Variations of the impact of astronomical publications versus physics publications

Marie-José Vin, CNRS, Observatoire de Haute Provence, France
Parina Hassanaly, CRRM, Centre universitaire de St Jérôme, Marseille, France

Abstract

Nowadays as credits for research become shorter and shorter, the impact of Astronomy is crucial. How can we define the impact of a science? and above all such a fundamental science as Astronomy? It is very high on the lay man who reacts emotively to each discovery which is, sometimes, badly explained. We don't intend to measure this kind of impact, only try to give some hints on the curves of the scientific impact of astronomical publications versus other journals. For this purpose, we shall study the variations of two factors: the impact factor (IF) and the cited half-life (HL) for the main publications on stellar and extragalactic astronomy and for some publications of physics during the last 10 years.

In the first part, we describe the tool used, then we discuss the choice of the publications and plot the various curves. In conclusion, we give some explanations for the variations.

I.- The tool

We have used the data given by the " Science Citation Index- Journal Citation Reports " (JCR) for the years 1982-1992. A description of this publication is given in the ref. 1.

The JCR defines an impact factor of a journal as :

number of all current citations of sources items
published in journal X during the previous 2 years/
number of articles journal X published in those 2 years

it is the frequency with which the "average article" in a journal has been cited in a particular year;

and a cited half-life as:

number of journal publication years going back from the current year
which account for 50% of the total citations received
by the cited journal in the current year.

Other people have taken other definitions. I don't discuss that as I want to put in evidence only some currents.

II.- The choice of the journals

a) In Astronomy we have choiced the main journals edited in US and Europe, excluding review ones and too specialized. We have excluded also a very important one, the Journal of Geophyscal Research as it is not a specific astronomical journal, its main subject being Geophysics. The choice is:

Astronomical journal (AJ)

Astrophysical Journal (ApJ)

Astrophysical Journal Supplement (ApJS) (this one appears in the JCR in 1983)
Astronomy & Astrophysics (AA)
Astronomy & Astrophysics Supplement (AAS) (this one appears in the JCR in 1985)
Monthly Notices of the Royal Astronomical Society (RAS)

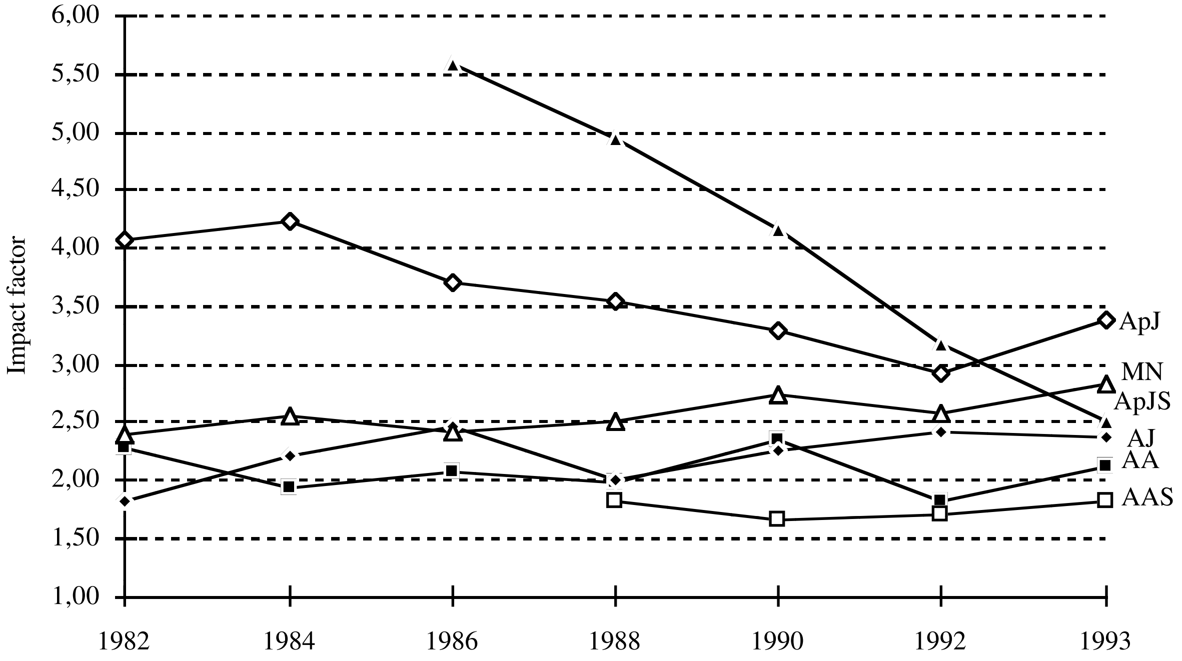
b) In Physics: one of us (MJV) has made a study of citations of astronomical articles based on observations made with the telescopes of the Observatoire de Haute Provence, articles published in referee journals between 1985 and 1990, citations taken in account between 1985 and 1992. We have choiced the Physics journals in the database of these citations. They are:
Journal of Chemical Physics (JCP)
Journal of Physics B (JPB)
Physics Letters B (PLB)
Physical Review A (PRA)
Physical Review D (PRD)
Physical Review Letters (PRL)

c) We have choiced also two multidisciplinary journals, Science and Nature.

III.- Plot of the curves

a) Impact factor

Impact factor	1982	1984	1986	1988	1990	1992	1993
AA	2,28	1,93	2,08	1,97	2,34	1,82	2,12
AAS				1,83	1,65	1,70	1,83
AJ	1,81	2,21	2,47	2,00	2,26	2,41	2,37
ApJ	4,07	4,24	3,70	3,54	3,30	2,93	3,39
ApJS			5,59	4,95	4,16	3,18	2,50
MN	2,39	2,56	2,42	2,50	2,74	2,58	2,82
Science	6,81	8,21	12,40	16,50	19,60	20,97	21,87
Nature	8,75	10,25	15,30	15,80	19,10	22,14	22,33
PRL	6,20	6,49	6,53	8,21	7,58	7,37	7,11
JCP	2,94	2,99	3,30	3,58	3,48	3,43	3,61
JPB	2,89	2,46	2,71	2,17	2,32	2,26	2,03
PLB	3,65	4,47	3,53	3,51	3,12	3,43	3,07
PRA	2,58	2,44	2,36	3,32	2,09	2,15	2,27
PRD	2,86	2,59	2,61	2,33	2,11	2,58	3,00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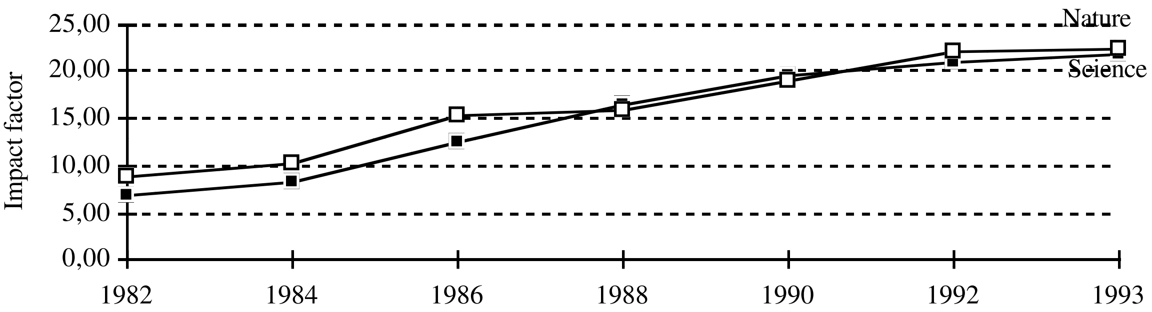
4,50
4,00
3,50
3,00
2,50
2,00
1,50
1,00
1982
1984
1986
1988
1990
1992
1993
ApJ
MN
ApJS
AJ
AA
AAS


Impact factor
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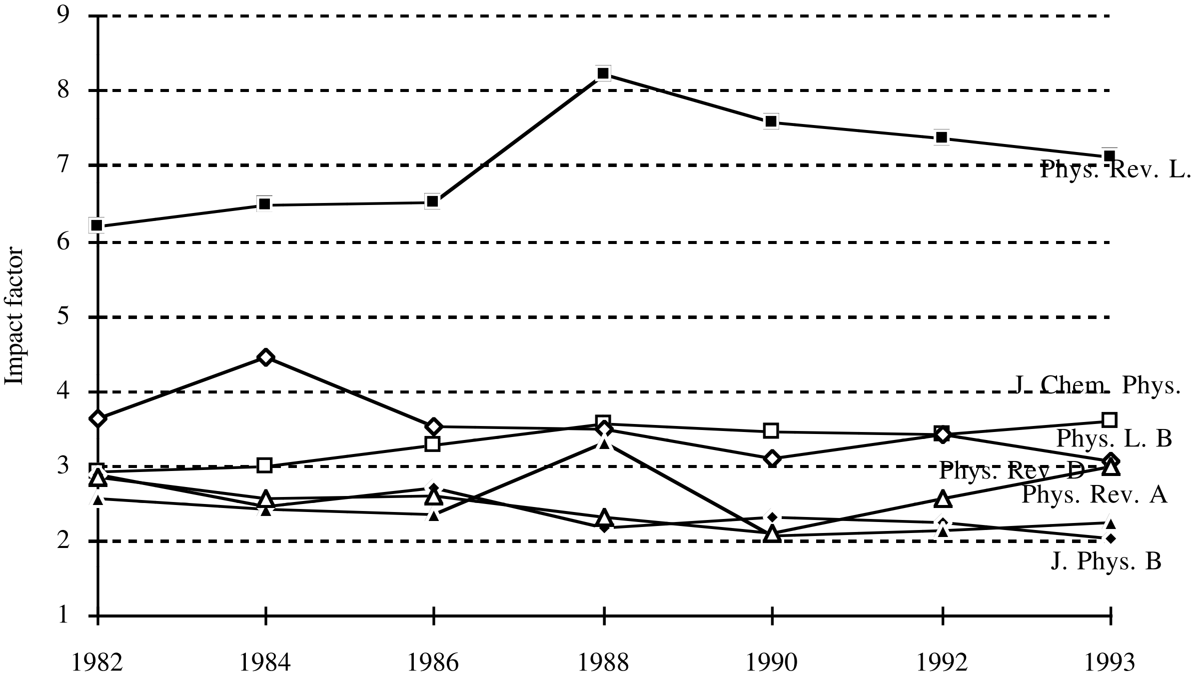
20,00
15,00
10,00
5,00
0,00
1982
1984
1986
1988
1990
1992
1993
Nature
Science


Impact factor
9
8
7
6
5
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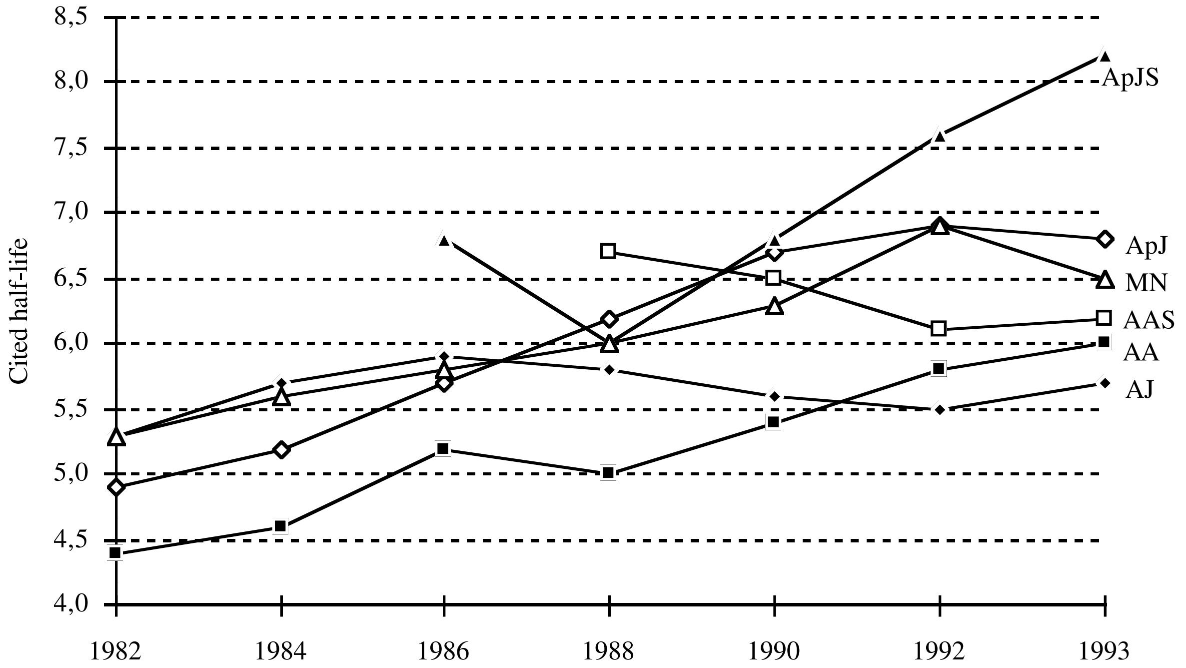
3
2
1
1982
1984
1986
1988
1990
1992
1993
Phys. Rev. L.
J. Chem. Phys.
Phys. L. B
Phys. Rev. D
Phys. Rev. A
J. Phys. B

b) Cited half-life

Cited half-life	1982	1984	1986	1988	1990	1992	1993
AA	4,4	4,6	5,2	5,0	5,4	5,8	6,0
AAS				6,7	6,5	6,1	6,2
AJ	5,3	5,7	5,9	5,8	5,6	5,5	5,7
ApJ	4,9	5,2	5,7	6,2	6,7	6,9	6,8
ApJS			6,8	6,0	6,8	7,6	8,2
MN	5,3	5,6	5,8	6,0	6,3	6,9	6,5
Science	6,4	6,2	5,7	5,2	5,1	5,2	5,4
Nature	5,7	5,8	5,7	5,5	5,8	5,8	6,0
JCP	9,5	9,5	9,4	9,3	9,6	7,5	9,8
JPB	4,5	5,0	5,7	6,3	7,0	8,7	7,9
PRA	5,8	5,3	5,5	5,2	5,3	7,2	5,5
PRD	4,6	5,3	5,9	5,8	6,6	6,0	6,4
PRL	4,4	4,6	4,4	3,9	4,6	5,0	5,1
PLB	3,2	2,9	3,4	3,7	4,1	4,6	4,5



Cited half-life
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7,5
7,0
6,5
6,0
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5,0
4,5
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1982
1984
1986
1988
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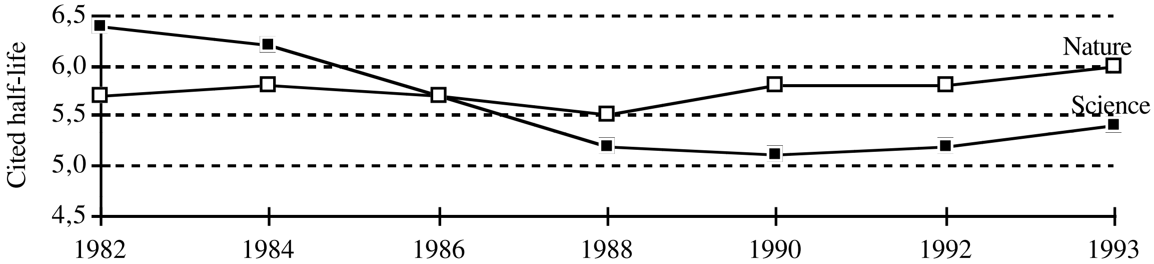
1992
1993
ApJS
ApJ
MN
AAS
AA
AJ



Cited half-life
6,5
6,0
5,5
5,0
4,5
1982
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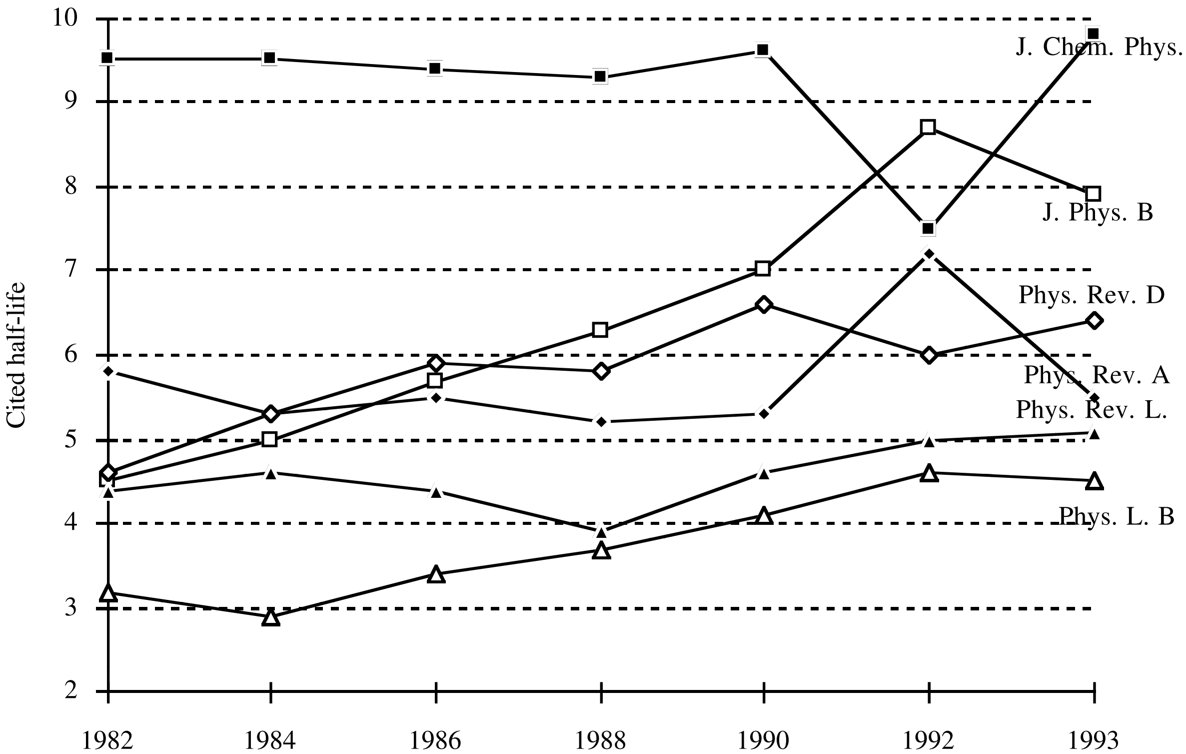
Nature
Science



Cited half-life
10
9
8
7
6
5
4
3
2
1982
1984
1986
1988
1990
1992
1993
J. Chem. Phys.
J. Phys. B
Phys. Rev. D
Phys. Rev. A
Phys. Rev. L.
Phys. L. B

IV.- Some comments

Impact factor (I.F.) general tendency both in Astronomy and Physics can be considered as stable if not reducing. Only with NATURE and SCIENCE can we acknowledge impact factor increasing twofold over the study period. Thos can be easily explained by the large number of scientific fields covered in these publications. On the other hand, in peak specialized papers, publishing delays are considerably extended: non official litterature composed mostly of preprints is having an ever increasing impact in this field but is not officially recognized.

Scientific results both in Astronomy and Physics are often linked to a number of tests performed on large international equpemnts and are the results of international cooperation. This could have a negative impact on publications de lays.

On the other hand, CHL is now considered to be expanding and this means that articles have to wait longer to be published. Nevertheless, information is now circulating at an increasing speed (networks, electronic distribution...). We then could have thought that CHL activity would decrease.

Nevertheless, Science is a phenomenum of our society. We think that these graphics acknowledge some social factors such as: different practice, aging scientific human resources due to a drastic cut in recruiting young brains for lack of funds in numerous countries. This could be the object of fruitful diccussions with sociologists.

Bibliographie

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