Minimum impact and immediacy of citations to physics open archives of arXiv.org: *Science Citation Index* based reports

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Abstract

The present work has calculated the minimum Open Archive Impact Factors and Open Archive Immediacy Index for the Physics Classes of arXiv.org as calculated for traditional journals in *Journal Citation Reports* of Institute of Scientific Information using *Science Citation Index* without the citation by the classes itself. The calculated Impact Factors reveal that High-Energy Physics classes of arXiv.org ('hep-th', 'hep-lat', 'hep-ex', and 'hep-ph') have made more impact on scientific community than any other classes except for the class 'nucl-ex'. The Impact Factors for the year 2003 are: 'hep-th' (0.999), 'nucl-ex' (0.806), 'hep-lat' (0.766), 'hep-ex' (0.73), 'hep-ph' (0.719), 'nucl-th' (0.338), 'quant-ph' (0.334), 'cond-mat' (0.313), 'astro-ph' (0.195), 'math-ph' (0.162), 'physics' (0.061), and 'gr-qc' (0.002). It has been found that if the period for getting the citations to the open archive classes is considered one year as against two years for journal articles the rank of the classes are same. The immediacy of citing the Open Archives is also high for the High-Energy Physics classes. The Immediacy Indexes for the year 2003 are: 'hep-ex' (0.619), 'hep-th' (0.454), 'hep-ph' (0.44), 'hep-lat' (0.263), 'nucl-ex' (0.238), 'quant-ph' (0.202), 'nucl-th' (0.185), 'cond-mat' (0.168), 'astro-ph' (0.094), 'math-ph' (0.075), 'physics' (0.03), and 'gr-qc' (0.002). Definitely, the impact is much more than what is concluded from the calculated factors as the self-citations are not taken into the study. Use of web-tools like 'Citebase', 'Citeseer' etc. may strengthen the above argument.

Keywords: Open Archives; Citation Impact; Immediacy in Citing; Impact Factor; Immediacy Index; Physics Open Archives; arXiv.org; Open Archive Impact Factor; Open Archive Immediacy Index; Minimum Impact

Introduction

'Open access' (OA) means that a reader of a scientific publication can read it over the Internet, download and even further distribute it for non-commercial purposes without any payments or restrictions. The four most important OA channels are electronic-refereed-scientific periodicals, research-area-specific archive (e-print) servers (in this paper called subject-specific repositories), institutional repositories of individual universities, and self-posting on authors' home pages [Björk, 2004]. R&D policy makers around the world have recommended mandating that researchers provide Open Access (OA) to their research articles by self-archiving them free for all on the Web [Harnad, 2001]. OA is now firmly on the agenda for funding agencies, universities, libraries and publishers. What is needed now is objective, quantitative evidence of the benefits of OA to research authors, their institutions, their funders and to research itself. OA articles have significantly higher citation impact than non-OA articles [Harnad et al., 2004]. Brody [2004] is also supported in a web-based analysis of usage and citation patterns. One universally important factor for all authors is impact made by their research papers, typically measured by the number of times a paper is cited.

Now the Open Archives (OA) era has revolutionized with new ideas about starting a global database for finding the number of citations received to the OA submissions. Citebase [Brody, 2003] and Citeseer are two such webtools, which serve this partially. Studies have begun to show that open access increases impact, although more studies and more substantial investigations are needed to confirm the effect. Hitchcock [2004] has given the progress in these directions in the form of a chronological bibliography with some explanation.

The citation analysis in the fields of high-energy physics and astrophysics, indicates that the number of citations to traditional preprints has gradually declined over the past 10 years, and that citations to electronic preprints have nearly doubled every year since 1992 [Youngen, 1998a, 1998b]. The electronic preprint servers are often the first choice of physicists and astronomers for finding information on current research, breaking scientific discoveries, and keeping up with colleagues (and competitors) at other institutions [Prakasan, 2004a; 2004b]. In addition to these benefits, electronic preprints allow the free, unrestricted access to scientific information without concern for international, institutional, or political barriers.

Recently Laurence [2001] and Brody, et al. [2004] have demonstrated that articles which are available on-line at no charge are cited at substantially higher rates than those which are not. Kurtz [2004] has shown that restrictive access policies can cut article downloads to half the free access rate [Kurtz et al., 2004].

A new measure that becomes possible with online publication is the number of downloads or 'hits', opening a new line of investigation. Brody *et al*. [2004] have been prominent in showing there is a correlation between higher downloads and higher impact, particularly for high impact papers, holding out the promise not just for higher impact resulting from open access but for the ability to predict high impact papers much earlier, not waiting years for those citations to materialise [e.g. Brody and Harnad, 2004]. The effect can be verified with the Correlation Generator.

Citation analysis can be used to find emerging fields, to map the time-course and direction of research progress, and to identify synergies between different disciplines [Brody, 2004]. Citation analysis is being mainly used for measuring the impact made by journal articles. But Rousseau [1997] has attempted to compare the impact made by the 'first and second international conferences on bibliometrics, scientometrics and informetrics' with some top journals in the field. Information scientists are already computing web impact factors [Bjorneborn and Ingwersen, 2001].

Garfield, probably the world's foremost proponent of citation analysis through two measures: impact factor and immediacy index, first mentioned the ideas in 1955. The analysis of citations is among the means by which policy-makers, scientists, and information professionals seek to achieve a greater understanding of the qualitative forces that affect communications in science [Tomer, 1986]. Like nuclear energy, the two measures have become a mixed blessing, expected that it would be used constructively while recognizing that in the wrong hands it might be abused [Garfield, 1999a]. As long as scientists publish articles containing lists of cited references, it will be possible to calculate impact factors [Garfield, 2001]. Garfield [2004] has also stated that "it has been demonstrated that on line access improves both readership and citation impact". The same impact factor can indicate the 'influence' and 'performance' of e-print archives they make among scientists.

According to Institute of Scientific Information (ISI), the 'Impact Factor' and 'Immediacy Index' of a journal are calculated as follows:

$$\text{Impact Factor} = \frac{\text{No. of citations to the previous two years articles in the calculating year}}{\text{No. of citable articles published in the previous two years}}$$

$$\text{Immediacy Index} = \frac{\text{No. of citations to the articles published in the calculating year}}{\text{No. of citable articles published in the calculating year}}$$

Sen et al. [1989] had calculated Impact Factors of non-*Science Citation Index* (*SCI*) journals. The calculation is based on three factors:

1. the number of citable items published in the journal during years (Y-1) and (Y-2), say y_1 and y_2 respectively;
2. the number of times those items are cited in year Y in *SCI* journals, say x_1;
3. the number of times those items are cited in year Y in the journal X itself, say x_2;

Impact Factor is calculated as:

$$IF_Y = \frac{x_1 + x_2}{y_1 + y_2}$$

The present paper attempts to calculate the minimum Impact Factor and Immediacy Index for Open Archives as calculated for journals by Institute of Scientific Information (ISI) without the first factor x_2. The *Science Citation*

Index data is used for computing the Impact Factors and Immediacy Index for Open Archives. Then the Open Archive Classes are compared with the journals included in the *Science Citation Index*.

Refining the computation of topic based impact factors can be done through the computation of impact factors for individual research papers [Garfield, 1999b]. Citation and publication patterns differ between disciplines, so the Impact Factor is only meaningful when it is used to compare journals within a discipline [Testa and McVeigh, 2004]. For this reason, the comparisons in this study are done for only the physics sub-class e-print archives of arXiv.org.

Materials & Methods

Open archive initiatives have for the first time started by Los Alamos National Laboratory arXiv.org in 1991 and it was the brainchild of Paul Ginsparg, a physicist. It receives about 10,000 downloads per hour on the main site alone (there are a dozen mirror sites), is an essential resource for research physicists. ArXiv's high level of usage by both authors and readers makes it an excellent database for analysing research trends as well as an important test-case for the OA literature [Brody and Harnad, 2004]. The categorised services of the present arXiv.org have helped scientists to look in to items of his/her interest. The categories are divided into five main categories, viz. Physics, Mathematics, Nonlinear Sciences, Computer Science, and Quantitative Biology. The physics category is again categorised in to 12 sub-classes as follows:

- Astrophysics (astro-ph)
- Condensed Matter (cond-mat)
- General Relativity and Quantum Cosmology (gr-qc)
- High Energy Physics - Experiment (hep-ex)
- High Energy Physics - Lattice (hep-lat)
- High Energy Physics - Phenomenology (hep-ph)
- High Energy Physics - Theory (hep-th)
- Mathematical Physics (math-ph)
- Nuclear Experiment (nucl-ex)
- Nuclear Theory (nucl-th)
- Physics (physics)
- Quantum Physics (quant-ph)

The calculation with out the third factor for the sub-classes of physics by treating them as journal titles is experimented here. The formulae for calculating the minimum Open Archive Impact Factor (OAIF) and Open Archive Immediacy Index (OAII) will be as follows:

OAIF = The ratio of the number of citations received to the previous two years submissions in the calculating year (without self citations) with the number of submissions in the previous two years.

OAII = The ratio of the number of citations received to the submissions in the calculating year (without self citations) with the number of submissions in the same year.

The citations received in *Science Citation Database* (1996 - 2003) are used as the base data for calculating the above parameters. There is no direct search mechanism for citations received for these categories. Search mechanism and analysis are somewhat different from the direct search in *Web of Sciences* or *Web of Knowledge*. For eg. The search query used for retrieving the citations received to the 'Condensed Matter (cond-mat)' category of physics for the year 1997 in the 'cited author/reference' field is as follows.

A*-COND-MAT97-* OR B*-COND-MAT97-* OR C*-COND-MAT97-* OR D*-COND-MAT97-* OR E*-COND-MAT97-* OR F*-COND-MAT97-* OR G*-COND-MAT97-* OR H*-COND-MAT97-* OR I*-COND-MAT97-* OR J*-COND-MAT97-* OR K*-COND-MAT97-* OR L*-COND-MAT97-* OR M*-COND-MAT97-* OR N*-COND-MAT97-* OR O*-COND-MAT97-* OR P*-COND-MAT97-* OR Q*-COND-MAT97-* OR R*-COND-MAT97-* OR S*-COND-MAT97-* OR T*-COND-MAT97-* OR U*-COND-MAT97-* OR V*-COND-MAT97-* OR W*-COND-MAT97-* OR X*-COND-MAT97-* OR Y*-COND-MAT97-* OR Z*-COND-MAT97-* OR <ANON>*-COND-MAT97-*

JCR-2003 was made use of to elicit the latest Impact Factors of some journals.

Results and Discussion

The minimum Open Archive Impact Factor (OAIF) and Open Archive Immediacy Index (OAII) for the physics classes of arXiv.org are computed and documented in Tables 1 for the years 1998-2003. The High-Energy Physics classes of physics have the highest Open Archive Impact Factors, followed by 'nucl-ex', 'nucl-th', 'quant-ph', 'cond-mat', 'astro-ph', 'math-ph', and 'physics' categories. The subfield of physics with hardly any impact was for the category 'gr-qc'.

Table 1: Open Archive Impact Factors (by considering citations to previous two years submissions) for the Physics Classes of arXiv.org as per *Science Citation Index*

arXiv Class	$OAIF_{2003}$	$OAIF_{2002}$	$OAIF_{2001}$	$OAIF_{2000}$	$OAIF_{1999}$	$OAIF_{1998}$
hep-th	0.999	1.068	1.097	1.149	1.053	1.407
nucl-ex	0.806	0.601	0.319	0.387	0.335	0.452
hep-lat	0.766	0.743	0.748	0.656	0.614	0.571
hep-ex	0.730	0.661	0.527	0.679	0.376	0.360
hep-ph	0.719	0.730	0.728	0.864	0.630	0.471
nucl-th	0.338	0.396	0.383	0.406	0.326	0.242
quant-ph	0.334	0.496	0.453	0.430	0.299	0.463
cond-mat	0.313	0.420	0.345	0.342	0.276	0.253
astro-ph	0.195	0.223	0.217	0.228	0.215	0.203
math-ph	0.162	0.203	0.147	0.136	0.147	0.000
physics	0.061	0.058	0.065	0.050	0.042	0.025
gr-qc	0.002	0.000	0.002	0.001	0.001	0.000

Open archives are increasingly and immediately accessed through the Web and instantly get cited than the traditional journal articles. For researchers, the time of accessibility to the open archives has drastically reduced. The phenomena have caused the time for citing the open archives. The study has also taken citations received in the previous one year as against two years for the calculation of Impact Factors for traditional journal articles. Table 2 presented the corresponding Impact Factors. In this case also, high-energy physics classes are leading and the rank of the classes are almost same. The Impact Factors have gone up for almost all classes. The quotient has increased only because the growth in numerator has increased. That means, the number of citations are increasing every year, but the number of submissions are not growing in that pace.

The study suggest that one year may be sufficient for the citing the Open Archives and so the application of Impact Factors should be the one with the calculation based on previous year citations. Also, delayed impact is very less for e-print archives as they get published in formal sources later on.

Table 2: Open Archive Impact Factors (by considering citations to previous year submissions) for the Physics Classes of arXiv.org as per *Science Citation Index*

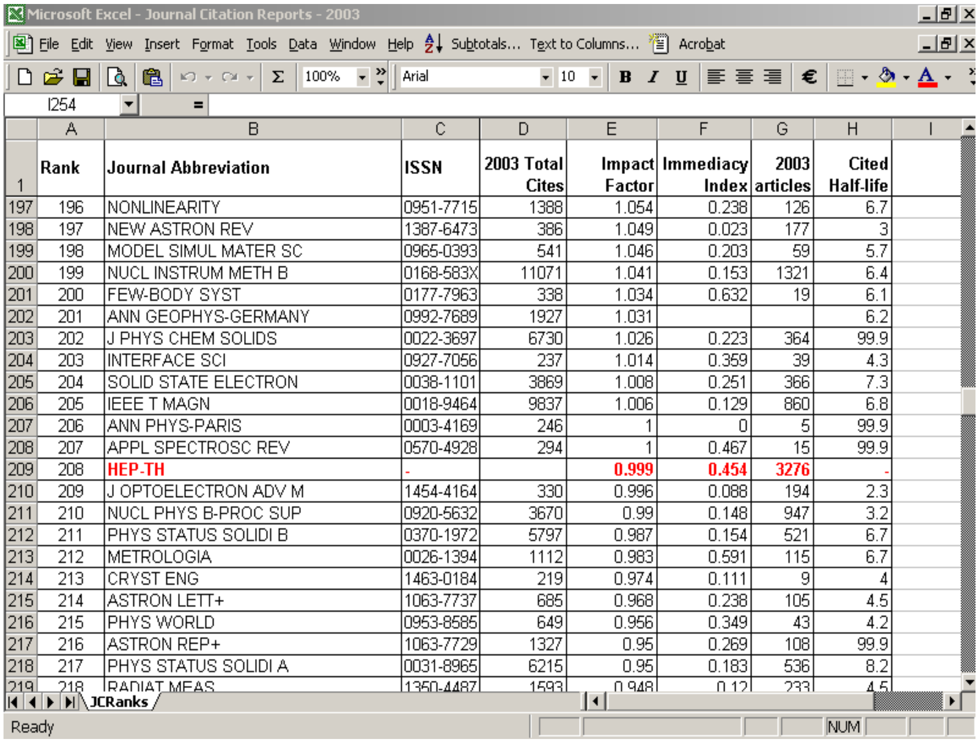
arXiv Class	$OAIF_{2003}$	$OAIF_{2002}$	$OAIF_{2001}$	$OAIF_{2000}$	$OAIF_{1999}$	$OAIF_{1998}$
hep-th	1.507	1.469	1.482	1.546	1.472	2.064
hep-lat	1.262	1.099	1.183	0.976	0.989	0.964
nucl-ex	1.214	0.845	0.448	0.534	0.264	0.739
hep-ph	1.024	1.072	0.994	1.195	0.946	0.723
hep-ex	0.881	0.951	0.670	0.855	0.501	0.468
nucl-th	0.437	0.517	0.528	0.569	0.494	0.356
cond-mat	0.415	0.609	0.481	0.471	0.361	0.363
quant-ph	0.401	0.585	0.571	0.545	0.362	0.424
astro-ph	0.278	0.294	0.303	0.287	0.280	0.258
math-ph	0.195	0.192	0.154	0.172	0.147	0.000
physics	0.082	0.064	0.073	0.059	0.049	0.027
gr-qc	0.001	0.000	0.003	0.002	0.002	0.000

Table 3 is the list of Immediacy Indexes calculated for the Physics classes of arXiv.org for the years 1998-2003. As the Impact Factors of High-Energy Physics classes of physics, they are cited more immediately after their submission than any other classes. 'gr-qc' class has very low immediacy index.

Table 3: Open Archive Immediacy Index for the Physics Classes of arXiv.org as per *Science Citation Index*

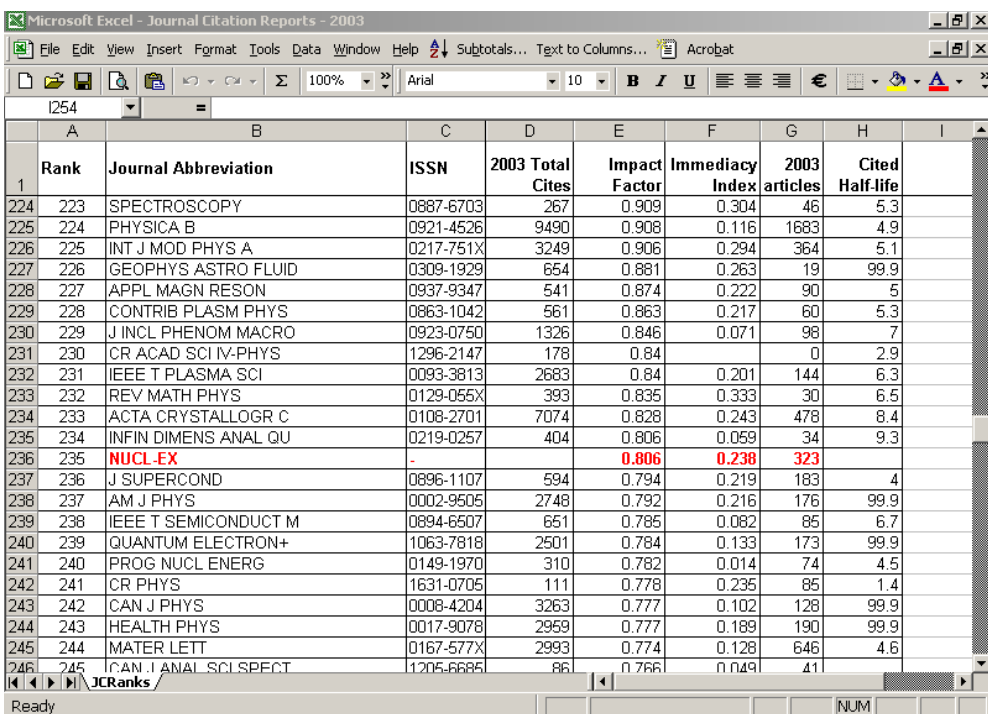
arXiv Class	$OAIF_{2003}$	$OAIF_{2002}$	$OAIF_{2001}$	$OAIF_{2000}$	$OAIF_{1999}$	$OAIF_{1998}$
hep-ex	0.619	0.312	0.301	0.216	0.106	0.061
hep-th	0.454	0.625	0.593	0.657	0.590	0.696
hep-ph	0.440	0.368	0.443	0.470	0.263	0.171
hep-lat	0.263	0.297	0.381	0.433	0.175	0.165
nucl-ex	0.238	0.153	0.135	0.098	0.178	0.055
quant-ph	0.202	0.268	0.209	0.192	0.111	0.237
nucl-th	0.185	0.260	0.270	0.234	0.096	0.068
cond-mat	0.168	0.155	0.153	0.147	0.106	0.054
astro-ph	0.094	0.132	0.100	0.118	0.082	0.062
math-ph	0.075	0.158	0.114	0.033	0.000	0.000
physics	0.030	0.049	0.032	0.020	0.019	0.002
gr-qc	0.002	0.001	0.000	0.000	0.000	0.000

If ISI had treated the arXiv physics classes as individual journals the position of the classes in JCR-2003 would be as in Figures 2a-2f. The ranks will certainly will go up if the study could have taken the self-citations to the classes.



	Rank	Journal Abbreviation	ISSN	2003 Total Cites	Impact Factor	Immediacy Index	2003 articles	Cited Half-life
197	196	NONLINEARITY	0951-7715	1388	1.054	0.238	126	6.7
198	197	NEW ASTRON REV	1387-6473	386	1.049	0.023	177	3
199	198	MODEL SIMUL MATER SC	0965-0393	541	1.046	0.203	59	5.7
200	199	NUCL INSTRUM METH B	0168-583X	11071	1.041	0.153	1321	6.4
201	200	FEW-BODY SYST	0177-7963	338	1.034	0.632	19	6.1
202	201	ANN GEOPHYS-GERMANY	0992-7689	1927	1.031			6.2
203	202	J PHYS CHEM SOLIDS	0022-3697	6730	1.026	0.223	364	99.9
204	203	INTERFACE SCI	0927-7056	237	1.014	0.359	39	4.3
205	204	SOLID STATE ELECTRON	0038-1101	3869	1.008	0.251	366	7.3
206	205	IEEE T MAGN	0018-9464	9837	1.006	0.129	860	6.8
207	206	ANN PHYS-PARIS	0003-4169	246	1	0	5	99.9
208	207	APPL SPECTROSC REV	0570-4928	294	1	0.467	15	99.9
209	208	HEP-TH	-		0.999	0.454	3276	-
210	209	J OPTOELECTRON ADV M	1454-4164	330	0.996	0.088	194	2.3
211	210	NUCL PHYS B-PROC SUP	0920-5632	3670	0.99	0.148	947	3.2
212	211	PHYS STATUS SOLIDI B	0370-1972	5797	0.987	0.154	521	6.7
213	212	METROLOGIA	0026-1394	1112	0.983	0.591	115	6.7
214	213	CRYST ENG	1463-0184	219	0.974	0.111	9	4
215	214	ASTRON LETT+	1063-7737	685	0.968	0.238	105	4.5
216	215	PHYS WORLD	0953-8585	649	0.956	0.349	43	4.2
217	216	ASTRON REP+	1063-7729	1327	0.95	0.269	108	99.9
218	217	PHYS STATUS SOLIDI A	0031-8965	6215	0.95	0.183	536	8.2
219	218	RADIAT MEAS	1350-4487	1593	0.948	0.12	233	4.5

Figure 2a: Rank of 'hep-th' class among the physics related journals in *JCR-2003*



	Rank	Journal Abbreviation	ISSN	2003 Total Cites	Impact Factor	Immediacy Index	2003 articles	Cited Half-life
224	223	SPECTROSCOPY	0887-6703	267	0.909	0.304	46	5.3
225	224	PHYSICA B	0921-4526	9490	0.908	0.116	1683	4.9
226	225	INT J MOD PHYS A	0217-751X	3249	0.906	0.294	364	5.1
227	226	GEOPHYS ASTRO FLUID	0309-1929	654	0.881	0.263	19	99.9
228	227	APPL MAGN RESON	0937-9347	541	0.874	0.222	90	5
229	228	CONTRIB PLASM PHYS	0863-1042	561	0.863	0.217	60	5.3
230	229	J INCL PHENOM MACRO	0923-0750	1326	0.846	0.071	98	7
231	230	CR ACAD SCI IV-PHYS	1296-2147	178	0.84		0	2.9
232	231	IEEE T PLASMA SCI	0093-3813	2683	0.84	0.201	144	6.3
233	232	REV MATH PHYS	0129-055X	393	0.835	0.333	30	6.5
234	233	ACTA CRYSTALLOGR C	0108-2701	7074	0.828	0.243	478	8.4
235	234	INFIN DIMENS ANAL QU	0219-0257	404	0.806	0.059	34	9.3
236	235	NUCL-EX	-		0.806	0.238	323	
237	236	J SUPERCOND	0896-1107	594	0.794	0.219	183	4
238	237	AM J PHYS	0002-9505	2748	0.792	0.216	176	99.9
239	238	IEEE T SEMICONDUCT M	0894-6507	651	0.785	0.082	85	6.7
240	239	QUANTUM ELECTRON+	1063-7818	2501	0.784	0.133	173	99.9
241	240	PROG NUCL ENERG	0149-1970	310	0.782	0.014	74	4.5
242	241	CR PHYS	1631-0705	111	0.778	0.235	85	1.4
243	242	CAN J PHYS	0008-4204	3263	0.777	0.102	128	99.9
244	243	HEALTH PHYS	0017-9078	2959	0.777	0.189	190	99.9
245	244	MATER LETT	0167-577X	2993	0.774	0.128	646	4.6
246	245	CAN J ANAL SCI SPECT	1205-6685	86	0.766	0.049	41	

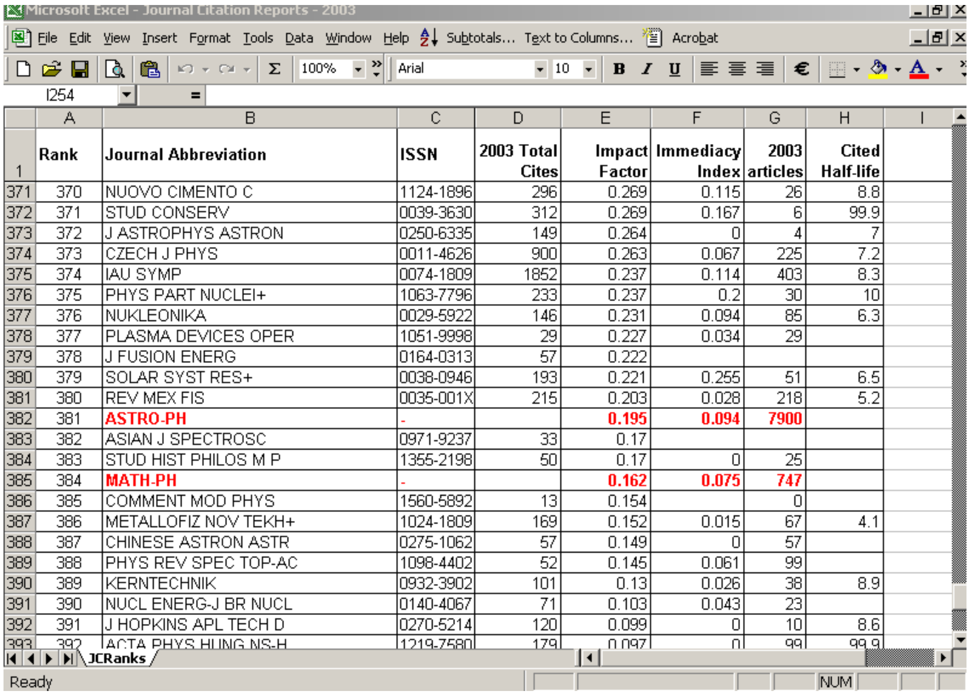
Figure 2b: Rank of 'nucl-ex' class among the physics related journals in *JCR-2003*

1	Rank	Journal Abbreviation	ISSN	2003 Total Cites	Impact Factor	Immediacy Index	2003 articles	Cited Half-life
245	244	MATER LETT	0167-577X	2993	0.774	0.128	646	4.6
246	245	CAN J ANAL SCI SPECT	1205-6685	86	0.766	0.049	41	
247	246	FLUID DYN RES	0169-5983	305	0.766	0.089	45	7.1
248	247	**HEP-LAT**			**0.766**	**0.263**	**575**	
249	248	THEOR COMP FLUID DYN	0935-4964	317	0.766	0.091	22	6.1
250	249	LASER PHYS	1054-660X	904	0.765	0.235	226	4
251	250	FUSION ENG DES	0920-3796	1534	0.753	0.08	377	3.7
252	251	INT J MOD PHYS E	0218-3013	295	0.753	0.263	38	6
253	252	ACTA PHYS POL B	0587-4254	1290	0.752	0.279	559	2.9
254	253	INT J MOD PHYS C	0129-1831	756	0.75	0.235	85	4.5
255	254	PHYS SOLID STATE+	1063-7834	4833	0.746	0.153	398	99.9
256	255	INT J THERMOPHYS	0195-928X	1180	0.743	0.216	102	7.2
257	256	PLASMA PHYS REP+	1063-780X	690	0.731	0.243	115	5.1
258	257	**HEP-EX**			**0.730**	**0.619**	**771**	
259	258	THEOR MATH PHYS+	0040-5779	1284	0.729	0.144	146	99.9
260	259	MOL SIMULAT	0892-7022	534	0.721	0.167	84	9.3
261	260	**HEP-PH**	-		**0.719**	**0.440**	**3964**	
262	261	LETT MATH PHYS	0377-9017	1184	0.709	0.109	64	9.4
263	262	MICROSYST TECHNOL	0946-7076	405	0.707	0.06	83	4.9
264	263	LOW TEMP PHYS+	1063-777X	1044	0.7	0.112	188	8
265	264	EUR PHYS J-APPL PHYS	1286-0042	461	0.699	0.106	104	3.8
266	265	J MOL LIQ	0167-7322	939	0.699	0.112	169	5
267	266	RADIAT PHYS CHEM	0969-806X	2787	0.693	0.153	334	6.5

Figure 2c: Ranks of 'hep-lat', 'hep-ex', and 'hep-ph' classes among the physics related journals in *JCR-2003*

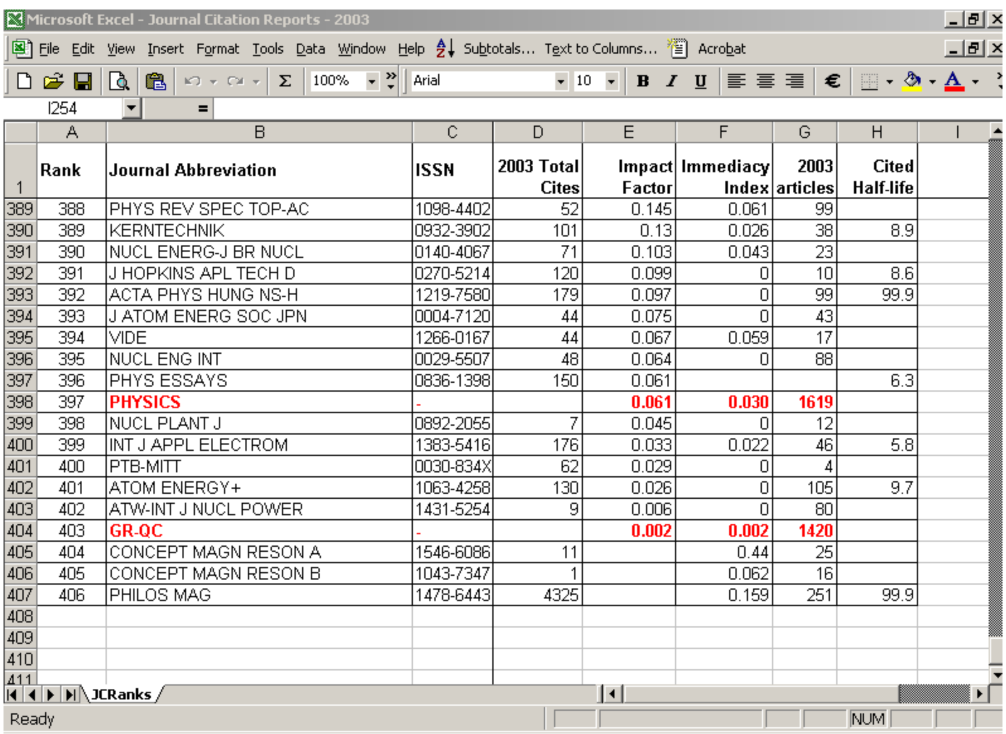
1	Rank	Journal Abbreviation	ISSN	2003 Total Cites	Impact Factor	Immediacy Index	2003 articles	Cited Half-life
350	349	INT J COMPUT FLUID D	1061-8562	116	0.373	0.075	40	5.1
351	350	CHINESE J PHYS	0577-9073	177	0.372	0.075	67	4
352	351	PROG THEOR PHYS SUPP	0375-9687	1236	0.368	0.357	126	99.9
353	352	INDIAN J PURE AP PHY	0019-5596	792	0.366	0.071	155	99.9
354	353	ADV IMAG ELECT PHYS	1076-5670	134	0.349	0.045	22	5.4
355	354	Z KRIST-NEW CRYST ST	1433-7266	507	0.349	0.19	179	3.1
356	355	INT J INFRARED MILLI	0195-9271	618	0.342	0.101	178	7.4
357	356	NUCL TECHNOL	0029-5450	793	0.339	0.109	110	9.8
358	357	**NUCL-TH**	-		**0.338**	**0.185**	**1156**	
359	358	**QUANT-PH**	-		**0.334**	**0.202**	**2439**	
360	359	PRAMANA-J PHYS	0304-4289	681	0.333	0.282	252	5.6
361	360	ATOMIZATION SPRAY	1044-5110	262	0.329	0.095	21	7.4
362	361	J PHYS IV	1155-4339	2182	0.319	0.021	1093	6.1
363	362	**COND-MAT**	-		**0.313**	**0.168**	**8368**	
364	363	J ELECTROMAGNET WAVE	0920-5071	445	0.311	0.025	159	6.4
365	364	COSMIC RES+	0010-9525	381	0.299	0.096	73	9.6
366	365	SPECTROSC SPECT ANAL	1000-0593	427	0.298	0.02	352	3.4
367	366	DOKL PHYS	1028-3358	218	0.285	0.076	171	2.5
368	367	HIGH ENERG PHYS NUC	0254-3052	293	0.285	0.105	238	3
369	368	NUOVO CIMENTO B	0369-3554	795	0.285	0	23	99.9
370	369	BRAZ J PHYS	0103-9733	298	0.277	0.015	136	4.1
371	370	NUOVO CIMENTO C	1124-1896	296	0.269	0.115	26	8.8
372	371	STUD CONSERV	0039-3630	312	0.269	0.167	6	99.9

Figure 2d: Ranks of 'nucl-th', 'quant-ph', and 'cond-mat' classes among the physics related journals in *JCR-2003*



	Rank	Journal Abbreviation	ISSN	2003 Total Cites	Impact Factor	Immediacy Index	2003 articles	Cited Half-life
371	370	NUOVO CIMENTO C	1124-1896	296	0.269	0.115	26	8.8
372	371	STUD CONSERV	0039-3630	312	0.269	0.167	6	99.9
373	372	J ASTROPHYS ASTRON	0250-6335	149	0.264	0	4	7
374	373	CZECH J PHYS	0011-4626	900	0.263	0.067	225	7.2
375	374	IAU SYMP	0074-1809	1852	0.237	0.114	403	8.3
376	375	PHYS PART NUCLEI+	1063-7796	233	0.237	0.2	30	10
377	376	NUKLEONIKA	0029-5922	146	0.231	0.094	85	6.3
378	377	PLASMA DEVICES OPER	1051-9998	29	0.227	0.034	29	
379	378	J FUSION ENERG	0164-0313	57	0.222			
380	379	SOLAR SYST RES+	0038-0946	193	0.221	0.255	51	6.5
381	380	REV MEX FIS	0035-001X	215	0.203	0.028	218	5.2
382	381	**ASTRO-PH**	-		**0.195**	**0.094**	**7900**	
383	382	ASIAN J SPECTROSC	0971-9237	33	0.17			
384	383	STUD HIST PHILOS M P	1355-2198	50	0.17	0	25	
385	384	**MATH-PH**	-		**0.162**	**0.075**	**747**	
386	385	COMMENT MOD PHYS	1560-5892	13	0.154		0	
387	386	METALLOFIZ NOV TEKH+	1024-1809	169	0.152	0.015	67	4.1
388	387	CHINESE ASTRON ASTR	0275-1062	57	0.149	0	57	
389	388	PHYS REV SPEC TOP-AC	1098-4402	52	0.145	0.061	99	
390	389	KERNTECHNIK	0932-3902	101	0.13	0.026	38	8.9
391	390	NUCL ENERG-J BR NUCL	0140-4067	71	0.103	0.043	23	
392	391	J HOPKINS APL TECH D	0270-5214	120	0.099	0	10	8.6
393	392	ACTA PHYS HUNG NS-H	1219-7580	179	0.097	0	99	99.9

Figure 2e: Ranks of 'astro-ph', and 'math-ph' classes among the physics related journals in *JCR-2003*



	Rank	Journal Abbreviation	ISSN	2003 Total Cites	Impact Factor	Immediacy Index	2003 articles	Cited Half-life
389	388	PHYS REV SPEC TOP-AC	1098-4402	52	0.145	0.061	99	
390	389	KERNTECHNIK	0932-3902	101	0.13	0.026	38	8.9
391	390	NUCL ENERG-J BR NUCL	0140-4067	71	0.103	0.043	23	
392	391	J HOPKINS APL TECH D	0270-5214	120	0.099	0	10	8.6
393	392	ACTA PHYS HUNG NS-H	1219-7580	179	0.097	0	99	99.9
394	393	J ATOM ENERG SOC JPN	0004-7120	44	0.075	0	43	
395	394	VIDE	1266-0167	44	0.067	0.059	17	
396	395	NUCL ENG INT	0029-5507	48	0.064	0	88	
397	396	PHYS ESSAYS	0836-1398	150	0.061			6.3
398	397	**PHYSICS**	-		**0.061**	**0.030**	**1619**	
399	398	NUCL PLANT J	0892-2055	7	0.045	0	12	
400	399	INT J APPL ELECTROM	1383-5416	176	0.033	0.022	46	5.8
401	400	PTB-MITT	0030-834X	62	0.029	0	4	
402	401	ATOM ENERGY+	1063-4258	130	0.026	0	105	9.7
403	402	ATW-INT J NUCL POWER	1431-5254	9	0.006	0	80	
404	403	**GR-QC**	-		**0.002**	**0.002**	**1420**	
405	404	CONCEPT MAGN RESON A	1546-6086	11		0.44	25	
406	405	CONCEPT MAGN RESON B	1043-7347	1		0.062	16	
407	406	PHILOS MAG	1478-6443	4325		0.159	251	99.9

Figure 2f: Ranks of 'physics', and 'gr-qc' classes among the physics related journals in *JCR-2003*

The study has given a typical example of the comparison of numerators (number of citations to the previous two years submissions in the calculating year) and denominators (number of submissions in the previous years of the calculating year) for the calculation of Impact Factors of 2000 to 2203 for the arXiv class 'hep-th' and the traditional journal '*Plant Ecology*', both have almost same Impact Factors (0.999 and 1.000 respectively) through Figure 3. The close observation to the figure reveals that the numerators i.e. the number of citations have the fluctuations in a horizontal way but the denominators i.e. the number of articles are going almost parallel in all calculated years for the journal '*Plant Ecology*'. But for 'hep-th', the number of citations increased with time, and also with the number of submissions to the category.

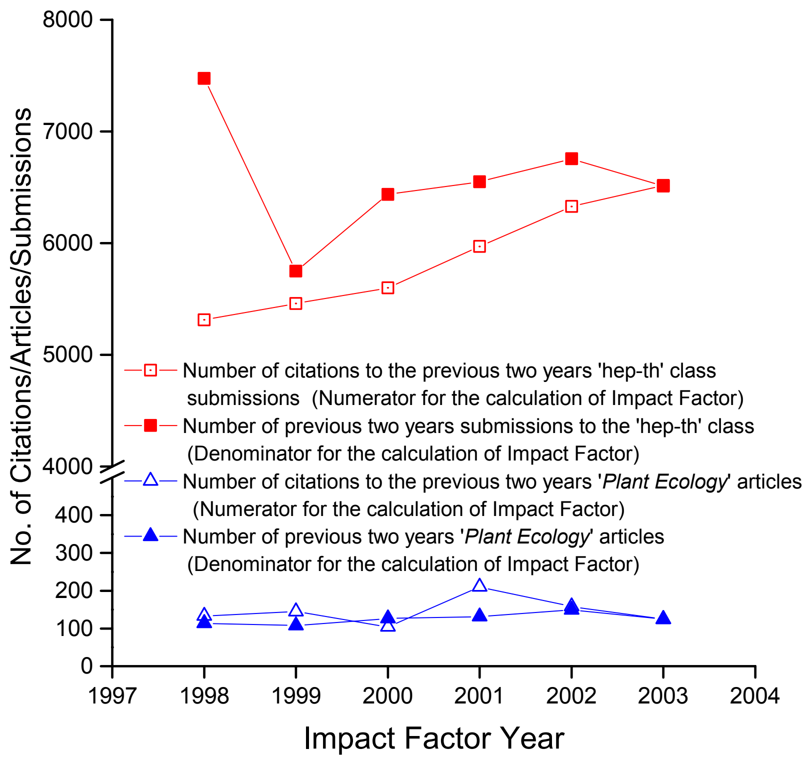


Figure 3: Comparison of numerators and denominators for the calculation of Impact Factors of arXiv 'hep-th' class and the '*Plant Ecology*' journal for the period 1998-2003

Conclusion

The High-Energy Physics open archives are making much impact among scientists. The immediacy factor is higher in High-Energy Physics open archives as compared to other classes. If the study incorporates the citations received for these e-print archives in the e-print archives itself, definitely the categories may compete with the science journals with impact factors of more than one. Again the impact made by the categories studied may go up if the study is also based on the new autonomous Open Archive web tools like 'Citebase', 'Citeseer', etc.

Since the e-print archives are instant information feeding mechanism with an ephemeral effect, the OAIF can be a divergent idea rather than OAII. This connotation can be complemented if half-life of e-print archives has been calculated.

Although many authors believe that their work has a greater research impact if it is freely available, studies to demonstrate that impact are few [Antelman, 2004].

Once the impact and immediacy in citations of subject open archives are compared, scientists will submit their research documents in the open archive categories with high impact factors and immediacy index. In that case, the continued emphasis on 'Impact Factors' will not be misguided the readers as stated by Brunstein [2000]. Wherever the readers can make a comparison of sources they want to publish considering impact factors as the criteria, they may slant towards the high impact side.

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