among members of the scientific community. Fraud, plagiarism and lack of scientific rigor are undesirable practices but they repeatedly happen, as recently was shown with the "isolation of stem cells" by South Korean Hwang Woo-suk (AFP and DPA, 2006: 3a.). Given these anomalies several questions arise: How to identify what is not scientific research, if it is carried out by the scientists themselves? What are the undesirable practices undertaken by pundits? Answers may seem simple at first glance, simulation, theft and falsification of data appear to be indisputable, but when delving a little, only the most obvious cases come to light or generate controversy due to the arbitrary use of experimental results; other cases, says G. Holton, escape criticism, hidden behind various epistemological and even institutional reasons (Freeland, 2006: 91-93).

Scientific practice has developed its own boundaries and while they are general –as might be expected of a system that applies to any scientific discipline– it is possible to identify a rule that can separate the truly scientific from what only pretends to be so: *the critical attitude* consists of the scientist taking on the commitment of applying universal values inherited from the Greek tradition, to all processes involved in scientific research. This rule challenges fraud with some success and could be another of the agreements that scientific communities have developed as a basic element to identify real research from apparent research (Freeland, 2006: 59-115). The critical attitude towards one's own scientific knowledge and to nature also enhances imagination –in a creative and innovative way– for achieving better plausible explanations of the problems that the scientific community has identified, or for allowing the scientist to focus her attention on other explanations so far unidentified while encouraging her to verify them. In this regard Ayala (1980: 477) states: "The *critical* element that distinguishes empirical sciences from other forms of knowledge is the requirement that scientific hypotheses can be rejected empirically [because] they may not be consistent with all possible states of the empirical world." This attitude also invites the scientist to publicly expose the reasoning and methods that allow him to test the validity of his ideas, and accept no explanation, –regardless of where it comes from– until it passes the test of critical analysis. "Changes in confidence [on a hypothesis] must obey a scientific judgment [...] and in no case result in arguments based on reputations or things like the numerical strength of the believers or unbelievers" (Lyttleton, 1987: 25).

Scientists traditionally focus on the mental gains derived from the act of discovering, few highlight the fruitful relationship between scientific aptitude and critical attitude (Medawar, 1988, 199-200). In almost all cases scientists omit the last of the social arrangements that offers them the opportunity to implement scientific research, not because of a desire to hide anything but because they include it in the scientific aptitude or perhaps they consider it a minor action compared to other aspects that appear to be much more relevant and interesting, we are talking about c*ommunicating the results openly* (De la Lama, 1977: 63), a rule as essential as those already mentioned, because its omission or failure to do so invalidates any discovery. Bernstein (1982: 222) highlights the fact that: "For a scientist what has not been published does not exist," indicating that scientific reporting is much more than a mere formality; moreover, it also demands a special personal disposition by the researcher, for the means by which results were found must be made explicit, a condition not observed in any other human activity: "The publication of scientific research should be done in such a way that the reader can follow all the steps that led to the results in question" (Lyttleton, 1987: 28). In turn, the specifics of the research report reinforce the critical attitude and the methodological aptitude of the researcher. This effort is realized through a creative process in which the use of language, the order, precision and clarity, are prevalent. All of these aspects attempt to rationally and objectively convince the scientific community of the validity of the results so they can enter the body of the discipline concerned.

In the arena of the implicit rules of science, the propositions made in this research are not the only ones that have been raised, there are a number of leading scientists in the sociology of science (Latour, Woollgar, Knorr-Cetina, Ben David) that have developed a sociological theory known as *constructivism* which principles are that the knowledge generated must be causal, impartial, symmetric and reflexive. The findings of these studies on the behavior of science are based on ethnographic studies and the actor-network theory.

This theory has generated an interesting set of implicit rules that are supposed to affect the performance of science. According to their discoveries, the aggregate of the natural scientists do not seek the truth, because they are embedded in a social context and power relations of domination –through hierarchies– expressed in the politics of subordination between different laboratories or other scientific institutions, as well as within them, etc., conditions which determine the production of knowledge, therefore achieving objectivity in science is an impossibility. Knorr-Cetina (2008, 209), for example, argues that an epistemic culture, "the amalgams of arrangements and mechanisms, achieved through affinity, necessity and historical coincidence, that in a given field, determine *how do we know and what do we know"* (emphasis in the original).

At the operational level, constructivists also encounter serious objections as to the capacity of objective observation, they believe facts are theory-laden, or in other words, the meaning of facts is different for each theory, consequently, facts are ineffective for showing which theory best explains reality. The recognition of a theory is achieved in a specific cultural context, which confirms that the content of science is socially constructed (Ben David, 2006: 22). Thus, scientific knowledge is achieved through community consensus, not by demanding tests that can be replicated.

The rules of constructivism differ from those raised by our research at a crucial point, the former are explicitly rejected by scientists who have had the curiosity to study them. For example, Perez Tamayo (2008: 174), a microbiologist, said, "For an experimental scientist, constructivism is a purely theoretical vision[...] entirely absent from reality." Freeland (2006: 57-58), also noted that "Active researchers or rather those who paid attention to constructivism, have made clear their bewilderment, alarm and sometimes anger", whereas the four rules proposed in our study, are expected to be recognized and accepted by the vast majority of scientists in natural and social sciences.

Another author who mentions the existence of rules in science is Bourdieu. His explanation of the behavior of science is based on a basic concept –the field–; and resorts to economic theory applied to symbolic production (Bourdieu 2000: 11 and 74). The competition or struggle that takes place in the field has the characteristic of being independent from the social environment, however, the degree of independency differs according to the field, there are some fields that are barely influenced, because they need few financial resources from the outside world, for example, mathematicians have greater independence, that is, their disputes are resolved through tools appropriate to their field (refutation and demonstration), whereas, in the fields more heavily dependent on external financial resources –institutional and private– the struggle for field dominion will be influenced by social and political pressures alien to the systems typical of the field. Progress in science is achieved to the extent that the field garners independence (Bourdieu, 2000: 95-96). This theory is even more compelling in countries where science is a luxury, because political criteria dominate the field, even in the natural sciences. For example, Ruiz Palacios, an immunologist (2007 National Prize of Sciences and Arts in Mexico), recognizes that the National Council of Science and Technology (CONACYT) needs a good shaking "so that money is allocated based on project quality and not on group interests, as usually happens" (Cruz Martinez, 2008: 4th).

The *field* concept has applications for all cultural products (literature, painting, writing) (Bourdieu, 2000: 74), due to this it gives rise to the legitimate idea that symbolic production is influenced by social context. Although this might be true in all fields, in the case of scientific discoveries –that is, great insights– they have to pass through a special sieve in order to be considered scientific. The difference between any individual and someone who is devoted to research is how each of them materializes their intuition. The researcher *will try to prove whether or not her conjecture is correct,* i.e. if it coincides with reality. If Bourdieu seeks to equate science with other cultural fields he should necessarily challenge the principle that the world can be explained through observation. To refute this principle, Bourdieu writes that the "*truth of the* [scientific] *product* is bestowed on the particular social conditions for its production" (2000: 11) and "*objective reality* to which everyone refers explicitly or tacitly is never much more than what the researchers involved in the field at any given time agree to consider as such and, only manifests itself in the field through the *representations* of it cast by those who invoke its arbitration" (Bourdieu, 2000, 85-86). By questioning objectivity, Bourdieu leaves an open path to associate the scientific field with the rest of the cultural fields, and apply its rules without exceptions to all symbolic capital; however, he omits the fact that the researcher uses another rule to try to neutralize any effect outside the variables studied: the critical attitude, which she uses to rescue objectivity.

Once the characteristics of the fields are unified, Bourdieu points out that: in the fields of science (laboratories, institutes, disciplines, etc..) competition is being waged for the monopoly of scientific might among the main symbolic capitalists –highly recognized scholars with great authority–, "the ones who set the game rules" (Bourdieu, 2000: 80), and the small producers –the young players in the field. The first try to make sure the field does not change, the second try to increase their (symbolic) capital and seek the best opportunities that the field can offer (through the *habitus*,–dispositions acquired at schools or through social background), regardless if at some point they destroy the rules: "The difference between a field and a game is that the former is a game where the rules themselves are at stake, either to consolidate or transform them" (Bourdieu, 2000: 82). Therefore, the field rules and those proposed in this study are qualitatively different, the first are imposed by a privileged minority, in the case of the latter –since they are the rules for playing the game– those involved try to respect them (Huizinga , 2005: 28).

By judging the bureaucratic rules and practices advocated by the dominant group (prestige, financial resources, theories and problems to address) of any scientific field, Bourdieu implicitly recognizes that there are as many rules as fields. This differs radically from the four rules of the theoretical framework of this research, which we hope will be accepted by the vast majority of scientists that exist regardless of the number of scientific fields.

The case study presented below was intended to verify if the scientific community accepts the existence of unwritten rules, and if these –the intelligibility of the world through observation, scientific aptitude, critical attitude and open communication–, are recognized by its practitioners as the general rules of engagement in scientific research. Should they not be recognized they will be rejected, if not, perhaps this would undeniably mean these are social rules or agreements that the scientific community, without distinction, consider common to their activities.

Case Study

At the beginning of this paper we presented the opinions of some scientists who recognized the existence of informal rules in the practice of scientific research, however, none of them were able to identify these rules. Later it was noted that there are four rules that, in theory, govern the work of researchers. Hereupon lies the task of testing whether these arrangements are followed by scientists while finding out if their nature is informal; to this end we propose verifying the following hypotheses:

1. Most researchers acknowledge that there are rules or agreements for carrying out scientific research.
2. Most scientists will be unable to identify the proposed rules spontaneously (intelligibility of the world, critical attitude, methodological skills and open communication).
3. If these rules are laid out, most scientists will recognize them as an integral part of their scientific work.

Method

To test these assumptions we prepared a case study, by means of an exploratory opinion poll (members of the universe studied did not have the same chance of being selected) administered to scientists of both natural and social sciences.

There was the technical challenge of proving that there were some very obvious professional rules, which scientists rarely acknowledge, but that once openly exposed, scientists would identify them as distinctive of their work. To solve this challenge, we applied a specialized questionnaire that measured true and *latent recollections.*

The first two items on the questionnaire identified *spontaneous* recollections. If in responding to the first item, respondents did not accept the existence of rules in scientific research, the first hypothesis was rejected. If in the second item the rules proposed by the theoretical framework of this study were intuitively recalled, the second hypothesis would be rejected. The next four questions openly stated the proposed rules (*assisted* recollection) and the responses marked the degree to which scientists recognized them, or not, as part of their work. If they were not recognized, the third hypothesis of the study was rejected. The questionnaire can be found in Annex 1 at the end of this study.

The questionnaires were administered to full-time teacher-researchers at the Universidad Autónoma Metropolitana-Iztapalapa (UAM-I) in Mexico City. Due to the research prestige of the academic unit where the survey was carried out the institution has a large number of scientists belonging to Mexico's National System of Researchers, hence we may assume that the results are related to the rules of scientific research.

Due to the scarcity of resources for conducting the survey we resorted to students from a Methodology course in the graduate program in History, class of 2010-2012, from the same academic unit. Each student had the responsibility of applying the questionnaire to one scientist from each of the three academic divisions at UAM-I: Basic Sciences and Engineering (CBI), Biology and Health Sciences (CBS), as well as Social Sciences and Humanities (CSH). From the latter we decided to exclude the Philosophy, Literature, Linguistics and History teachers from the poll, to avoid any bias caused by the surveyors. A total of 54 interviews were planned, however, the field work only rendered 36: 14 researchers from CBS and 11 researchers from both CBI and CSH. Out of all respondents, one stated that the questions were biased and two teachers refused to answer, saying they were too busy. The survey was conducted between the 7th and the 27th of October, 2010.

Findings

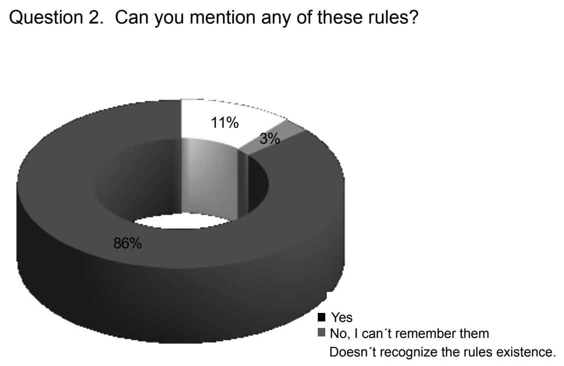
Spontaneous recollection results. Regarding the first question in our questionnaire (Are there any agreements or rules that researchers follow in scientific research?), Most of the scientists interviewed accepted their existence (89%), however, it was found that a significant minority (11%) denied the existence of such agreements (see Graph 1).

Graph 1 **Opinion poll among full-time teacher-researchers at UAM-I**

Opinion poll among full-time teacher-researchers at UAM-I, conduct ed from October 7th to the 27th, 2010. Source: Annex 3, Table 1.

Graph 2 refers to responses to the second item of the questionnaire (Can you mention any of these rules?). When discounting the 11% that on the first question denied the existence of such rules, most of those who believe that there are agreements, mentioned some rules or arrangements (86%), while a minority (3% of total) said they did not remember them at the time of responding to the interview.

Graph 2 **Opinion poll among full-time teacher-researchers at UAM-I**



Opinion poll among full-time teacher-researchers at UAM-I, conducted from October 7th to the 27th, 2010. Source: Annex 3, Table 2.

Table 1 resulted from comparing the four agreements this study suggests to the spontaneous responses scientists gave to item 2 of the questionnaire (Can you mention any of these rules?) to determine whether there were similarities. It was found that the first rule (intelligibility of the world is possible through reason and observation) was not mentioned by the scientists interviewed (Table 1, rule 1). The "scientific aptitude," however, was the most spontaneously recalled, by 9% of the total (see Table one rule 3 3). The spontaneous recollections of the "critical attitude" were stated by 6% of respondents (see Table 1, rule 2). Finally, spontaneous recollection of the rule "to communicate the results in a verifiable manner" were reported by 6% of all respondents (see Table 1, rule 4).

Assisted recall results. Below are the results of the last four items of the questionnaire, which sought to determine whether the proposed theoretical framework of this research was accepted as a set of rules by the scientists interviewed. These questions were even asked to those who had originally said there were no such rules (11%).

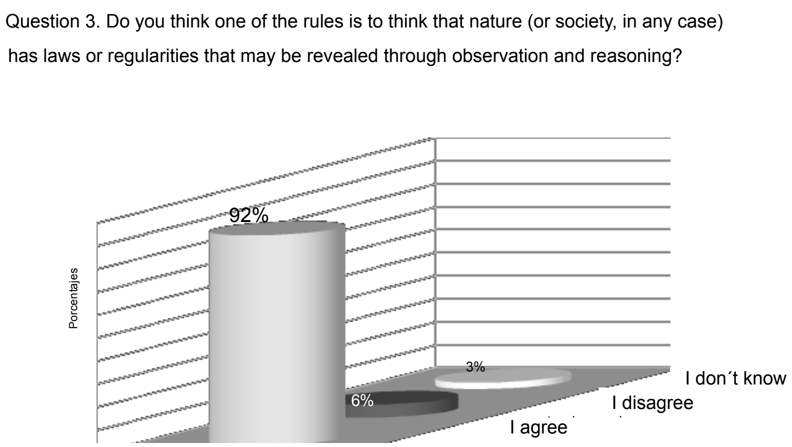
Question 3: Do you think one of the rules is to think that nature (or society, in any case) has laws or regularities that may be revealed through observation and reasoning? Answers are presented in Figure 3.

Table 1
Analysis of question 2 of the survey

Opinion poll among full-time teacher-researchers at UAM-I					
		Rule 1	Rule 2	Rule 3	Rule 4
Answers:	Yes	0%	6%	8%	5%
	No	100%	94%	92%	95%
Total		100%	100%	100%	100%
Frequency		36	36	36	36

Opinion poll among full-time teacher-researchers at UAM-I, October 7th to the 27th, 2010. Rule 1. The explanation of the world is possible through observation; Rule 2. Critical attitude; Rule 3. Methodological aptitude; and Rule 4. Communicate results in a verifiable manner. Source: Annex 2 and Annex 3, Table 3 (figures were rounded from 5.5 to 6% in Rules 2 and 4).

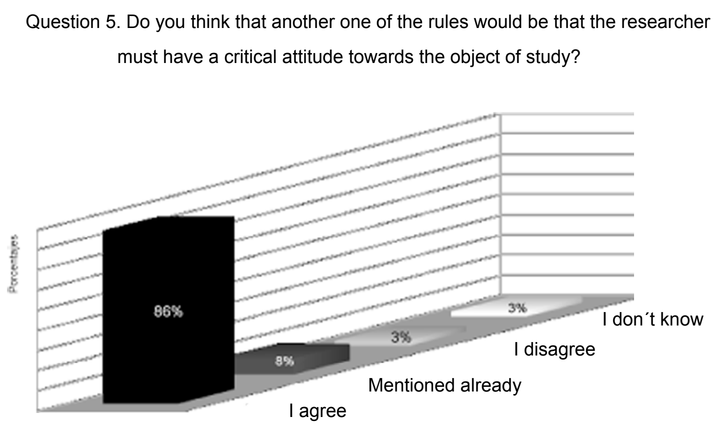
Graph 3 Opinion poll among full-time teacher-researchers at UAM-I



Opinion poll among full-time teacher-researchers at UAM-I, conducted from October 7th to the 27th, 2010. Source: Annex 3, Table 3, first column of responses. The answers "I disagree" were rounded from 5.56 to 6%.

None of the scientists interviewed spontaneously mentioned that understanding the world through observation was a rule, however, when asked directly whether they consider it part of the rules of scientific practice, nine out of ten scientists interviewed (92%) recognized this as an agreement in science, while the rest (9%) rejected this principle, either because they disagreed (6%) or because they said they did not know whether or not it constituted a general rule (3%).

Graph 4 **Opinion poll among full-time teacher-researchers at UAM-I**



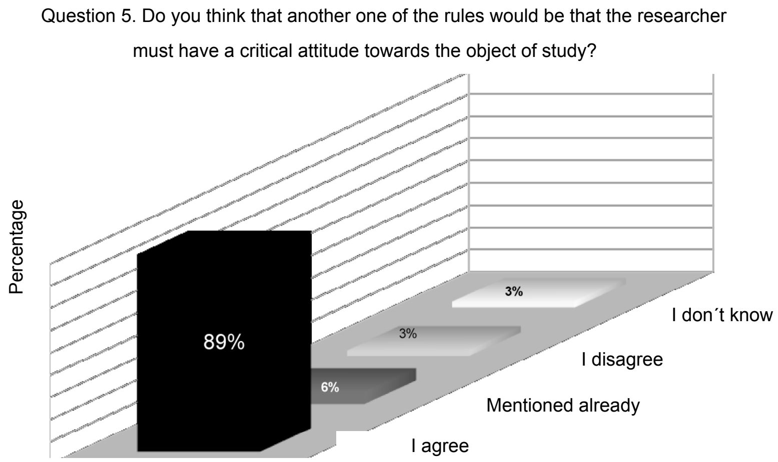
Opinion poll among full-time teacher-researchers at UAM-I, conducted from October 7th to the 27th, 2010. Source: Annex 3, Table 3, third column of responses.

The answers to another one of the agreements raised are presented in Figure 4: methodological aptitude, understood as "the ability to use procedures, tools and techniques to test their assumptions" (Question 5). 94% of the researchers interviewed adhered to this rule if adding spontaneous responses (8%) to the assisted recollections (88%), another 3 percent disagreed with this rule and a similar percentage said they did not know if it constituted a rule of scientific research.

Figure 5 corresponds to the responses to item four (Do you think that another one of the rules would be that the researcher must have a critical attitude towards the object of study?). If the question raised doubts on the part of the respondent, the interviewer added the following clarification: "i.e., to develop the ability to analyze in an objective, impartial, systematic and verifiable way all of the information in any investigation." Only 6% of researchers surveyed responded spontaneously that one of the agreements to carry out their research was the critical attitude. If this is added to the positive responses of the assisted recollections (89%), the acceptance rises to 95%. 3% of respondents disagreed with considering it as a rule and a similar percentage said they did not know if it constituted another rule.

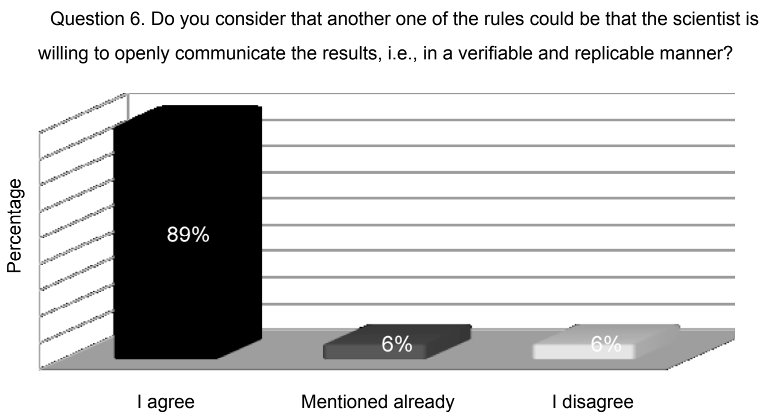
The last item in the questionnaire was related to the publication of research results (Do you consider that another one of the rules could be that the scientist is willing to openly communicate the results, i.e., in a verifiable

Graph 5	Opinion poll among full-time teacher-researchers at UAM-I



Opinion poll among full-time teacher-researchers at UAM-I, conducted from October 7th to the 27th, 2010. Source: Annex 3, Table 3, second column of responses. The answers "it was already mentioned" were rounded from 5.56 to 6%.

Graph 6	Opinion poll among full-time teacher-researchers at UAM-I



Opinion poll among full-time teacher-researchers at UAM-I, conducted from October 7th to the 27th, 2010. Source: Annex 3, Table 3, fourth column of responses. The figures "it was already mentioned" and "I disagree" were rounded from 5.56 to 6%.

and replicable manner?). The answers to this question are reflected in Figure 6. A minority (5%) spontaneously considered this aspect among the rules, when this figure is added to the positive answers through assisted recollection (89%), this last rule was recognized by the majority (94%) of scientists interviewed.

Out of all of the researchers interviewed 6% denied that such agreement constituted a general rule.

Conclusions

The results of this pilot study invite to renew, expand and deepen the concepts that have been developed on how scientific research is carried out, as they demonstrate the importance that informal agreements in science have on research practice.

To sum up, understanding the world through observation, a critical attitude towards the processes of scientific research, developing a methodological aptitude to test the assumptions and to communicate results openly constitute the informal rules of the scientific work. At the same time they are part and parcel of the classical scientific tradition. These results confirm unity among scientists, regardless of the problems they address, the methods they use, the theories they support and the conflicts they might have in their respective fields of work.

More specifically, if a person is looking for new and broader generalizations about natural or social processes through scientific research, by taking into account the interaction that occurs between the four above mentioned agreements, and internalizing them, she would increase the possibility of gaining more effectiveness in her performance. Yet, if he omits any of them, or he considers that any of them can be resolved as a mere formality, he will be compromising his own ability as a scientist, not only in personal terms, but against the backdrop of the whole scientific community.

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Annex 1

The questionnaire
1/10-O Project

Good morning, afternoon, and so on.

We are UAM-I graduate students, from a methodology course and we are interested in knowing the views of experts in their fields of work. Would you please answer the following questions. We will be brief.

Are you a Full-time researcher-professor at the UAM-I?
Yes ( ) No ( ) (cancel interview)

From what academic division?
CBS ( ) CBI ( ) CSH ( )

1. Do you consider there are general rules or agreements in scientific research that are followed by most scientists?
Yes ( ) No ( ) (go to No.3) I don't know ( ) (go to No. 3)

2. Could you mention any of these rules?
I do not remember ( )

3. Do you think that one of these rules is to think that nature (or society, in any case) has laws or regularities that can be revealed through observation and reasoning?
Yes ( ) No ( ) I don't know ( )

4. Do you think another of the rules would be that the investigator must have a critical attitude toward the object of study?
That is, to develop the ability to analyze in an objective, impartial, systematic and verifiable manner all of the information in any investigation?
Yes ( ) No ( ) I don't know ( )

5. Do you consider that another one of the rules is to develop a methodological aptitude?
That is, to have the ability to resort to procedures, tools and techniques to test one's own assumptions?
Yes ( ) No ( ) I don't know ( )

6. Do you think another one of the rules could be that the scientist is willing to openly communicate the results, i.e., in a verifiable or replicable manner?
Yes ( ) No ( ) I don't know ( )

That's it. Thank you very much.

Annex

Gross coding tables

3. Do you think that one rule could be to think that nature (or society, in any case) has laws or regularities that can be revealed through observation and reasoning?
4. Do you think that another rule would be that the investigator must have a critical attitude towards the object of study? That is, to develop the ability to analyze in an objective, impartial, systematic and verifiable way all information in any investigation?
5. Do you think that one of the rules is to develop a methodological aptitude? That is, to have the ability to resort to procedures, tools and techniques to test one's own assumptions?
6. Do you think that another one of the rules could be that the scientist is willing to openly communicate the results, i.e., in a verifiable or replicable manner?

Table 1
Question. 1. In your opinion do you think there are rules or agreements in scientific research that are followed by most active scientists?

Question. 1	
Answers:	**total**
Yes	**32**
No	4
I don't know	0
Frequency	36

Table 2
Question 2: Can you mention some of these rules?

Question. 2	
Respuestas	**total**
Yes	**31**
I do not remember	1
Said no to Question 1	4
Frequency	36

Table 3
Questions 3,4,5 and 6.Do you think that one of the rules could be…?

Question. 3,4,5 y 6				
	Question 3	Question 4	Question 5	Question 6
I agree	33	32	31	32
It was already mentioned	0	2	3	2
I disagree	2	1	1	2
I don't know	1	1	1	0
Frequency	36	36	36	36