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Writing and Publishing Science Research Papers in English

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Abstract - Scientific research papers are among the most prestigious documents produced today. They are the means by which scientists report their scientific contributions. In addition, the publication of research papers is a means for scientists to their credibility. Each paper is counted as a product of knowledge. The number knowledge products count toward determining a scientist's status, an institution's prestige and a nation's economic well-being. In other words, in the contemporary, globalized world of science, research papers have a value beyond their scientific content. • The rise of English as the language of science; • Measuring the impact of articles, journals and nations; • English competence, funds for research, and publishing success; and, • Collaborations, teams and networks. To explicate the context, we draw on empirical research in the fields of applied linguistics, bibliometrics, sociology of science, and economics. Together, they set the foundation for understanding the backdrop of contemporary scientific article creation. At the conclusion of this section, you will have a broad understanding of how this context influences the creation of research paper.

INTRODUCTION

The prominence of English began as German's prominence waned, and it coincided with the dominance of scientific research in the United States. The American influence in science, and thus the role of English, too, took such prominence for several reasons. In the postwar period, the American educational and scientific infrastructure was still intact, while Europe had been devastated by war (Kaplan, 2001). Large numbers of European scientists immigrated to the United States, and the so-called Cold War of the late 1940s and 1950s motivated vast investments in scientific exploration (Ferguson, 2007). Together these factors allowed for English—the language of the United States with its economic and cultural power—to take on

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increasing importance for the dissemination of scientific knowledge.

Applied linguists rightly point out that English is not a superior language for science: it is not inherently any better than would be Latin or German or French, or Chinese (de Swaan, 2001). English is not better suited to science because of innate qualities of the language. Rather, the confluence of socio-historic and economic factors gives English its contemporary dominance. There is no other language that is as commonly used in scientific forums, whether conferences, proceedings, research article publications, or citations. It is interesting to note that some speculate that as China takes on increasing importance in global science, we may see Chinese become the language of science sometime toward the end of this century.

"Impact" is defined by the Oxford English Dictionary as "a marked effect or influence", and most scientists would hope that their work will have a marked effect or influence on their field. In science, having "impact" has become quantifiable through the "impact factor". The system of determining the impact of a journal was created in 1961 by Eugene Garfield, founder of the Institute for Scientific Information (ISI). The ISI is now incorporated into Thomson-Reuters' Web of Knowledge which includes the hugely important Science Citation Index (SCI). The impact factor which Thomson-Reuters calculates has become ubiquitous. The formula for calculating a journal's impact factor is simple:

Number of citations to articles in a journal in one year (e.g. 2012)	÷	Number of articles published in that journal in the previous 2 years (e.g. 2010 and 2011)	=	IMPACT FACTOR

The reasoning behind this formula is simple: a journal publishes articles that are cited by others; therefore, the journal has a measurable impact on the field (Garfield, 2006). The higher the impact factor, the greater the impact. Impact factors are recalculated every year. Criticisms of the impact factor are numerous (See Box 2.1). Fundamentally, some argue that "citations are a shallow measure of research quality or impact" (Lillis and Curry, 2010, p. 15).

Nonetheless, the impact factor is now well entrenched in the world of scientific publishing. The impact factor is stated on the individual journal webpages of the world's four major journal publishers (Elsevier, Springer, Taylor & Francis and Wiley-Blackwell have well over 1000 journals each) (Ware & Mabe, 2009). The impact factor is calculated for the 16,000+

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journals included in the Web of Knowledge, comprised of the Science Citation Index Expanded, Social Sciences Citation Index Expanded, Conference Proceedings Citation Index, and Arts & Humanities Citation Index. (Thomson Reuters, 2011). The field of bibliometrics, which has grown up around the measuring of impact, is central to the ranking of journals. For scientists to achieve maximum impact in the bibliometric system that is prevalent today, they are best to publish in the journals that are indexed in Thomson Reuters' Web of Knowledge

Citations counts are valuable in determining the importance of published work; these counts are used as a measure of the "quality" of the work. However, much as the Web of Science disproportionately favors journals published in English, so, too, do the citation counts that it generates. In contrast, Google Scholar is used in many parts of the world as a search engine, as access is free with internet connection. The impact of scholars' work may create a very different picture when Google Scholar is consulted. For example, the impact of 36 well-established Latin American scholars who have each been publishing for more than 30 years was compared in the two databases, Google Scholar and Web of Science (Brunner-Ried & SalazarMu`niz, 2012). Based on the large citation counts, we can say that the impact of Latin American academics throughout the region is significantly more substantial than the Web of Science metrics indicate.

The emphasis on publication metrics has created new demands and incentives for scientists in many parts of the world (Qiu, 2010; Englander & Uzuner-Smith, in press). In China, scientists are awarded cash prizes, housing benefits or other perks for their publications in high profile journals. Practicing doctors at a major surgical hospital in China are now required to publish at least one research paper per year in order to maintain their medical privileges (Yongyan Li, personal communication, March, 2013). The pressure to "rack up publications" seems to encourage dubious research practices such as plagiarism, fabrication and falsification of data (Qiu, 2010, p. 142). There is a concomitant rise in the number of retractions of published work, although these were papers that all passed the peer review process. One biochemist expressed concern that "counting the number of publications, rather than assessing the quality of research, becomes the norm of evaluation," (Qiu, 2010, p. 143). Thus individuals, institutions and nations all

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emphasize producing a high number of publications, even if those papers might be retracted at a later date. In sum, metrics have become central in determining value within science today. The emphasis on metrics of the number of articles and the citations they accrue is highly visible in institutional, national and international rankings. The metrics that underlie the rankings are calculated using indexes such as those created by the Web of Knowledge. There, journals gain visibility, since they are the journals that the databases search when a scientist conducts a search for papers. The journals that are included provide the papers that are more likely to be consulted. Subsequently, those papers are more likely to be cited, raising the likelihood of obtaining or maintaining a high impact factor for the journal. The metrics very heavily favor publications in English, and publishing in English is more likely to produce citations in subsequent Englishlanguage articles. The desire on the part of nations, institutions and scientists to rank highly in the measures of research output and impact can give scientists much reason to be cognizant of the impact factors of the journals in which they seek to publish (Englander and Uzuner-Smith, in press).

Journal editors call upon a network of fellow scientists and scholars to comment on a manuscript that is submitted in hope of it being published. These members of the scientific community review the manuscript in order to determine its appropriateness for publication in that particular journal. The journal editor typically relies on those comments to determine whether the manuscript should be accepted 'as is' or it should be rejected; in between those two extremes is the request for revisions that may range from minor to major. Together, the reviewer's and editor's goal "is to ensure that inaccurate or sloppy research is weeded out" (Yaffe, 2009, p. 1) but also to assure that "new discoveries … get disseminated to the scientific community as rapidly as possible" (Yaffe, 2009, p. 1). Once a manuscript is accepted for publication, it is "up to the community at large to come to their own conclusions about the soundness of the research" (McGinty, 1999, p. 138). Because journal editors and reviewers control access to publication, they are sometimes termed gatekeepers; that is, they prevent those who have not earned the right to enter from entering. There are a number of typical questions that reviewers are asked to consider concerning a manuscript (Box

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13.1). On the broadest level, the manuscript should be well presented to demonstrate that there is an important contribution based on appropriate methods that will be of interest to the journal readers.

13.1 Typical Questions Included on Reviewer Evaluation Forms

- Is the contribution new?
- Is the contribution significant?
- Is it suitable for the publication in the Journal?
- Is the organization acceptable?
- Do the methods and treatment of results conform to acceptable scientific standards?
- Are the conclusions firmly based in the data?
- Is the length of the paper satisfactory?
- Are all illustrations required?
- Are all the figures and tables necessary?
- Are figure legends and table captions adequate?
- Do the Title and Abstract clearly indicate the content of the paper?
- Are the references up to date?
- Is the paper excellent, good or poor?
-

A fundamental tenet of the peer-review publishing process is that reviewers will offer a thoughtful and objective reading of the manuscript in order to bring sound science to the larger community. However, the neutrality of journal reviewers has been questioned in a number of studies. There is evidence that reviewers are influenced by the gender, Anglophone name and/or institutional affiliation of authors (Link, 1998; Wenneras & Wold, 1997, 22 May; Kourilová, 1996). Reviewers tend to favor those whom they are most familiar with, and the overwhelming majority of reviewers of the sought-after English-medium journals are people in the U.S., U.K. and Canada. This preference for the known and familiar can put scientists who are affiliated with institutions outside of those countries at a disadvantage: their provenance can elicit a degree of skepticism from the reviewers that another author would not be subject to. One Korean physicist with more than 200 published papers noted that reviewers were more critical of his papers when he relocated from the U.S. to Korea (Cho D. W., 2009). He attributed the increased scrutiny to his physically being located outside the Anglophone, American institution.

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One means of minimizing such possible bias is to recruit a broader group of reviewers from scientific associations and institutions around the world. Efforts are deliberately being made by journals such as Neurology, Canadian Journal of Forestry and the International Journal of Cybercriminology to recruit more international reviewers. The comments that reviewers make about manuscripts have been studied (Belcher, 2007 ; Gosden, 2003; Fortanet, 2008; Daniel, 1993/2004). Generally, there are more negative or critical comments than positive comments in a reviewer's commentary. This may not be surprising as these documents can be characterized as falling into one of three categories: "those that suggest improvements, those that find the paper to be…less than a publishable unit, and those that identify flaws beyond repair" (Ioannidis, Tatsioni, & Karassa, 2010, p. 285). In other words, the rejection rate is high, and comments to improve are often indications of the value of the paper. Often scientists aim high; that is, they first submit to a high impact journal. If the paper is not accepted, they will submit to another journal of similarly high impact or of lesser impact. It seems that in some cases, an author will resubmit a previously rejected paper to the same journal, making a change to the title and other non-substantive revisions but do not address the initial reviewer comments (Ioannidis, Tatsioni, & Karassa, 2010). This practice is not recommended and such duplicate submissions can earn one a blacklist within the publishing community. Being rejected by a high impact journal does not mean that it won't be accepted in a different one. Chemistry manuscripts that were rejected by a high impact journal due to negative comments from the reviewers about the "relevance of the contribution" and "design/conception" were not later published in another high impact journal (Bornmann, Weymuth, & Daniel, 2010). However, negative comments from the reviewers in the areas of "reference to the literature and documentation", "method/statistics", "discussion of results" and "writing/presentation" did not have a statistically significant probability of later being published in a low- or a high-impact journal. With this finding, readers of high impact journals can well assume that the papers published have acceptable design and implementation of the work and its importance is well positioned. As indicated above, poor writing in itself is usually not a reason to reject a manuscript (Guardiano,

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Favilla, & Calaresu, 2007), although it can be. When manuscript acceptance rates are low, language can "be as good a reason as any" to reject a manuscript (Gosden, 1992). Intolerance for what is considered poor writing is made clear in an editorial in The Scientist, titled "No pardon for poor English in science" (Jaffe, 2003). The former editor of the journal Science equates poor language skills with poor science, saying, "If you see people making multiple mistakes in spelling, syntax and semantics, you have to wonder whether when they did their science they were not also making similar errors of inattention" (cited in Gibbs, 1995, p. 96). The journal Applied Physics Letters (2007) explicitly indicates that manuscripts can be rejected for language problems (Huang, 2010). The focus on language problems is certainly legitimate because a scientific paper needs to effectively communicate what was done, what was found and why it is important. Language problems are reported in the manuscripts written by local Anglophone scientists as well as those written by international scientists (Swales J. M., 2004). Some journal editors report that they provide extra attention and go "out of their way" to help nonnative speakers of English with their manuscripts (Flowerdew J. , 2001, p. 129). In three reported studies, about half to three-quarters of the international authors received a comment about insufficient English in their papers (Gosden, 2003; Mungra & Webber, 2010; Hanauer & Englander, 2013). Even native-English-speaking authors who submit a paper from outside an Anglophone country have received reviewer comments telling them to have their paper "reviewed by a native speaker" (Belcher, 2007; David Hanauer, personal communication, May 18, 2008).This suggests a predisposition on the part of the reviewer that an author residing outside the Anglophone world could not submit a paper that is fluently written. As comments on the nonnative langauge elements is commonly noted by reviewers, an analysis was conducted of several sets of reviewer reports received by two Mexican scientists (Englander & López-Bonilla, 2011). The reviewers' comments revealed what they considered to be "good science" and a "good paper". When the reviewer believed that the Mexican scientist shared those same criteria, the reviewer's attitude to the language difficulties in the manuscript was helpful. He played the role of an "ally" in assisting the author to improve the manuscript, or a "ringmaster" in helping the

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author to acquire the necessary resources to improve the manuscript. However, when the reviewer felt that the author did not share the same beliefs about good science or a good paper, the reviewer played the role of "guardian" of the discipline, and the language difficulties were emphasized. "Although the reviewers commented on the same manuscript, and all noted nonnative English, some severely criticized the language, and others offered linguistic assistance" (Hanauer & Englander, 2013, p. 44, emphasis added). The reviewer's perception of whether or not the author shared the same attitude about science seemed to determine the decision to support or deny access to publication.

All in all, there is ample evidence that the peer review process does not guarantee that good work will get published and neither does it guarantee that bad work won't get published. Nonetheless, many scientists remark that peer review does make their papers better. Novice scientists learn from the comments of the reviewers about writing better manuscripts. Established scientists gain the opportunity to defend or limit their work before it goes to the wider scientific community. Peer review of manuscripts continues to be a collegial process that is considered central for scientific knowledge to progress.

CONCLUSION'

This short volume has presented the research conducted in the last few decades about writing and publishing scientific articles in today's global world. The research comes from the fields of applied linguistics, rhetoric, sociology of science, history of science, and bibliometrics where the researchers use quantitative and qualitative approaches to understanding the phenomenon. The research makes clear that never before have so many scientists around the world been so pressured to publish their work in English. At the same time, never before has there been such great opportunity for scientists around the world to communicate quickly and widely with colleagues who share an interest in scientific endeavors. The use of English as a lingua franca in science opens up global scientific conversations to native and non-native speakers alike. This situation makes for a time of great excitement in science as formerly muted voices gain access to the conversation. The scientific research paper is the most established medium for capturing and creating new knowledge. This is a great value in itself. The knowledge

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communicated in scientific papers helps explain the universe we live in and often helps us to make the world better. It is a kind of knowledge capital.

Scientific publishing also creates social capital. The individual scientist has an increase in prestige that can turn into funding opportunities, conference plenaries, and university promotions. As the prominence of the individual scientist rises, so does the prestige of the research team, the institution, and the nation. The pervasive system of metrics and rankings are a tangible form of reporting this social capital. As described in Section I of this book, this is the context in which science today takes place. Scientific investigation which is not reported in a scientific paper is lost to the world. A To prevent such loss, science education should inculcate a writing culture for university students and allow students to see for themselves the importance of creating appropriate scientific texts. Learning to write, think and work in the ways that are accepted in a discipline takes years, and so it must begin early. Students who do not speak English as their first language should have opportunities to gain scientific English skills. And they should be permitted to ask the questions, develop the approaches and use the international sources that can broaden science for us all. Scientists everywhere need to be able to fulfill the stylistic and rhetorical demands of scientific writing. As shown in Section II of this book, those demands are high.

The scientific world is also a social world. As discussed in Section III, relationships are crucial in science. Novices need to be apprenticed into not only the writing skills, but the social dimension of the scientific world: collaborations, conferences, networks and international alliances. Scientists who are located outside the predominantly English-speaking countries benefit greatly by informal networks and formal collaborations if they want to publish in the English-language journals that are indexed in the major databases. They also may make decisions to form local networks to publish in their own language or in regional journals. In this way they may talk to a different audience than if they chose an English-language journal in the United States. Choosing the audience who are to be the scientist's readers is one of the many social elements of writing and publishing.

Bringing a paper into publication is also a social activity. Editors and journal reviewers determine what they believe to be

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appropriate for their journal. If a paper is not outright rejected, a negotiation of improvements and changes occurs between the author and the editor. The scientist must consider what is being asked of him or her and justify the decisions made. Bringing the work to the larger scientific community is the immediate goal. But that goal is part of a much larger social project. By scientists publishing their work, they set a new foundation upon which further discovery is made possible. This is a process by which we can make the world a better place.

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