POWER POSITIONS IN SCIENCE JOURNALS

Their Gatekeeping, Demography, Ecology, and Accessibility

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The present system of scientific communication depends almost entirely on the primary journal literature. Derek Price introduced the important concept of the research front in science. This briefly says that in any point in time there exists a set of articles belonging to a given subject literature which constitute the active state of the subject at that point in time. The present study analyses the gatekeping patterns, demography, ecology, and accessibility of the relatively small set of journals publishing the papers of the actual research fronts in science, mainly from the point of view of the positions of power they possess.

Gatekeeping

Modern science has developed a particular mechanism of communication which began with the appearence of the first scientific journals in the 17th century and which have remained basically the same ever since. Briefly, this mechanism is based on the selective publication of fragments rather than complete treatises. It is this selective concern with fragments of knowledge, represented primarily by journal articles, that enables science to function effectively and is responsible for its phenomenal growth and pre-eminence.

The fact that a paper has been accepted for publication in a well-known refereed journal is probably the best immediate indication that it reports worthwhile research.

This approach is based on the assumption that the primary literature represents the only genuine record of scientific achievement.

For the satisfactory operation of this international mechanism in the sciences the control and screening activity of journal editorial boards, which guarantee the professional standard of science journals, is of paramount importance. It is considered that the critical mentality and decisions of journal editors have so far protected, and will also

Country region	Rank	All Fields %	Rank	Clinical med. %	Rank	Biomed res. %	Rank	Chemis. %	Rank	Physics %	Rank	Biol. %	Rank	Earth Space sci. %	Rank	Eng. Techn. %	Rank	Mathe. %
Number of journals		252		45		28		22		49		25		10		59		14
Number of editors		8222		1742		937		615		1688		709		349		1858		324
USA	1	28,8	1	30,0	1	30,2	1	24,6	1	25,7	1	21,5	1	21,8	1	35,6	1	32,4
UK	2	14,6	3	14,0	2	16,2	2	14,0	2	21,4	4	11,2	3	9,5	2	15,6	4	6,8
Rest of W Europe	3	13,6	2	18,2	3	13,6	3	12,3	3	12,8	2	15,1	2	17,8	3	9,7	2	13,0
FR Germany	4	10,2	4	9,0	4	13,2	4	11,3	4	10,3	3	11,9	4	8,9	4	9,2	5	6,5
France	5	5,3	7	4,2	5	5,0	5	7,6	5	7,2	9	3,9	5	7,4	6	4,0	7	4,0
East Europe	6	4,7	6	4,3	10	2,5	6	6,9	6	5,6	7	4,7			5	4,1	6	5,6
Japan	7	3,1	9	2,4	7	2,6	7	4,6	8	2,5	10	2,9			8	3,0		
Italy	8	2,9	10	2,4	13	1,5	9	3,1	10	2,0	6	5,4			11	1,9	3	13,0
Canada	9	2,8	8	2,9	11	1,6	10	2,8	9	2,5	8	4,6	6	6,9	9	2,4		
Soviet Union	10	2,7	11	1,5	8	2,6	8	3,4	7	2,5	12	2,1			7	3,4		
Sweden	11	2,2	5	4,3	9	2,6	13	1,4	11	1,7			9	3,4	14	1,3		
Australia	12	1,9	12	1,3	12	1,5	11	1,5			11	2,6	7	5,7	10	2,3		
German	13	1,6	14	0,7	6	3,3					5	5,4	8	3,4				
Israel	14	1,2	15	0,7	14	1,2	12	1,5							13	1,6		
Latin America	15	1,0	13	0,9			15	0,8							12	1,7		
India	16	0,9	16	0,6			14	0,9										
South Africa	17-18	0,4													16	0,7		
Rest of Near East & North Africa	17-18	0,4													15	1,1		
Rest of Asia	19	0,3													17	0,6		
Other		1,1		2,6		2,6		1,9		5,8		8,7		15,2		1,1		18

warrant in the future, the social and intellectual integrity of science. The members of the editorial and advisory boards of science journals are rightfully considered the gatekeepers of science journals. These gatekeepers, in controlling the systems of manuscript evaluation and selection, occupy powerful strategic positions in the collective activity of science. Taking into account their vital strategic importance in the orchestration of science it seems interesting to have some quantitative data on the science journal gatekeeping process.

We have built a machine readable database on journal gatekeepers (1). 252 international journals were selected from the fields of clinical medicine, biomedical research, biology, chemistry, physics, earth and space sciences, engineering and mathematics.

Science journals were considered "international" if their editorial board included scientists from five countries at least, irrespective of the title of the journal in question. (The "International" label in the title of some journals may hide a truly national journal. On the contrary, in the editorial board of, e.g. the American Heart Journal there are, in addition to north Americans, scientists from ten, mostly European, countries).

Issues from the first quarter of 1980 of international (in the above sense) journals were selected. The classification of journals by fields followed that used previously (2).

The necessary data were obtained by counting and pooling the editors by country. In so doing we considered editors, the editor-in-chief, the editors, the deputy editors (or editors-in-chief), the managing editor, the members of the editorial board and advisory board, excepting only the technical editors.

Table 1 shows the field, country and geopolitical region distribution of editors in the 252 journal sample.

It shows quite clearly that the decision power in science journal gatekeeping is firmly in the hands of scientists from a few (4-5) countries from the metropolis. As a group, gatekeepers from the South are playing a very modest role in deciding the power positions in science journals.

In almost all cases, the *primus inter pares* in the editorial boards of science is the editor-in-chief: a respected scientist or scholar, assuming, as it were, personal responsibility for the papers published in his or her journal.

An attempt has been made (3) to have a quantitative view on the professional status and influence of the editors-in-chief of 769 medical journals. By using the method of citation analysis, answers are sought to the question whether the editors-in-chief as authors have larger influence and/or authority than an average author in the respective subject field.

769 journals in 28 medical subject fields were included in our study. The 894 editors-in-chief of these journals were identified from Ulrich's International Periodical Directory (1986, 1987, and 1988 editions on CD-ROM). Source data from the years 1981 to 1985 and citations to them in the same 5-year period were used in the analysis. Journal citation indicators were produced by processing the magnetic tapes of the SCI data-

← **Table 1.**
Editorial gatekeeping patterns in a selected set of science journals

base; citation data of the editors-in-chief's first-authored papers were searched manually from the printed SCI volumes. Prior studies indicate that first-author citation counts are a reasonably good and reliable approximation of total citation count (4).

For each journal and editor-in-chief the following data were collected:

- the number of cited publications (papers published between 1981 and 1985 and cited in the same period)
- the number of citations received between 1981 and 1985 by the above papers
- the percentage of in-journal citations, that is, the percentage share of the citations from the journal itself in all citations received (for the editors-in-chief: the percentage share of the citations from their own journals in all citations received by their papers published in their own journals).

From these data two indicators were built:

- the Index of Editor Expertise (IEE): the ratio of the editor-in-chief's mean citation rate per cited paper to that of his or her journal
- the Index of Editor Authority (IEA): the ratio of the editor-in-chief's percentage of in-journal citations to that of his or her journal.

Both indexes have a value of 1.00 if there are no specific differences between the editor-in-chief and an average author. All editors-in-chief having at least one cited paper in the period in question (709 persons, 855 editorial chairs) were included in the determination of the Index of Editor Expertise (IEE); all editors-in-chief having at least one cited paper in their own journals in the period in question (353 persons, 435 editorial chairs) were included in the determination of the Index of Editor Authority (IEA). The overall average IEE value was 0.59, the overall average IEA value was 1.64. (The subset of editors considered in evaluating IEA had an average IEE of 0.61, i.e., no significant difference from the total set has been found.) The values of both indicators are presented at a subfield aggregate level in Tables 2 and 3, respectively.

Subfield differences among IEE and IEA indexes, although interesting to consider, are in general, not statistically significant.

The main inference to be drawn from the data presented in Tables 2 and 3 is obvious. In all but 3 of the 28 subfields of medicine, the editors-in-chief are, on average, less cited than the authors of their own journals; and in all but 6 subfields, the average percentage of in-journal citations is higher for the papers of the editors-in-chief than for those of "GI" author. The answer to the question of whether the editors-in-chief of medical journals are experts, authorities, both or neither is that they are not necessarily experts (in the sense of higher-than-average citation rate) but, as a rule, authorities at least in their own specialities.

The question now arises, if not their research eminence, what else might be the *source of authority of these scientists? An obvious explanation would be to relate* present authority to past expertise, to assume that 1981-1985 is too recent a period to represent properly the real scientific performance of the editors-in-chief. To check this hypothesis, the citation rate of a subsample of 267 editors-in-chief (those having 6 to 15 cited papers in the 1981-1985 period/ was searched also in the 1970-1974 period (1970-1974 citations to 1970-1974 papers). Surprisingly, the average was only insigni-

Table 2. Mean Citation Rate per Cited Paper and the Index of Editor Expertise

Subfield	Number of Editors	Mean citation rate per cited paper		
		Journals	Editors	IEE
Allergy	8	3.46	3.46	1.00
Andrology	5	3.02	2.57	0.85
Anesthesiology	8	3.53	3.33	0.94
Cancer	48	4.72	3.39	0.72*
Cardiovascular system	46	5.30	2.72	0.51*
Dentistry and odontology	21	2.86	2.00	0.70*
Dermatology and venereal diseases	18	3.17	2.60	0.82
Endocrinology and metabolism	46	6.09	4.27	0.70*
Gastroenterology	19	4.15	2.11	0.51
General and Internal medicine	65	2.89	2.26	0.78
Geriatrics and gerontology	10	2.61	2.66	1.02
Hematology	32	5.81	3.10	0.53*
Immunology	66	6.02	3.13	0.52*
Neurosciences	106	5.47	3.13	0.57*
Obstetrics and gynecology	27	3.56	2.10	0.59*
Ophthalmology	15	3.53	2.20	0.62*
Orthopedics	9	2.45	2.12	0.87
Otorhinolaryngology	9	2.61	1.87	0.71
Pathology	39	4.61	2.96	0.64*
Pediatrics	31	2.92	2.59	0.89
Psychiatry	36	3.72	2.31	0.62*
Radiology and nuclear medicine	40	3.64	1.90	0.52*
Research and experimental medicine	28	3.77	3.02	0.80*
Respiratory system	19	4.22	2.62	0.62*
Rheumatology	13	2.68	2.78	1.04
Surgery	58	3.02	1.92	0.63*
Tropical medicine	12	2.71	2.57	0.95
Urology and nephrology	21	2.81	2.78	0.99

(*) Asterisks denote a statistically significant deviation between the journal and the editor values at the 95% confidence level (using a simple t-test).

Table 3. Percentage of In-Journal Citations and the Index of Editor Authority

Subfield	Number of Editors	Percentage of in-journal citations		
		Journals	Editors	IEA
Allergy	8	3.46	3.46	1.00
Allergy	5	20%	29%	1.44
Andrology	5	13%	25%	1.92
Anesthesiology	6	25%	69%	2.79*
Cancer	21	14%	14%	1.00
Cardiovascular system	25	13%	26%	1.94*
Dentistry and odontology	12	29%	38%	1.30
Dermatology and venereal diseases	14	25%	32%	1.27
Endocrinology and metabolism	20	14%	12%	0.84
Gastroenterology	9	10%	26%	2.56
General and Internal medicine	35	21%	50%	2.33*
Geriatrics and gerontology	5	20%	52%	2.52
Hematology	21	12%	21%	1.72*
Immunology	30	15%	23%	1.58*
Neurosciences	51	16%	22%	1.38
Obstetrics and gynecology	8	12%	16%	1.38
Ophthalmology	10	21%	18%	0.86
Orthopedics	4	11%	7%	0.63
Otorhinolaryngology	7	19%	49%	2.56
Pathology	18	13%	26%	1.94
Pediatrics	19	20%	35%	1.70
Psychlatry	17	17%	30%	1.77
Radiology and nuclear medicine	15	21%	39%	1.87*
Research and experimental medicine	16	17%	35%	2.07
Respiratory system	10	15%	13%	0.92
Rheumatology	7	17%	5%	0.27
Surgery	29	18%	23%	1.29
Troplcal medicine	6	23%	39%	1.67
Urology and nephrology	10	17%	29%	1.74

(*) Asterisks denote a statistically significant deviation between the journal and the editor values at the 95% confidence level (using a simple t-test).

ficantly higher in the earlier period, namely, 3.10 citations/cited paper in the 1970-1974 period, 2.84 citations/cited paper in the 1981-1985 period.

This difference does not account for the observed underperformance of the editors-in-chief in their citation level.

We are inclined to think that editing a scientific journal requires qualities somewhat different from those of a prolific and highly cited author. Although most of the editors under study were active as publishing scientists and were also cited in the period in question, their influence seems to be shorter range, presumably more personal in nature, and their authority domains are more limited. We even suspect that the same qualities that make someone an eminent editor-in-Chief (strong personal influence, ability to make quick, intuitive decision, and so on) may prevent him or her from being a universally acknowledged highly cited scientist. Of course, the next fortunate cases are those in which the two sets of qualities coincide but this is the exception rather than the rule.

Demography

The word "demography" was apparently first used by Achille Guillard in his book which appeared in 1855 (5). Its Greek origins are demos (people) and graphein (to draw, describe). According to the definition, "demography deals with the scientific investigation of the human population with main regard to the quantitative aspects of its size, structure and development".

In this paper we would like to describe the parallel characteristics in both human and journal populations, which can be analysed using demographic methods. In this way we intend to formulate a picture about the life of the journal population "with main regard to...its size, structure and development". Like human society, the journal population is made up of individuals: journals. The launching of a journal is equivalent to a birth, its cessation to death. Like changes in human population, these two events determine primarily the number of journals present in a given time in a given population. Migration, which has a substantial effect on human statistics, is not typical of the "society" of journals (a change of publisher may be considered analogous). Multiplying of journals by bipartition is a unique feature of the journal population, and this is a characteristic in which periodicals specialize. Fusion (marriage) of titles, decreasing the number of journals, is encountered less frequently. Unlike the human population, in the journal society an individual can die temporarily but be resurrected (reincarnated) at a later date. In the journal population the kaleidoscope of change seems to be more colourful than in human society.

Unlike human society, where the rate of demographic events (births, marriages and deaths) depends on an individual's age, journals do not show such dependence. The founding of a journal is not influenced by the age of others in the population and, "participation" is caused by other reasons. Cessation of publication is not a consequence of "ageing" but the retirement or death of an editor can terminate a "sick" periodical.

In human society an individual is in existence from his/her entrance to and exit from the population. The publication "density" of a journal (number of issues per volume, number of pages in a volume, number of articles per volume), however, can vary over

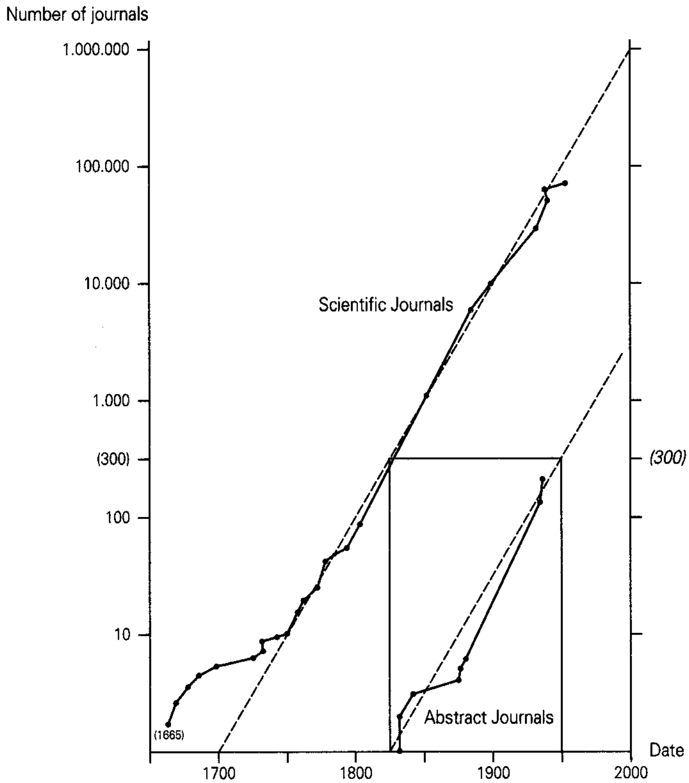

Figure 1. Number and growth of scientific journals and abstracts journals founded as a function of date

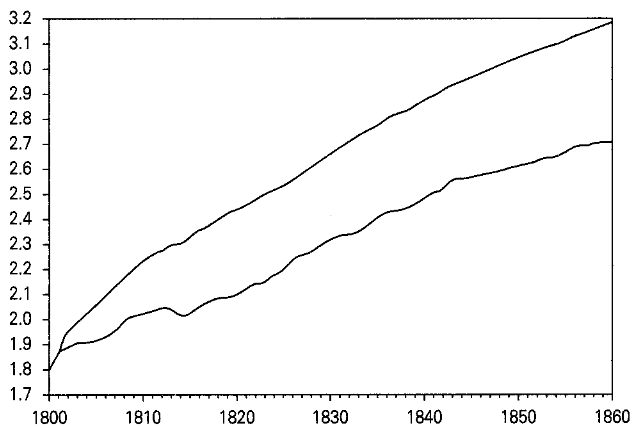

Figure 2. Number of All Launched (Upper Curve) and the "Living" (Lower Curve) Journals between 1800 and 1860 (in 1,000s) based on the Catalogue of Scientific Papers, 1800-1863

time. Consequently, a particular journal may exist in various numbers in a given population; and this can grow or diminish over time. The "change in number" characterizes the "health" of the periodical. A growth in the number of issues per volume, or in size, indicates the flourishing of the undertaking, and the contrary its decline.

A well-known yardstick of development of human society is infant mortality, i.e. the number of deaths in the first 12 months per 1,000 live births in one year. In primitive societies this parameter is high, and it decreases with the progress of civilization. Such a phenomenon can be observed in journals too. We suppose that such a phenomenon can frequently be found in the case of science journals born in some countries of the South.

If primitive communities do not develop technologically, are unable to combat the high mortality rate and have no effective family planning, the population increases until it reaches an equilibrium with its environment. As a rule, after increasing exponentially a limit is reached, which is determined either by the increase in mortality or by the decrease in the number of births.

The development of the journal population shows a similar picture. For instance, the cumulative numbers of primary and reference journals are increasing exponentially as a function of their year of foundation.

The exponential growth of scientific knowledge (information) was well described and graphically depicted (Fig. 1) by Derek de Solla Price in his monograph, Science since Babylon (6). Since the founding of the earliest surviving journal, the Philosophical Transactions of the Royal Society of London, in 1665, "the pace of growth of quantity of all learned literature has been maintained at a compounded interest with a tremendously rapid doubling time and are about tenfold increase in every generation of 35 to 50 years". Price observed that "it became evident by about 1830 that the process had reached a point of absurdity: no scientist could read all the journals or keep sufficiently conversant with all published that might be relevant to his interest." This led to the development of abstract journals, and they too have been growing at an exponential rate (Fig. 1).

The well-documented figure in Price's book gives a distorted picture of the "demography of journals", because it includes only the "births" and not the "deaths".

To eliminate this deficiency we tried to account not only for the launch but also of the cessation of journals. For this purpose scientific journals published between 1800 and 1860 (7) were selected (Fig. 2). It can be seen that the actual number of scientific journals in existence increased exponentially in the period investigated,even though the rate of increase was somewhat slower in this case.

Although there are now available more precise versions of Price's curves of journal growth rates (Fig. 3) it's clear that the growth rate of journals is still very rapid. Another factor that must be taken into consideration is the constant rise in costs of journals, which in recent years, at least, has been increasing well above the levels of inflation.

And this is a component of excessive importance for the South. Many countries from the South are increasingly unable to afford the costs of the science journals published in the North which are however of paramount importance for good quality basic research in the sciences.

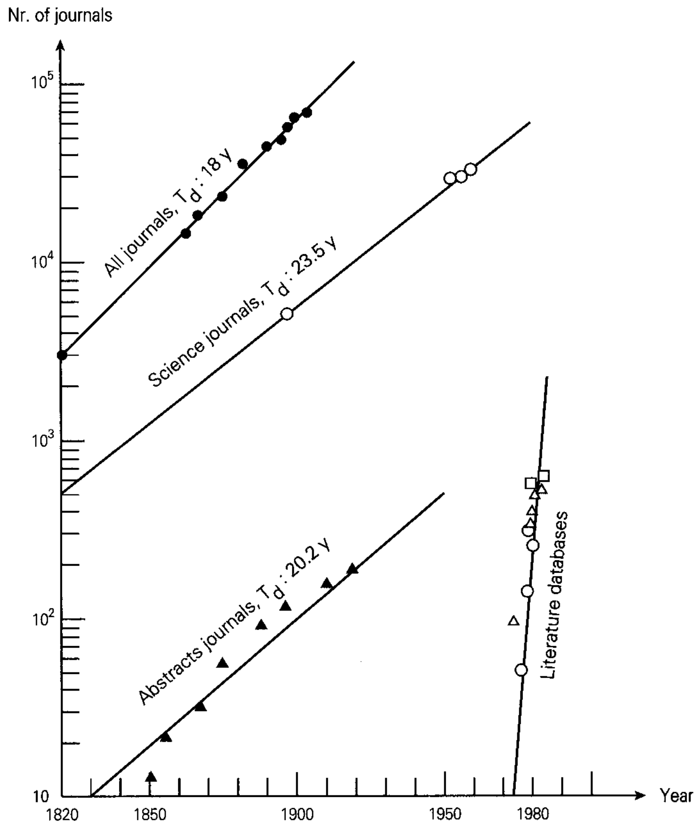

Figure 3. Corrected number and growth of scientific journals and abstracts journals

A cyclically surfacing event materializes in papers lamenting the growth of scientific literature in general or of science journals. In these papers the growth is damned with eyecatching epithets as "explosion", "pollution", "flood", "crisis", "eutrophication", "glut", etc.

There is however one aspect of such lamentations on the literature growth topic not yet dealt with and perhaps worth mentioning here. We like to call it the "Barnaby Rich syndrome". Rich (8) who already in 1613 wrote: "one of the diseases of this age is the multiplicity of books; they doth so overcharge the world that it is not able to digest the abundance of idle matter that is every day hatched and brought fourth into the world" seems to be one of the first to decry detrimental growth in literature. However, it is funny to note that being so critical to the excessive productivity of others did not impede Rich from publishing at least 26 books including five romances and translations, five military works, seven reports on Ireland, six commentaries on manners and morals, and three pamphlets, a quite remarkable output at that time. We feel the attitude. Rich represents is a manifestation of a very common effect defined as "it's always the other authors who publish too much and "pollute", "flood", or "eutrophicate" the literature, never me".

A quick look at the productivity of a group of scientists who did lament on literature growth and selected on the basis of their use of one (or many) of the abovementioned damning epithets, largely confirmed the validity of the Barnaby Rich syndrome. The output of these authors was namely fairly above the productivity of average authors in their respective fields. As a conclusion we can state that all of them confirmed the popular say "they don't practice what they preach".

There is ample evidence that the exponential growth of the literature of science, including science journals, which sometimes is mentioned also as the proliferation of the literature is not necessarily an indication of ill health in science. It may be a natural consequence of scentific progress. This puts severe strains on the scientific information management system, mainly in countries of the South which would have to be reasonably matched not only to the needs of the cumulative growth of knowledge but also to the precarious nature of science and research funding in those countries.

It is well known that global disasters are reflected in statistical data. From the age pyramids showing the age distribution of the population can be gauged, the consequences of wars, epidemics, disasters, as well as the wellbeing of peaceful years. The analogy with journal demography holds in this case too: wars, revolutions, and changes of regime are accompanied by reorganizations in the "society" of journals, launching of new and cessation of old periodicals. The premature death of movements results in a premature "journal decease".

It is worth noting that the abovementioned facts are not limited to periodicals dealing with or directly influenced by politics. Greater changes in society can also influence the publication of scientific journals.

In contemporary sciences specialization became a characteristic feature. Scientists want to obtain more and more detailed information about less and less. The splitting of the disciplines is well reflected in the partition of scientific journals. As an example, the "biography" of the renowned English periodical, The Journal of the Chemical Society, owned by the Chemical Society, London, can be mentioned. The Journal has published articles on various subfields of chemistry since 1844. Its partition was a result of the specialization of science. Articles published in the volumes of the journal became more and more specialized. The issues, increasing in volume, raised costs but diminished the number of subscribers. With the purchase of a few relevant articles readers got a lot of information which was useless for them. The "over-sized" journal was split into three in 1966 (Parts A, B and C), later "adopting" The Transactions of the Faraday Society, in six parts, in 1972. These "specialty" journals retained their original titles like a family name. Wider science fields are labelled with names of respectable scientists of the discipline, narrower ones with numbers in the subtitle of the offshoot journals. "The Journal of the Chemical Society no doubt deserves its scientific eminence, and one can perhaps excuse the nostalgia of the title's Victorian egocentrism. But the journal proliferation of sections with kaleidoscopic subtitles is as blameworthy as its consistent failure to use a volume number".

For the needs of new scientific subfields the founding of genuinely new journals is more advisable, suggest information scientists. This notion did not find very much support: the "descendants" of the journals of the Institute of Electrical and Electronics

Engineers (IEEE), or The Journal of Geophysical Research have a more complex family relationship with their "predecessors". This phenomenon is not rare, and illustrates that "birth-control" with the help of instructions is as hard to practise in the journal population as it is in human societies.

However, one can find examples of the operation of natural control mechanisms in the "society" of journals, too. Some journals, which had previously been split into parts, were merged again later. The Acta Chemica Scandinavica, which had been published in two parts (A and B) since 1974, was reunified in 1989. The Journal of Physics split into three, and later into seven parts, but recently two of the seven "descendants" were reunited. Here the tendency of interdisciplinarity is at work and prevents unreasonable specialization: journals covering too small a subfield are in general not be viable.

Demographic investigations can be extended, aside from the whole population, to include various groups, age-groups and social classes in society. In this way various social groups can be compared, using statistical methods. Of course, the journal population is also divisible into various groups, according to different viewpoints. In this respect one can distinguish scientific or non-scientific, primary reference journals, journals published by societies or profit-oriented ventures, etc. Continuing the division, there are among the group of scientific journals those dealing with natural sciences (scientific journals in a strict sense); among these there are journals for special science fields, and so on. Consequently, we can compare the "demographic" data of periodicals published by learned societies, universities, academies (i.e. not profit-oriented) and those published by profit-oriented publishing houses.

It can be noted that different tendencies are apparent between journals published by the two types of publishers. In the 1970s the profit-oriented British publishing houses made an effort to publish journals which were more specialized, smaller (containing fewer pages per issue and per year), and with fewer copies. Publication time was shorter and they were more expensive per page than those published by their non profit-oriented counterparts. Contrarily, scientific societies do not particularly want to publish journals in new, strongly specialized subject fields and are still less willing to cease publication of old, well-established periodicals. The professional publishing houses are more versatile than scientific societies. When one of their publishing efforts does not realize the expected profits, publication of the newly launched journals is ceased. It seems that, in groups of journals selected by type of publisher, the Methuselahs can be found among the publications of scientific societies. The life expectancy of periodicals published by profit-oriented companies is, however, shorter. The former are "multiplying by bipartition", the latter "naturally" by way of foundation.

Ecology

Ecology has been originally defined by Ernst Haeckel as "the whole science of the relationship of the organism to the surrounding outer world"(9). In the case of the ecology of journals, the organism referred to is the scientific journal. Ecology has been pursued through various disciplinary perspectives (e.g. biological, geographical, sociological, etc.) within both natural and social sciences. As a result the ecological approach is widely regarded to be of effective assistance for a realistic understanding of complex biological and environmental problems.

Here we present for the first time some not yet settled, preliminary, ideas on an approach which could be of some assistance in the understanding of the complex relationships governing the existence and activities of science journals. Integration in a complex topic is difficult to achieve, for many variables must be considered and large gaps of knowledge exist. Special tools are needed to provide a certain framework against which concepts can be organized. Frequently, conceptual models are constructed for this purpose. These are abstract and often schematic representations of perceived ecological systems. Such a model should provide the basis for the selection of variables for study, for the consideration of patterns of interplay between the different components of the system, for the formulation and testing of hypotheses concerning interrelationships within the system. Such a model may aid the location of "pressure points" at which the system may be sensitive as well as "structural constraints" on possible problem solutions.

We think that by using some of the demographic approaches outlined in the previous section of this paper a successful model-building can be attempted in the future in the field of the ecology of science journals. In addition some useful preliminary concepts could be outlined. As we mentioned previously, the overwhelming growth of the number of scientific journals, coupled with the inadequacy of individuals to cope with the changes, has resulted in widespread disaffection. This has led to suggestions for alterations in the system (10) (11), the most drastic of which calls for elimination of the science journal and substitution with a centralized computerized communication system.

Consideration of the scientific literature as an evolutionary ecological process that has been responsive to the growth and responsible for the pre-eminence of science in the North (12) leads to the conclusion that with our present insufficient knowledge of the entire ecological model, it would be extremely risky to tamper with the journal environment in any drastic manner. Any radical interference could namely, in analogy to the ecology of biological systems, reduce not only the quantity of the affected species (in our case science journals) but its quality as well. It is supposed that this problem can be controlled without altering the ecology by gentle means and measures which have still to be found by future research. One of the ways would be the introduction of quality filters at various key points of the ecological cycle.

REFERENCES

1) S. Zsindely, A. Schubert, T. Braun, *Scientometrics*, 4 (1982) 57.

2) T. Braun, W. Glanzel, A. Schubert, Scientometric Indicator, World Scientific Publ. Co., Ltd., Singapore, 1985.

3) S. Zsindely, A. Schubert, *Communication Research*, 16 (1989) 695.

4) R. Roy, N.R. Roy, G.G. Johnson Jr., *Scientometrics*, 4 (1983) 41.

5) A. Guillard, *Eléments de statistique humaine et de démographie comparée*, Guillaumin, Paris, 1855.

6) D.J. de Solla Price, *Little Science, Big Science*, Columbia University Press, New York, 1971, p. 63.

7) Catalogue of Scientific Papers (1800-1863), compiled and published by the Royal Society of London, Vol. 1, HMSO, London, 1867.

8) T. Braun, S. Zsindely, *Scientometrics*, 7 (1985) 529.

9) E. Haeckel: Generelle Morphologie der Organismen. 2 Bd. Allgemeine Entwicklungsgeschichte der Organismen, Reimer, Berlin, 1866.

10) J.D. Bernal: *The Social Function of Science*, Routledge, London, 1939.

11) T. Fox: *Crises in Communication*, The Athlone Press, London, 1965.

12) J.M. Ziman, *Nature*, 224 (1969) 318.

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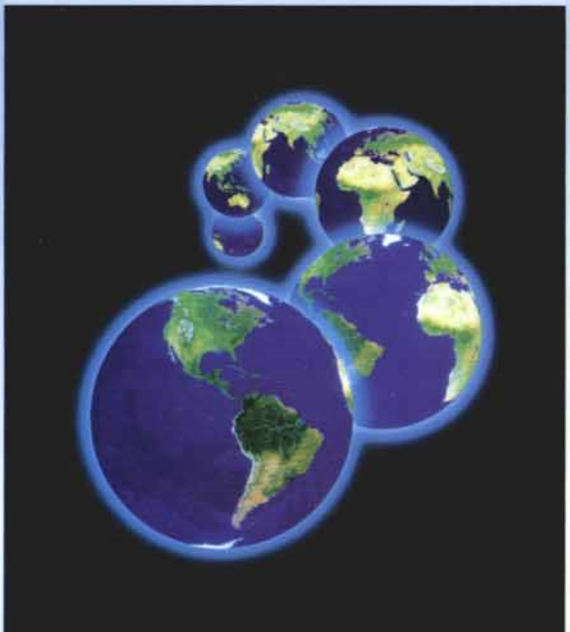

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