

Some Incorrect Journal Impact Factors

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We point out that the journal impact factors for *Astronomy & Astrophysics* and for the *Astrophysical Journal* were computed incorrectly during 1998-2001, and the reason for those errors is explained.

1. INTRODUCTION

The Institute for Scientific Information (ISI) has scanned the reference lists in all the major scientific journals and attributed them to the original authors and papers. This is complete back to 1955 and is being extended to 1900. Thus one can find for each paper published the subsequent papers that refer to (cite) the original paper. The resulting Science Citation Index (SCI) has been used for several purposes: (1) to search the literature for papers related to the original paper, (2) to evaluate which papers have contributed to certain fields, and (3) to collect or evaluate the papers written by individual authors or originating in individual institutions.

The ISI now has separate publications for the physical and biological sciences, for the social sciences, and for the arts and humanities. The entries tell in addition to the citations, the type of paper (research paper, letter, erratum, biographical item, note, review, etc.). The indexing is now done for both the lead authors and the co-authors. The SCI is available (by subscription) on the internet (called the “Web of Science”), on CDs, and in print. The internet edition is updated weekly. The CD edition is often used for special searches (e.g. the list in *Science*, 302, 779, 2003 of the 10 most-cited researchers in the past 20 years – all of whom are in the bio-medical field because it is so large relative to the other sciences). Although the printed edition continues, the five-year accumulations have been terminated. Because ISI now has a database of the major published papers, it checks each citation for the errors that occur in references (Abt 1992) and corrects most of them. Currently SCI scans the 8700 most-cited journals (out of an estimated 100,000 scientific journals worldwide) to collect about 20 million citations annually to about 1 million papers. Only a small fraction of the research monographs (books) are included.

2. JOURNAL IMPACT FACTORS

A byproduct of the SCI is an evaluation of the relative importance of each journal. That quantity is called the “journal impact factor” (JIF) and is defined as the ratio of the citations to papers in a journal divided by the number of papers, averaged over the previous two years. For instance, of the 43 astronomical journals currently included in the Web of Science, the journals with $JIF \geq 2.00$, their common acronyms, and their JIFs in 2002 were:

- (1) *Annual Reviews of Astronomy & Astrophysics (ARAA)*: 15.58
- (2) *Astrophysical Journal (ApJ)*: 6.19
- (3) *Astronomical Journal (AJ)*: 5.12
- (4) *Astrophysical Journal Supplement Series (ApJS)*: 4.75

- (5) *Monthly Notices of the Royal Astronomical Society (MNRAS)*: 4.67
- (6) *Astroparticle Physics*: 4.27
- (7) *Astronomy & Astrophysics (A&A)*: 3.78
- (8) *Annual Review of Earth & Planetary Science (AREPS)*: 3.53
- (9) *Acta Astronomica*: 3.15
- (10) *New Astronomy*: 3.11
- (11) *Icarus*: 3.01
- (12) *Publications of the Astronomical Society of the Pacific (PASP)*: 2.83
- (13) *Revista Mexicana de Astronomia y Astrofisica*: 2.58
- (14) *Astronomy & Astrophysics Review*: 2.00

It was noticed recently that the JIFs of several journals showed sudden decreases in 1998. We list here the JIFs for several journals that did not show such decreases:

Journal	Year					
	1997	1998	1999	2000	2001	2002
<i>AJ</i>	2.42	2.00	2.88	3.60	3.02	5.12
<i>MNRAS</i>	3.38	3.96	4.55	4.68	4.68	4.67

Note that these generally show steady growth in JIFs.

In comparison, we show the JIFs for two journals that showed dips:

Journal	Year					
	1997	1998	1999	2000	2001	2002
<i>ApJ</i>	2.95	1.95	2.54	2.82	5.92	6.19
<i>A&A</i>	2.36	1.63	2.25	2.79	2.28	3.78

Why should these values for *ApJ* in 1998-2000 and for *A&A* in 1998-2001 be roughly half of those in 2002? The total citations per year for these two journals also showed dips in 1998-2001, although those of the *AJ* and *MNRAS* did not.

3. THE SOURCE OF THE ERRORS

The editors of three of the major astronomical journals (*A&A*, *ApJ*, *MNRAS*) met in 1987 to reduce the editorial differences between their journals. Why should one journal require Roman numerals for section headings while another required Arabic numbers and decimals? Or one journal used letters for footnotes and another used Arabic numbers. Many authors now publish in several different journals in their international collaborations, so all these differences in requirements of authors became confusing. While agreeing to reduce such differences, the editors also decided to shorten journal abbreviations, e.g. to use *MNRAS* instead of *Mon. Not. Roy. Astron. Soc.* Such acronyms are explained

monthly, and saved about 60 pages of print in the *ApJ* alone. These changes were agreed to in those and other journals and were described in separate editorials (e.g. Abt 1990, Lequeux 1990).

The adoption of the short acronyms (also used widely in speech among astronomers) caused no problems for the following seven years. However, in 1998 ISI changed a computer program with the result that citations to both *ApJ* and *Astrophys. J.* were not included in computing the JIFs. That is what caused the dips for *ApJ* and *A&A*. We have not been able to learn why this did not affect *AJ* and *MNRAS* also. It was several years before the problem was realized and corrected. We are assured that this problem did not affect citations to individual papers; sample scans confirmed that. Only the JIFs were affected. However, the incorrect JIFs during 1998-2001 have been published and ISI cannot change those numbers. The purpose of the present note is to call attention to those incorrect values.

4. WHAT DIFFERENCE DOES IT MAKE?

Most astronomers are unaware of the JIFs; they publish their papers in the journals that best fit the nature of their research. However, in these times when scientists in one field find it difficult to understand forefront papers in another field, administrators, even if they are scientists themselves, find it difficult to evaluate the importance of papers and the performance of their authors. Thus they are more impressed with papers published in journals with higher JIFs than with low ones. A scientist may publish many papers, but if they produce few citations and are published in secondary journals, their work is considered less important than that of others.

Editors and editorial board members are conscious of the competition between journals. If their journal ranks low in

JIFs, they wonder whether they are doing something poorly or incorrectly. Many papers are not submitted to the national journals of the authors, but rather to journals that best fit the nature of their work. Thus editors cannot count on a captive set of authors.

These errors in JIFs point to the fact that even a mechanical and objective handling of citations can fail to give reasonable results and that judgment by users is always needed. For instance, people sometimes say that all self-citations should be eliminated in counting citations because some authors cite their own papers instead of more appropriate papers by others. That may often not be due to egotism but rather to ignorance of all the papers that have been published in a field. However, most astronomers concentrate on specific areas, building up an understanding of certain astronomical objects. Just as science is a pyramid in which each paper builds on previous ones, it is natural and necessary for authors to refer to their previous results. One should not dismiss all self-citations as due to egotism; only an informed judgment of the nature of each reference can tell whether that reference is appropriate or egotistical. This is an example to show that simple counting of citations can fail to give reasonable results.

We are sorry that ISI made errors in some JIFs, which was partly due to our deviations from standard (cumbersome) journal abbreviations. However, this warns us to be aware that errors can occur, an awareness that we always need to exercise in doing astronomical research.

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