

Electronic Access to Journals

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Abstract. The use made of electronic access to journals by astronomers in some developing countries is estimated and compared with the use made of it by astronomers in developed countries.

1. Introduction

Most astronomical journals are now published in two editions: a printed version and an on-line version. The latter has at least five advantages in addition to being a convenient form for computer-literate users: (1) unlimited free access by all faculty, employees, and students at any institution subscribing to the journal, (2) ability to click on references and to bring them directly to the screen in most cases, (3) unpaginated editions of the letters a month or two before the printed edition appears, (4) virtually unlimited space for tables and illustrative material that would cost too much to reproduce in print, and (5) the on-line versions have the full tables and illustrations, rather than samples.

We ask here whether scientists in developing countries are taking advantage of these services in this rapidly-changing medium. To do so, we asked the University of Chicago Press staff to count the number of visits (“hits”) to the *Astrophysical Journal* (ApJ) in April 2000 by people in seven developed countries and four developing countries. The numbers are given in Table 1 for the North American site and its two mirror sites in France and Japan. A user is not limited to the nearest site, e.g. a Japanese may find that the North American site is less busy during his daylight hours than the Japanese mirror site.

The numbers in Table 1 are impressively large except for China, where Internet charges are significant and access is not encouraged. How can we meaningfully compare the numbers for the developed and developing countries? We will use three comparisons: with the gross national domestic product, with IAU membership, and with estimates of the national numbers of papers published.

2. Comparison with Gross Domestic Product

We obtained gross domestic product (GDP) values from the 2000 edition of the *World Almanac Book of Facts*; the amounts are 1997 estimates and are expressed

Table 1. Visits to the ApJ in April 2000

Country	N. America	Europe	Japan	Total
(Developed)				
France	10,767	26,515	713	37,995
Germany	24,883	14,636	582	40,101
Italy	24,246	13,404	160	37,810
Japan	38,217	552	47,101	85,870
Spain	9,393	11,583	57	21,033
U.K.	47,335	10,350	164	57,849
U.S.A.	529,089	13,237	4,788	547,144
(Developing)				
Argentina	6,497	14	0	6,511
China	15	33	0	48
India	10,767	147	113	11,027
Russia	11,560	881	45	12,486

in billions of U.S. \$. Table 2 gives the GDP numbers and then the visits per GDP (in 10^9 U.S. \$). The average for the seven developed countries is 36.8 ± 15.5 (1σ) visits per billion US\$, while for three of the four developing countries it is 13.3 ± 5.8 (1σ). The difference, a ratio of 2.8, is not significant because countries devote different fractions of their GDP to R & D.

3. Comparison with IAU membership

The national IAU membership numbers are taken from the 1997 *Transactions of the International Astronomical Union* and are tabulated in the fourth column of Table 2. The fifth column gives the number of visits per IAU member. The average number of visits per IAU member is 126 ± 66 (1σ) for the developed countries and 52 ± 18 (1σ) for the three developing countries (China excluded). The difference, a ratio of 2.4, is probably not significant because the fraction of the IAU members active in research may differ widely from country to country.

4. Comparison with papers published

We counted the number of papers published in the January 2000 issues of *Astronomy and Astrophysics* (and its *Supplement*, the *Astronomical Journal* the *Astrophysical Journal* (and its *Supplement*), *Icarus*, *Monthly Notices of the Royal Astronomical Society* and *Solar Physics*. For each paper we determined the fraction of authors coming from each of the 11 selected countries, plus other countries. The numbers of January 2000 papers from each country are given in the sixth column of Table 2; the seventh column gives the number of visits per published paper. The average for the seven developed countries is 1820 ± 400 (dispersion in the mean) while for the three developing countries, excluding China, it is 1500 ± 177 (dispersion in the mean). Therefore the difference is not significant.

Table 2. Comparison of April 2000 On-line Visits to the ApJ with GDP, IAU Membership, and Papers Published in January, 2000.

Country	GDP	Visits/ GDP	IAU Members	Visits/ Member	Papers	Visits/ Paper
(Developed) France	1,320	28.8	611	62	28.3	1,340
Germany	1,740	23.0	489	82	45.1	890
Italy	1,240	30.5	410	92	36.4	1,040
Japan	3,080	27.9	448	192	25.6	3,360
Spain	642	32.7	204	103	13.6	1,540
U.K.	1,242	46.6	535	108	37.6	1,540
U.S.A.	8,080	67.7	2,250	243	179.9	3,040
Mean		36.8		126		1,820
(Developing)						
Argentina	348	18.7	90	72	3.7	1,750
China	4,250	(0.0)	367	(0)	6.2	(8)
India	1,534	7.2	228	48	8.8	1,250
Russia	892	14.0	345	36	8.3	1,500
Mean		13.3		52		1,500

We conclude that most of the developing countries are making use of the advantages of on-line publications.