Between fetishism and survival: is the scientific article an academic commodity?

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Published in Cad. Saúde Pública, Rio de Janeiro, 23(12):3041-3050, December 2007
Received 06/Jun/2006
Approved 01/Jun/2007

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I
Introduction

Several key bibliometric indicators signal dramatic changes in the scientific research landscape in the last 10-15 years. While more than 70% of the world's scientific output comes from the United States, the European Community, and Japan, several other countries have witnessed particularly spectacular growth (with China and Ireland as the most significant examples), while others have experienced a decline (United Kingdom). Recent data from Latin America show Brazil's outstanding position in scientific output, with an 8% increase in its share of annual production worldwide, occupying 17th place among the most active research countries[1].

The above-mentioned analyses certainly deserve proper attention when describing and comparing scientific output and its flows with multiple levels of scope, in both global and local terms. However, such data need to be considered in context, not only in regional and national bibliometric terms. We should also take socio-historical aspects into account in the development of disciplines and fields of knowledge production in relation to political and economic structural transformations in recent decades.

Our perspective here focuses on an analysis of the possible meanings of a phenomenon that manifests itself as an adverse reaction in this context of expansion in scientific research, as well as in the quantification of articles, resulting in ranking based on the corresponding counting of items published in scientific journals. Journals themselves are also ranked in turn, through a quality judgment by their indexers. This has triggered an apparently irreversible process, perhaps even uncontrollable at the limit, and increasingly common in academic circles in general and in the field of public health research in particular[2]

Undeniably, new available computer resources and the Internet have allowed an amazing dissemination of academic output and expansion of possibilities for accessing it.

Searching and obtaining bibliographic sources, utilizing databases, analyzing data, and writing scientific articles have thereby become increasingly accessible. The general impression is that it has become much less troublesome to draft proposals and, having obtained funding, to conduct research. Yet this increased research availability comes with unwanted side effects.

The world has witnessed a considerable increase in competition for research funds, along with a decrease in available public funding[1]. In order to access funding, research groups must demonstrate productivity, especially as measured by publication in the most reputable academic journals in their respective fields. Competition thus spawns a relentless struggle between articles seeking to occupy the publishing spaces – the much sought-after outlet for research results, but also entailing the need to maintain spheres of prestige and influence[3].

With the huge expansion in the number of journals and articles, we inevitably begin to find something unreasonable about this cornucopia of scientific articles. The process all happens at once, not only with enormous research output at breakneck speed, but also with dubious prospects as to its respective fertility for building knowledge in public health[4]. The scenario fails to result proportionally in improved health conditions, as if in a mismatch, with scientific output hardly altering the precarious health situation in many parts of the world.

Although the specialized literature is increasingly accessible, it is more and more toilsome to read what is published in the corresponding fields of interest. The ideal of remaining up-to-date in the one's field appears increasingly difficult to achieve in daily practice. Thus, there are (and will be) many articles that will never be read. It is difficult to reach an accurate figure, but according to estimates, some 50% of articles published in the social sciences will never be cited[5].

Several critical and even humorous terms are used to designate this order of ethical issues in light of the proliferation of scientific literature. One of the more well known is 'baloney science', in which a study is sliced into smaller publishable units and transformed into various articles distributed through different journals[6]. Other less common terms like 'publicationism'[7] and 'productivitis'[8] have been used recently to describe the phenomenon.

In other words, the same content can appear in various articles, after receiving minor cosmetic changes. Self-citation can constitute so-called 'self-plagiarism'[9]. Some journals already request that the cover page submitted with the article specify that it is not a redundant publication[10].

Ethical issues in scientific research are in no way negligible. One indicator of this concern in the field of public health can be measured by the number of hits using the descriptors '*scientific misconduct*' and '*public health*' in the Google search engine, namely 3,190,000 on June 1, 2006.

In more specific terms, various types of misconduct and fraud can occur in the scientific community in managing protocols, study samples, and data in general[11]. The number of authors per article has also grown steadily, meaning not so much an increase in the size of research groups, but a possible case of 'author bartering' (my name on your article, your name on mine, etc.)[12].

Plagiarism itself has become increasingly practicable and difficult to detect – although in the form of 'micro-plagiarisms' – by copying text excerpts available on the Internet[13]. Apparently, authors increasingly quote references from an article they have consulted as if making their own citations, without having specifically consulted the originally cited article. The task of editing scientific journals has obviously become quite complex, involving intricate and multiple ethical issues.

Thus, 'publicationism' is now accompanied by another academic phenomenon, 'citationism', or the great importance ascribed to the act of citing other authors and of being cited in articles – to a major extent an effect of the success achieved by the impact indicators

developed by the ISI® - Institute for Scientific Information. In a sense, this excessive concern now represents the current spirit of 'rapid evaluations', as a fashion in the academic setting. Indeed, the etymology of the Latin terms '*citus*, *cita*, *citum*' is emblematic in the sense that they indicate 'to put in motion, summon, excite'[14]. Authors have to produce articles that generate citations, that is, that are published and display the necessary vitality to appear in other publications.

II

Science is certainly an intellectual technology capable of generating excellent understanding and interpretations of the world, besides fostering interventions and creating technical objects that correspond to many human designs. Still, a serious problem remains with the ideology of scientificity, that is, briefly, when science is considered the best model (in more radical cases, the only model) for understanding and representing the world and humans[15].

The strength of science derives from the fact that its protocols, instruments, and analytical devices sufficiently simplify 'reality' with the purpose of studying and acting upon it. As we witness around us, this usually happens quite effectively. Still, the umbrella called science can also commit abuses of knowledge, for example when one attempts to deduce norms of conduct based on univocal evidence from scientific research or reduce problems merely to their translation in technical terms[15].

Latour has approached the transition from a culture of 'science' to a culture of 'research'. Science is understood as a cold, direct, and objective activity, while research is a heated, risky activity leading to other implications. While science puts an end to the whims of human disputes, research creates controversies. As mentioned, science operates under the mantle of objectivity, attempting to escape (insofar as possible) from the supposed shackles of ideology, passions, and emotions, while research feeds on all these aspects to generate questions less removed from us. These two basic perspectives thus coexist to varying degrees in current scientific activity[16].

Following this line a reasoning, a purely scientific view is something abstract – as if what essentially defines scientific activity were the faithful search for data and the correspondingly correct application of protocols, research designs, and analysis of findings. The social imaginary already features a scientist who is first and foremost a benefactor of mankind[17] (as reflected in the title of a children's book published in the 1940s, with the life stories of renowned scientists), with noble qualities, among others. For example: disinterest in material things at the personal level[18], altruism – in relation to the scientific article, only a few decades ago scientists were often believed to behave like donors, by delivering their articles to a journal, with this donation defining them as scientists. Their reward was prestige, according to Hagstrom. The social organization of science consisted in an exchange of information for social recognition[19] (p. 104). But there is increasingly strong evidence that much of this social imaginary is progressively changing.

III

One activity by researchers is to generate interest in their object of study at various levels in the process of scientific output[20], including awakening the interest in scientific journals to publish articles on their line of research. In other words, researchers also need to manage their professional careers and their links and roles inside research groups. Other dimensions thus affect their scientific work, like influence and power games between and within research groups and levels.

We apparently need to contextually scrutinize researchers' various activities beyond the demands for objectivity and maintenance of scientific rigor in academic output, to include: research fundraising activities, managements of relations between academic groups, peer-to-peer communication (hence the supreme importance of standardizing scientific practices), and ways of successfully producing and publishing an important number of articles in prestigious journals in the respective field, spawning a major number of citations in order to ensure complete success. Let us call this latter aspect 'citationogenic bibliography', in the specific sense of articles capable of generating the largest possible number of citations.

In one example, in molecular biology laboratories, Hackett studied issues linked to ambivalence, tensions, and paradoxes pertaining to: 1) the establishment and maintenance of the group's identity, and that of each researcher within the group; 2) obtaining and sustaining power and control in relations between researchers vis-à-vis the set of research technologies and practices; and 3) the choice of risks that researchers are willing to take in their work in relation to the possibilities for satisfactory results with a view towards the continuity of their research lines[21]. This scenario is obviously permeated by a strong citationogenic preoccupation.

Let us suppose that a researcher chooses a line of research with increased risk levels for obtaining results, given his investments – a system to study recombinant events in human cells. However, there were problems with confounding caused by methodological artifacts, due to the use of polymerase chain reaction (PCR), which itself can cause recombination. The researcher in question abandoned this line and took a different direction with another set of research technologies centered on transgenic rats, combining molecular biology, traditional genetics, and manipulation of ova from sham-pregnant rats. This second line of investigation also proved fruitless. Such unsuccessful efforts dried up his funding sources and forced him to move to a different university, where he began another line of research, closer to medicine than basic biology. Data from the Science Citation Index tell this story's bibliometric version, proper to the spirit of our citationogenic time:

Phase 1 (basic biology, up to 10 years after publication): 7 articles that received a total of 37 citations;

Phase 2 (biological research with a biomedical focus, 4 years after beginning the investigations): 5 articles, receiving a total of 211 citations[21].

In the field of public health, these various dimensions of 'big science' do not all behave the same. There is not as much pressure for new discoveries or the creation of products and technologies. The tensions involve other aspects, like instrumental pressure from public health issues and their mismatches in terms of producing studies that allow satisfactory knowledge of the various morbidity, mortality, and risk status trends and the corresponding possibilities for insertion of such knowledge into practices that lead to effective results and changes in the population's health situation.

As described by Coimbra-Jr[22], for public health in Latin America, there are sufficient elements to contend that ISI impact factors produce a partial and distorted picture by failing to capture the field's specificities in relation to: '...impacts on policies, planning of intervention strategies and health programs, and organization of services, beyond the mere quantification of bibliographic references/citations' (pp.887).

Even so, publicationist pressures are omnipresent in all contexts, in terms of place-of-publication and impact. As a corollary to the above, having one's article extensively cited does not necessarily mean progress in knowledge, even though citation is still one way of measuring an article's alleged importance. Computational devices like the system indexer SCOPUS (http://www.info.scopus.com/.) even allow specific follow-up of who cites whom, and where.

IV

One immediate way to gauge a scientific article's 'commodity' dimension is to focus on the prices paid by potential readers interested in article whose access is not free, but requires payment to the journal publishers, among other reasons because journals sustain various embedded costs in the articles' editorial production. On the other hand, the Internet carries open access texts, but a consistent literature review has to include articles with paid access, even though this provides a limited reading for the intended focus. At any rate, 'free-versus-paid access' is a hot and important debate, but beyond the scope of the current paper.

One can deal with a scientific article from the sociological perspective of the dynamics of scientific communities – as the result of a line of investigation that generates symbolic capital along with its scientific output. Following this same argument further, articles can assume given traits as if they were commodities marketed in scientific journals. The latter, in turn, display a selective capacity to refuse given items and approve others according to academic quality control criteria, applied by reviewers who are also selected among the consecrated authors in the respective field. Meanwhile, supply and demand criteria also govern the journals' selectiveness. For example, the *British Medical Journal* advises potential authors that the journal only approves 12% of the 6,000-7,000 articles submitted annually[23.]

Arranz[24] criticizes the 'game' spirit in scientific publication, based on an article by New Zealander Tim Albert[24], translated from English specifically for publication in the Spanish journal *Gaceta Sanitaria*. The article features a 10-step recipe, reminiscent of self-help manuals, with advice for winning the 'game' of writing scientific articles. Winners get their articles published, preferably in important journals. The article explicitly mentions that article publication is a sales activity and that the job is to create a product (the scientific article) and sell it to the customer (the editor). Once the latter buys it (accepts it for publication), the transaction is complete, the job has been performed successfully, and the game is won (pp 355).

We thus suggest that the game to be won is the market competition 'game', with elements and rules that are consistent with prevailing competition in various contemporary activities. This requires expanding the discussion on the market dimension of publishing scientific work.

Article authorship has become a currency, or a negotiable commodity on the academic market in times of mainstream biological and medical sciences, or 'big science'. In another context, Marx himself pointed to the dimension of commodity fetishism by highlighting its 'mysterious' character[26]

'(...) *simply because in it the social character of men's labor appears to them as an objective character stamped upon the product of that labor: because the relation of the producers to the sum total of their own labor is presented to them as a social relation, existing not between themselves, but between the products of their labor. This is the reason why the products of labor become commodities, social things whose qualities are at the same time perceptible and imperceptible by the senses (...). There it is a definite social relation between men, that assumes, in their eyes, the fantastic form of a relation between things. (...) So it is in the world of commodities with the product of men's hands. This I call the fetishism which attaches itself to the products of labor, so soon as they are produced as commodities'*. (pp. 52-53)

It would certainly be overly detailed to argue the need for an adaptation of these ideas, by conceiving them in the bibliographic sphere and claiming that the scientific article is not exactly the product of human hands, in the original sense of manufacturing. Rather, it is

doubtless the result of primordial intervention by the human intellect. Even so, by a curious linguistic quirk, at the beginning of its journey, soon after being drafted by the authors, the scientific article customarily receives the original name of 'manuscript', even though texts are now processed primarily with computer technology.

In this brief analysis of the scientific article as commodity, we should emphasize the notion of perceptible use-value, pertaining to the specific utility of this 'article' for its consumers/readers vis-à-vis the capacity to what is supposed to be the advancement of knowledge in the respective disciplinary field. It is also necessary to consider its imperceptible exchange value, as a fetish in the case of symbolic exchanges – in the sense of being an element capable of having certain 'amounts' of added prestige or recognition for its author. Such components are essential to keep both the author and his research group active and influential in the field of cooperative and competitive interactions in their scientific community.

Benjamin[27] proposes another promising key for analyzing this aspect, namely the notion of 'exposure value' referring to the study of an art work, but which, all else being equal, applies perfectly well to the scientific article. If the notion of 'exposure value' applies to the analysis of an art work's dissemination, it is equally valid for the various forms of communication that are proper to scientific communities, since we also consider scientific dissemination an implicit way for authors and research groups to exhibit their work.

Researchers need to publish, whether for normative reasons defined by the configuration of the necessary network exchanges that define the advancement and debate inherent to scientific activity, or due to the need to appear productive in the judging eyes of those who fund research. According to Agamben[28], scientific communities display a dose of targeted showmanship, because consumption and spectacle are essential elements in the extreme phase of contemporary capitalism, and science appears unable to escape the effects of this process.

Darwinist analogies can also be used to represent this emerging perspective. Analogies with Darwinian evolutionary ideas in the history of sciences and epistemology are not new. Thomas Kuhn[29] contended that his idea of the evolution of scientific ideas was similar to Darwin's theory on the evolution of species. Biological comparisons are also used for emergence or disappearance in publishing contexts[30].

Therefore, the famous 'publish or perish' imperative may well contain something like territorial struggles for the selection of the fittest among articles battling with each other for publication. First, to awaken editors' interest and attention as a relevant and important theme in the respective academic setting. Later, after being duly analyzed, to comply with reviewers' demands in pursuit of the anxiously sought-after quality stamp leading to the goal of approval for publication. The latter is the prize after passing all these checks and controls, since it means the possibility of inhabiting premium niches in this market, in a kind of 'bibliographic Darwinism'.

But there are still other awards to pursue in the ongoing struggle with the objective of propagation, through legitimization by one's respective community, namely the highly prized peer citations. Citations are so highly valued that they have spawned classification systems (in a virtual 'hit parade' of specific publications in journal websites) [31,32] for ranking authors with highly successful articles.

Analyzing the meanings of scientific articles, Velho reinforces the perspective of the scientific article as a commodity. For him, bibliometric scientometrics views scientific activity as a process in which certain inputs or resources generate given outputs. Impact measurement consists in establishing the input/output relationship. The task is thus to establish input and output indicators. It is much more difficult to measure outputs, especially in relation to the effects of the knowledge produced and its links to society[31]. Outputs are generally measured by bibliometric indicators that establish links between the scientific

literature, research results, and internal repercussions in the field, like citation in other articles, often without a direct (or even indirect) relationship to societal issues or people's lifeworld[33].

The predominant image of the author of scientific articles is no longer one of the 'romantic genius' who dedicates his intelligence and analytical skills to proposing ways for inquiring into the world's mysteries, to the benefit of humankind. Neither is it that of the 'tinker' who develops better ways to describe entities or improve existing processes. Today, a major share of authors work as company 'employees' dedicated to following the routine of established protocols in research projects approved by funding agencies and consecrated by the scientific community. They also devote their time and efforts to bureaucratic activities in the scientific trade: conducting literature searches, maintaining relations with other research levels and groups, drafting articles, submitting research proposals, reviewing papers and materials, and participating in attempts to publish the group's work[34].

Research group leaders, in addition to contributing their technical and scientific expertise, function increasingly as businessmen by managing inputs, outputs, personnel, human resources, and equipment, but especially keeping the funding sources active in order to ensure their group's ongoing survival, as a way of maintaining their own existence in the field.

A meticulous analysis of funding sources for scientific articles from 1994 to 2003 illustrates the private interests involved in articles in the biomedical field with the most citations. According to the findings, of the 289 articles investigated, public funding was the most common, with 60% of the articles, while private initiative accounted for 36%. The proportion of the most frequently cited articles that were funded by private industry increased over time, and was equal to the proportion funded by the public sector in 2001. Of the 77 most widely cited randomized clinical trials, 65 were funded by the private sector, and the proportion increased significantly over time. Eighteen of the 32 most widely cited clinical trials published after 1999 were funded by industry alone[35].

An important element in this scenario is the expansion of so-called contract research organizations (CROs), nongovernmental organizations dedicated to conducting research, functioning as 'contractors' hired by drug companies to perform research more quickly and at lower costs. By 2000, CROs already received 60% of all drug research funding.[36]

V

Researchers can be viewed as agents that position themselves as both producers and consumers of articles that compete with each other to call attention in the midst of a sea of 'papers'. Both cases entail difficulties in the approval of articles by the more prestigious journals, purportedly involving narrower filters in article selection – which can add more value to the articles published there.

The vast majority of such journals are published in English and belong to contexts in which scientific output is more highly developed (European Community and United States). Since these settings value empirical approaches and objects and themes pertaining to their respective health research contexts, approval of articles ends up reflecting these patterns. In other words, some research themes and approaches succeed in spawning interest and thus tend to be accepted by more prestigious journals.

Meanwhile, and from a similar perspective, journals display their own hierarchy of supremacy. There is also a 'ranking' of periodicals according to the impact factor – which enjoys considerable acceptance in its capacity to describe the panorama of authors and journals in accounting terms, although many view it as a measure of criticizable quantification in its fetish for numbers, generating out-of-context scores based on article citations[35]. In addition, even with all the proper ethical precautions, the 'mainstream' journals may be

exercising editorial power by implicitly defending interests that are sometimes (but not always) justified, by accepting certain articles to the detriment of others, in the name of 'good science'[37].

On another scale, competition is mimicked in the relationship between journals and indexers. Journals also compete with each other to main their respective prestige, as measured by their capacity to receive the seal of approval from consecrated indexers (in general Anglo-Saxon, in particular Medline and ISI®), after daunting tests (the impact factor is a key requisite) to be accepted and meet the requirements for maintaining such a position.

In an editorial, the editors of the Spanish journal *Gaceta Sanitária* declare their equidistance between impactophobia and impactophilia, while adopting a 'pragmatic' stance towards the importance of citations. And they have no qualms about requesting citations of the journal for purposes of future indexing in the ISI® Science Citation Index SCI®. [38]

The Thompson Corporation administers groups specialized in producing bibliometric rankings, with websites providing access to academic performance classifications in quantitative terms, corresponding to names, journals, institutions, and countries by disciplinary field (since they deal with basic research, unfortunately neither public health nor epidemiology appear. Examples include: <http://isihighlycited.com>; <www.sciencewatch.com>; and <http://in-cites.com/>. All these websites feature classifications of various topics, formats, and categories, including the 'most cited articles' called the season's 'hottest papers', as if they were monitoring passing fads in the context of ordinary 'consumption', to the point of receiving the same metaphor for their respective success.

As stated in the website http://in-cites.com, such ranking has the following objectives: "analyzes research performance of companies, institutions, countries, and journals; ranks top countries, journals, scientists, institutions, and companies by field of research; identifies significant trends in the sciences and social sciences; enables users to evaluate potential employees, collaborators, reviewers, and peers; and determines research output and impact in specific fields of research"[40].

Ranking is thus an eminently econometric analytical instrument, aimed primarily at orienting and optimizing cost-effectiveness assessments for investments in various orders and types of research, from the point of view of their economic return. This becomes clear in the list of potential users of such information: government policymakers, university or company research administrators, research analysts or government information specialists, academia, industry, the publications sector, financial services, and research foundations[39]. This leads us to the familiar and inevitable question proper to the critique of hierarchical control and surveillance systems: who indexes the indexers? Such groups apparently conduct their activities and impose their standards and disseminate the prevailing bibliometric ideology without any great resistance, thereby feeding the cornucopia of scientific output.

Final remarks

Nearly three decades ago, Latour and Woolgar stated that scientists are like corporations, and their curricula vitae are like company balance sheets[40] Authorship means the capacity to tap credit (or credits) in terms of scientific capital, which can be accumulated and reinvested to sustain one's work, for proposals to fund new research, and/or to have subsequent work accepted for publication. Wisely used credit responds effectively to the laws of supply and demand. In this model, scientists act as both employers (companies) and employees: their funding sources remain as the ultimate power in this market, over which they wield limited power. The scientific article is thus one of the main forms of scientific capital, with the power to generate more capital[41]

Although there is no consensus as to the theoretical perspectives in the proposals for studying participation by academia in marketing scientific research, some authors suggest that the phenomenon began on various fronts in the early 1980s[33], with a sharp upturn in scientific research, coinciding with the development of widespread resources in informatics and telematics: the personal computer and the Internet[43].

From our perspective, in the area of science publication, the marketing of scientific research manifests itself through a progressive 'commodification' of the 'scientific article' as an object. As discussed above, an important dimension involves the transactions for entering the 'market' of mainstream scientific communities. In this case, what are the negotiations between authors, editors, and reviewers, beyond complying with the 'technical and scientific aspects' of judging an article, i.e., what are the extra-scientific elements and their biblioethical limits in the actions and concessions that researchers make (or allow to be made) to publish their articles and accept articles by others? To list as bibliographic references articles published in the same periodical in which one is attempting to publish? Failing to consult the original bibliographic sources while copying them from other authors' references?

The concern for detecting and combating scientific practices that deviate from the ethical path and for controls to regulate scientific work has not proven a sufficient approach to deal with the excesses in the current scenario. The very attempts at control run the risk committing excesses. What is important is to produce analytical keys that allow understanding the directions and meanings of scientific activity in this time of information flows in a globalized economy.

We should view academic contexts in a less simplistic and limited way than the 'rankings' based on bibliometric indicators, as if they reflected an activity that is 'purified' through its proposals to measure scientific output. Scientific communities sometimes place too much faith in their regulation and control systems, as if such systems actually allowed them to distance themselves from other fields of human activity.

Despite the difficulties, we need contextual analyses of power vectors and relations at play when publishing and citing scientific articles. We should thus develop and adopt other categories that allow viewing the production of articles based on elements beyond their explicit academic content. Such categories should allow the identification of elements that can fill the numerous gaps in the results of bibliometric studies[44]. An example would be ethnographic studies on the negotiations that occur in a journal's editorial process, from the arrival of an article until its final destination (whether refusal or publication).

Scientific output aims not only at generating an effective strategy for what is possible to do. It also consists in a vigorous symbolic production of an ideological nature that never ceases to legitimize itself or to encourage actions in this direction. It is vigorous because it appears to hover above ideologies. Its undeniable instrumental efficacy can disguise the ideological functioning of science, which is also a socially contextual activity. Thus, we cannot overlook the need to measure and understand the participation by the universalizing perspective of scientific culture within the prevailing proposals in the current economy.

The mode of production and consumption of scientific articles show equivalent excesses to those of many other aspects in the production and consumption of commodities in globalized capitalism. We need studies that help us understand the origin, dynamics, power flows, and respective networks through which goods, services, information, and knowledge circulate that determine and control the definitions of the 'reality' of science, in the sense of identifying not only beneficial and advantageous aspects for relieving human suffering, but also proposals that take for granted practices from the neoliberal ideology, with relentless implications for maintaining their effects of wasting lives[45] by sustaining profound social inequalities.

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