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Coluna opinião/Point of view

Why publish?

FABIO RUBIO SCARANO[1,2,3]

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ABSTRACT – (Why publish?). This paper forwards an opinion about authors' and journals' motivations for scientific writing. Personal and institutional motivations are listed and discussed and, in regard to biodiversity sciences, I propose that a nationalistic motivation is also pertinent in a biodiversity-rich country such as Brazil. Curiosity and competitiveness should be combined for better results. Finally I discuss ground-breaking science within a post-modern perspective, and how the mere act of scientific writing might trigger both scientific and social revolutions.

Key words - citation frequency, impact factor, science in Brazil, scientific journals, scientific writing

RESUMO – (Por que publicar?). Este artigo opina acerca das motivações de autores e periódicos para publicar. Motivações pessoais e institucionais são listadas e discutidas e, em relação às ciências da biodiversidade, é proposto que uma motivação nacionalista é também pertinente em países ricos em biodiversidade como o Brasil. A combinação de curiosidade e competitividade leva ao alcance de melhores resultados. Finalmente, são discutidas originalidade e inovação sob uma perspectiva pós-moderna, e como o mero ato da redação científica pode ser o início de revoluções tanto científicas quanto sociais.

Palavras-chave - ciência brasileira, redação científica, fator de impacto, freqüência de citação, periódicos científicos

Introduction

Why publish? Which are the motivations that drive scientific writing? How editors of scientific publications choose which material they are going to publish? What do scientific journals aim at? Although at first glance answers to these questions might seem obvious and straightforward, indeed they are not. The reason for this lack of general answers is that the subject behind the writing activity is man, whose motivations are often multiple and perhaps even hidden from the subject himself.

This paper aims to discuss motivations behind scientific writing and publication practice. First, I establish three premises which are essential for the logic of the arguments that will follow, *i.e.* 1) knowledge is power; 2) no knowledge is useless; and 3) curiosity drives scientific enterprise. Next, I gradually move from personal to institutional motivations, while tracing a parallel between authors and journals. I suggest that authors and publication vehicles who combine different types of motivation are the most prone to success. Finally, I propose that originality and creativity are essential to high-quality science. My central tenet is that within fields such as botany and biodiversity sciences as a whole, high-quality papers by Brazilian authors and high-quality scientific communication vehicles housed in Brazil shall be essential for the country to achieve intellectual independence and sovereignty as regards the use of its natural resources.

This paper clearly targets a reader akin to fields related to biodiversity issues, particularly plant sciences. Therefore, it is neither my intention nor my capacity to deal with all scope of scientific writing. In addition to this clarification, three premises are necessary starting points for this paper, in order to dissipate any possible confusion regarding the domain of my arguments.

Premises

Premise 1: "Knowledge is power" – This sentence, coined by Francis Bacon (1561-1626), remains adequate and finds echo in contemporary philosophy. Lyotard (1979/1988), in his *"La Condition Postmoderne"*, argued that knowledge is the most important tool in the world's power

1. Universidade Federal do Rio de Janeiro, CCS, IB, Departamento de Ecologia, Caixa Postal 68020, 21941-970 Rio de Janeiro, RJ, Brazil.
2. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Diretoria de Pesquisas, Rua Pacheco Leão 915, 22460-030 Rio de Janeiro, RJ, Brazil.
3. Corresponding author: fscarano@biologia.ufrj.br.

struggle. Drori *et al*. (2003) showed how "instructions", as they call it, flow into the developing world from knowledge-producing nations, affecting various aspects of society and culture, such as economy, education and health. For an example related to biodiversity sciences, the concept of national parks and conservation units was built within a given nation (from the developed world), within a specific set of conditions (where biodiversity had been largely used), and is now almost undisputed elsewhere in the world. Hironaka (2003) gives an interesting historical account on how national park concept was absorbed and incorporated by developing nations. It is not my purpose to discuss the adequacy or not of such practice, however, this is a fair example of how "instructions" based on scientific-knowledge flow without any need for command or enforcement; *i.e.*, scientific authority backs up social practice. Thus, it is my first premise that scientific knowledge, expressed via scientific communication, can "change the world".

Premise 2: No knowledge is useless – Bertrand Russell (1935/2002) in his *"In Praise of Idleness"* discussed the distinction between "useful" and "useless" knowledge. His inverted commas, which I here transcribe, indicated that he did not agree with such labelling. His argument, which I fully accept, is that "useless" knowledge is also useful for representing a contemplative attitude towards the object observed. In other words, such attitude is an essential element for creativity that is a key to scientific progress. Thus, it is my second premise that all knowledge produced is useful, within a given domain of space and time.

Premise 3: Curiosity is the backbone for scientific action, however it is not enough to grant a successful scientific career – One practice I fully reject is the distinction many authors (*e.g.*, Van den Hove 2007) make between issue-driven and curiosity-driven research. This argument is keen to some conservation biologists (*e.g.*, Meffe & Viederman 1995). I follow Brenner's (1998) argument that this distinction often hides a biased labelling of the latter as a product of idleness. However, I agree with Franck (1999) that curiosity alone is not enough to produce successful science.

Saying that curiosity is the backbone for scientific activity, such as writing, is not to say that all science is value-free, which would no doubt be a naïve assumption (Chalmers 1990/1994, Pielke Junior 2002). Since science aims to both enhance knowledge and to solve practical societal problems (Shrader-Frechette & McCoy 1993), it is expected that it, as providing the means to solve problems, should have an effect on politics. Thus, directly or indirectly related to that, it might bear relationships with money. The question is to which extent politics and/or money has an effect on science. Assuming that the most instinctive stimulus to scientific activity is curiosity, and not politics or money, means to say that, in principle, I make no distinction between basic and applied science, or that basic science is value-free while applied science might be value-laden. Science is primarily moved by curiosity and might be value-free or value-laden. However, irrespective of the box (basic or applied) in which one places its original agenda, it can be used as a tool by politicians or by people with economic goals.

Pielke Junior (2002) has written a thought-provoking paper proposing that there is a thin line that separates politics based on science from science that is political in essence. He gives the example of the 2007 winner of the Noble Prize for Peace, IPCC (Intergovernmental Panel for Climate Change), and argues that it assesses knowledge on climate-change related sciences but not their policy significance, leaving interpretation in this respect free to governmental agencies or corporations. In other words, a wealth of the so-called "basic science" is turned "applied" by IPCC (which reinforces the notion that these two boxes are in practice indistinguishable), and derived politics are made by decision-makers based on a variety of interpretations on the same set of information and knowledge. This is then a case of politics loosely based on science. This author concludes that in order to avoid politicization of science, the independent scientific community must take responsibility for assessing the significance of scientific results for policy.

Although I tend to agree with Brenner (1998) that in science whoever is aiming for money is in the wrong business, there is recent evidence showing that in some fields such as Medicine this might be otherwise (Van Kolfschooten 2002). While on the one hand I do admit that such type of interest is likely to blur curiosity, on the other hand it seems to me a distant perspective (at least for now) when it comes to biodiversity-related sciences produced in Brazil.

In short, the fact that scientific activity cannot be separated from other activities fostered by different motivations, such as money and politics, does not necessarily mean that the objective or motivation of science is in itself subverted (Chalmers 1990/1994). Thus, my third premise is that curiosity drives scientific efforts, that the distinction between pure and applied science is flawed and that, within a developing country perspective, knowledge production is a key action in itself (see premise 1 and also Scarano 2006, 2007).

Motivations

There are different motivations that might drive authors to publish and they are not mutually exclusive. I classify them into two large categories: personal and institutional. Personal motivations are always of an individualistic nature, and are placed somewhere along a gradient, while extremes are unlikely. One extreme is the fully pragmatic motivation (*e.g.*, career progress) and the other is complete idleness (*e.g.*, pleasure in writing; pleasure in the research process or emotional attachment to the object of study; vanity and search for fame, visibility and recognition between peers). Institutional motivations arise from a sense of group and collective duty, however they can have either a cooperative (*e.g.*, dissemination of knowledge or information, education, enhancement of life-quality standards) or a competitive nature (*e.g.*, competition between scientists and/or institutions).

John Grace, an outstanding and influential ecologist, has recently argued that "making the world a better place is both an aspiration and an outcome of scientific activity", but it is not the factor that leads scientists to publish (Grace 2007). He claims that motivations are mostly personal and distinguish them into two categories: curiosity-driven and ambition-driven. This is in harmony with my premise 3, since Grace does not relate curiosity to idleness and claims that both types will often lead to practical effects applied to mankind. Nevertheless, he worries about the extinction of curiosity-driven research. However, since a similar concern has been shown by Russell (1935/2002) 70 years earlier, this is probably a sign that curiosity still thrives.

If Grace is correct in his assessment, it would remain to be seen how can personally-motivated science lead to "making the world a better place", in his own terms. Robert Merton (1973) argued that personal motivations of scientists are reconciled with the major objectives of science by an institutionalized system of rewards and penalties. Such a system promotes competition and Franck (1999) proposed that "collective intelligence" (which we can call *knowledge*, in its most integrated and broadest sense) is an emergent property of the scientific community that comes to being through competition between scientists. What scientists compete for is attention, and their output to achieve attention is scientific communication.

From this perspective then, it is not surprising that Franck (1999) is in favour of scientific metrics related to authors' citation frequency and journal's impact factors (see table 1 for definitions). Curiously, this is a dissonant point between him and Grace (2007), whereas both think similarly as regards the emergent property of the individual scientific writing routine. In the case of authors' citation frequency, the recent excitement with the *h*-index (table 1; Hirsch 2005, Batista *et al*. 2006, Schubert 2007) is not free of criticism (Grace 2007), and impact factor of journals has raised enough and passionate controversy in recent years (*e.g.*, Nature Editors 2005). Some relevant resistance is found at the realm of biodiversity sciences (Kokko & Sutherland 1999, Krell 2002). Ideas on how to measure scientific quality appear at an unprecedented rate. One of the latest ideas on how to measure the quality of journals is to use an *h*-index applied for journals (Chapron & Husté 2006), which is still open for debate and testing.

Table 1. A small glossary of scientometric terminology used in this paper.

Terminology	Meaning
Impact factor of a journal	The average number of times that articles published in a given journal in the two previous years (*e.g.*, 2006-2007) were cited in a particular year (*e.g.*, 2008). Citing journals have to be indexed in Thomson Scientific's ISI.
Citation frequency of authors	Number of citations to a specific author within a given time frame.
h-index	The number of papers of a given author that has received each at least that number of citations. For instance, an author with $h = 10$ has 10 papers which have been cited at least 10 times.

In this paper I am not taking sides in this debate. However, my view on the subject is well conveyed by a recent editorial of the free-access journal *Public Library of Science Medicine* (PLoS Medicine Editors 2006). While evoking the need of better ways of assessing scientific literature, the editors admitted they would be lying if they said they were not interested in their journal's impact factor. This exemplifies that despite one's awareness of the limitations and flaws of impact factor judgement, it is simultaneously the most practical way of producing any type of objective analysis of scientific value.

Thus, journals are motivated to raise their impact factor, which is an element of competition between them, *i.e.* the very element that fuels scientific growth according to Franck (1999). The current indexation of several

biodiversity-related journals in Brazil (including this Brazilian Journal of Botany) in the Institute for Scientific Information (ISI) places them in the "impact factor game", as PLoS Medicine Editors would call it. Journal's motivations to reach high impact factors are, such as in the case of authors in relation to their citation indices, related to visibility and recognition.

Combining motivations

The opinion I forward in this paper is that authors and journals that combine different types of motivation are the most prone to success, *i.e.*, to receive high attention from peers. In the case of journals, in order to attract more attention editorial policies should privilege originality and creativity (which I will discuss in the next topic). In the case of authors, curiosity and competitiveness should be combined, along with personal and institutional motivations. I recognize, nevertheless, that extreme competition might jeopardize creativity and curiosity (*e.g.*, De Meis *et al*. 2003, Lawrence 2003). It is noteworthy that some of the literature revised above focuses mostly on personal motivations of authors, without acknowledging a role for institutional motivations that I claim exist. In the case of Brazil, the traditional practice of evaluation and grade attribution to graduate programs via CAPES (the agency for graduate training of the Ministry of Education) is an obvious incentive to institutional competition. Moreover, globalization of higher education also creates an atmosphere of international competition between institutions epitomized by classifications such as the "top-500 world Universities" (*e.g.*, Cheng & Liu 2005).

However, in the specific case dealt with in this paper, *i.e.*, biodiversity-sciences produced in Brazil, I argue that another motivational layer must be added to personal and institutional ones, which I call a *nationalistic* motivation. Although the word "nationalism" might seem dated in the globalization era, I urge to justify that the sense applied to the term here is strongly related to premise 1. Since knowledge is power, and Brazilian territory comprises most of the biodiversity in the world (WCMC 1992), it is a matter of national interest and of national sovereignty that the country ranks among the top countries in the world producing biodiversity science. The correctness of this logic is backed up by the United Nations that recognizes that topics such as climate change and biodiversity loss urgently need the input of the developing countries, which are so important for global processes such as these (Annan 2003, Holmgren & Schnitzer 2004).

Thus, there is a current trend to measure and compare the scientific productivity and impact of nations (*e.g.*, King 2004, Glänzel & Schlemmer 2007). Brazil has had an outstanding performance in the past decade and now ranks 15th in scientific productivity and 23rd in number of citations. Biodiversity-related sciences such as "Ecology and Environment" and "Plant and Animal Sciences" are 20th in citations in comparison to other countries, which places them among the top 5 sciences in Brazil (Scarano 2007). Therefore, Brazilian research profile is now classified as "bio-environmental" (Glänzel *et al*. 2006, Leta *et al*. 2006). The fact that only recently some Brazilian journals related to biodiversity sciences have been indexed in ISI turns the above data quite surprising, particularly if we assume as correct the argument of Pasterkamp *et al*. (2007) that there is a nation-oriented bias in citation frequency and impact factors (*i.e.*, countries with a larger research output have larger citation frequencies and journals with higher impact factors). In conclusion, for any given Brazilian journal related to biodiversity sciences, playing the "impact factor game" will both increase attention to them as well as attention to their home-country, increasing its competitiveness for scientific visibility with other countries in the world.

Originality and creativity

I have argued above that the editorial policy of competitive journals should privilege originality and creativity in order to better compete for attention. Thus, Brazilian journals publishing issues related to biodiversity sciences within an international scope should behave likewise. This is to say that they must look for papers forwarding new ideas and/or challenges to established ideas.

But what is a ground-breaking paper? Ziauddin Sardar (2002) offers some inspiring arguments in this direction. He says that the notion that science provides certainty and assurance is no longer valid and that science has moved to a post-normal phase in which "facts are uncertain, values in dispute, stakes high, and decisions urgent". This is particularly true to sciences dealing with complex systems, such as biodiversity-related sciences (*e.g.*, Botkin *et al*. 2007, Scarano 2007). Thus, I believe a ground-breaking paper in biodiversity sciences should either not conform to normal science (*sensu* Kuhn 1962) or at least challenge it.

In a country as rich in biodiversity as Brazil, such ground-breaking material is prone to emerge in the entire range of disciplines comprised by the plant sciences as long as authors move from a strictly descriptive approach

to question-driven efforts. Can the description of a new species cast light on the controversial concept of species itself? Can the description of the phytosociological structure of a given portion of vegetation help understand delimitation of plant communities or to better define classification and boundaries of vegetation types? Can the description of a piece of natural history unveil hidden aspects of ecological functioning? Authors should ask themselves these kinds of questions at the onset of their studies, so as to design them adequately to allow such an upgrade. Journals, similarly, should privilege such question-driven efforts since they are more likely to raise new ideas as opposed to new information alone. In addition to original articles, review papers and opinion papers are also highly desirable for journals competing for higher impact, particularly if they provide synthesis of available information and knowledge, while fostering new ideas (see Blagosklonny & Pardee 2002).

Final remarks

Kuhn (1962) has listed several symptoms of a "transition from normal to extraordinary research", as he describes it. One of such symptoms, he argues, is that scientists within a given field in a phase of crisis often resort to philosophy. Thus, I trust that the fact that the Brazilian Journal of Botany has opened this valuable space for a philosophical discussion is perhaps an indication that plant sciences are on the verge of paradigmatic changes and that Brazil – via individual scientists, institutions, and vehicles for scientific publication – is a potential candidate to play an important role in such changes. Considering that the country has biodiversity as one of its main richness, this is both desirable from a scientific point of view (Annan 2003) and strategic from a political point of view (Scarano 2007). Re-invoking premise 3, the Brazilian scientific community will need to take responsibility for assessing the significance of scientific results for biodiversity policy, and instruct Brazilian decision-makers and politicians in this respect (see Pielke Junior 2002). Graduate training such as the one provided by Professional Masters courses is one tool, among several, to reach such goals (Scarano & Oliveira 2005).

The fact that mere scientific writing and publishing of a paper might be the onset of such scientific and social advancement is both a wonder and an additional responsibility for scientists and journals alike.

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References

ANNAN, K. 2003. A challenge to the world scientists. Science 299:1485.

BATISTA, P.D., CAMPITELI, M.G., KINOUCHI, O. & MARTINEZ, A.S. 2006. Is it possible to compare researchers with different scientific interests? Scientometrics 68:179-189.

BLAGOSKLONNY, M.V. & PARDEE, A.B. 2002. Unearthing the gems. Nature 416:373.

BOTKIN, D.B., SAXE, H., ARAÚJO, M.B., BETTS, R., BRADSHAW, R.H.W., CEDHAGEN, T., CHESSON, P., DAWSON, T.P., ETTERSON, J.R., FAITH, D.P., FERRIER, S., GUISAN, A., HANSEN, A.S., HILBERT, D.W., LOEHLE, C., MARGULES, C., NEW, M., SOBEL, M.J. & STOCKWELL, D.R.B. 2007. Forecasting the effects of global warming on biodiversity. Bioscience 57:227-236.

BRENNER, S. 1998. The impact of society on science. Science 282:1411-1412.

CHALMERS, A. 1990/1994. A fabricação da ciência. Editora Unesp, São Paulo [tradução por Beatriz Sidou, do original "Science and its fabrication"].

CHAPRON, G. & HUSTÉ, A. 2006. Open, fair and free journal ranking for researchers. Bioscience 56:558-559.

CHENG, Y. & LIU, N.C. 2005. A first approach to the classification of the top 500 world universities by their disciplinary characteristics using scientometrics. Scientometrics 68:135-150.

DE MEIS, L., VELLOSO, A., LANNES, D., CARMO, M.S. & DE MEIS, C. 2003. The growing competition in Brazilian science: rites of passage, stress and burnout. Brazilian Journal of Medical and Biological Research 36:1135-1141.

DRORI, G.S., MEYER, J.W., RAMIREZ, F.O. & SCHOFER, E. 2003. Science in the modern world polity: institutionalization and globalization. Stanford University Press, Stanford.

FRANCK, G. 1999. Scientific communication – a vanity fair? Science 286:53-55.

GLÄNZEL, W. & SCHLEMMER, B. 2007. National research profiles in a changing Europe (1983-2003): an exploratory study of sectoral characteristics in the Triple Helix. Scientometrics 70:267-275.

GLÄNZEL, W., LETA, J. & THIJS, B. 2006. Science in Brazil. Part 1: a macro-level comparative study. Scientometrics 67:87-105.

GRACE, J. 2007. The best papers are the boldest. Frontiers in Ecology and the Environment 5:49-50.

HIRONAKA, A. 2003. Science and the environment. *In* Science in the modern world polity: institutionalization and globalization (G.S. Drori, J.W. Meyer, F.O. Ramirez & E. Schofer, eds.). Stanford University Press, Stanford, p.249-264.

HIRSCH, J.E. 2005. An index to quantify an individual's scientific output. Proceedings of the National Academy of Sciences 102:16569-16572.

HOLMGREN, M. & SCHNITZER, S.A. 2004. Science on the rise in developing countries. Public Library of Science Biology 2:10-13.

KING, D.A. 2004. The scientific impact of nations. Nature 430:311-316.

KOKKO, H. & SUTHERLAND, W.J. 1999. What do impact factors tell us? Trends in Ecology and Evolution 14: 382-384.

KRELL, F.-T. 2002. Why impact factors don't work for taxonomy. Nature 415:957.

KUHN, T. 1962. The structure of scientific revolutions. University of Chicago Press, Chicago.

LAWRENCE, P.A. 2003. The politics of publication. Nature 422:259-261.

LETA, J.; GLÄNZEL, W. & THIJS, B. 2006. Science in Brazil. Part 2: sectoral and institutional research profiles. Scientometrics 67:87-105.

LYOTARD, J.-F. 1979/1988. O pós-moderno. 3ª ed. José Olympio Editora, Rio de Janeiro [tradução por Ricardo Corrêa Barbosa, do original "La condition postmoderne"].

MEFFE, G.K. & VIEDERMAN, S. 1995. Combining science and policy in conservation biology. Wildlife Society Bulletin 23:327-332.

MERTON, R.K. 1973. The sociology of science. University of Chicago Press, Chicago.

NATURE EDITORS. 2005. Not-so-deep impact. Nature 435:1003-1004.

PASTERKAMP, G., ROITMANS, J.I., DE KLEIJN, D.V.P., BORST, C. 2007. Citation frequency: a biased measure of research impact significantly influenced by the geographical origin of research articles. Scientometrics 70:153-165.

PIELKE JUNIOR., R.A. 2002. Policy, politics and perspective. Nature 416:367-368.

PLoS MEDICINE EDITORS. 2006. The impact factor game: it is time to find a better way to assess scientific literature. Public Library of Science Medicine 3:e291. [http://medicine.plosjournals.org]

RUSSELL, B. 1935/2002. O elogio ao ócio. Sextante, Rio de Janeiro [tradução por Pedro Jorgensen Júnior, do original "In praise of idleness"].

SARDAR, Z. 2002. Thomas Kuhn and the science wars. *In* Postmodernism and big science (R. Appignanesi, ed.). Icon Books, Cambridge, p.187-233.

SCARANO, F.R. 2006. Prioridades para conservação: a linha tênue que separa teorias e dogmas. *In* Biologia da conservação: essências (C.F.D. Rocha, H.G. Bergallo, M.A.S. Alves & M. Van Sluys, eds.). Editora Rima, São Carlos, p.23-39.

SCARANO, F.R. 2007. Perspectives on biodiversity science in Brazil. Scientia Agricola 64:439-447.

SCARANO, F.R. & OLIVEIRA, P.E.A.M. 2005. Sobre a importância da criação de mestrados profissionais na área de Ecologia e Meio Ambiente. Revista Brasileira de Pós-Graduação 4:90-96.

SCHUBERT, A. 2007. Successive *h*-indices. Scientometrics 70:201-205.

SHRADER-FRECHETTE, K.S. & MCCOY, E.D. 1993. Method in ecology. Cambridge University Press, Cambridge.

VAN DEN HOVE, S. 2007. A rationale for science-policy interfaces. Futures 39:807-826.

VAN KOLFSCHOOTEN, F. 2002. Can you believe what you read? Nature 416:360-363.

WCMC – WORLD CONSERVATION AND MONITORING CENTRE. 1992. Global biodiversity: status of the Earth's living resources. Chapman & Hall, London.