# THE SUCCESSFUL SCIENTIFIC PERIODICALS: CONTEMPORARY ISSUES[1)]

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**Abstract.** The new scientific results should be published. However, the scientific result will be lost in inappropriate choice of the media in which is expected to appear. The world periodicals are developed in two levels, parts of the World System of Abstracting, Indexing and Evaluation, WSAIE. This system is just the body of the world science. The first level consists of the *primary research journals.* After careful inspection these journals should be accepted for covering in *secondary research sources* – the latter build the second level of the system. Journals, which are not presented in secondary research sources, are considered as *marginal* and the submission of manuscripts to such journals is not recommended. The second level of WSAIE has an elite part, an American one (Thomson Reuters, Web of Science), and an European one (Elsevier, SCOPUS). The journals of Web of Science are characterized by their impact factor, IF; the journals of SCOPUS are characterized by their impact rank, SJR – these journals' scientometric characteristics are entirely equal in use; no one of them should be favoured in respect to the other. However, these factors characterize the journals, not authors publishing in them; therefore, these numbers cannot be used neither to compare different scientific areas nor in the personal evaluation of authors' scientific activity. The personal and institutional competencies for research could be estimated by properly use of some scientometric variables. The most important of them are considered.

Amongst them are the *index of Hirsch, h*, and the *factor of efficiency, e*. In twenty-first century a new development of science began. The researchers should know the features of the contemporary science policy; otherwise the traps of the new time would compromise the effort of the researcher to achieve a success in his/her research activity. The status and the new developments in world science are both discussed. The transition from the 'normal science' (Kuhn) to the 'post-normal science' (Funtowicz & Ravetz) is commented. The integration processes in science, the mass higher education and its mcdonaldization are also considered. The difference between 'science' and 'surrogate science' is explained. Finally, the present status of the Macedonian and Bulgarian chemistry (and of some other fields of science) is commented in comparative manner on the basis of data of the analytical section of SCOPUS.

*Keywords:* science policy, international publishing standards, scientometrics, impact factor, impact rank

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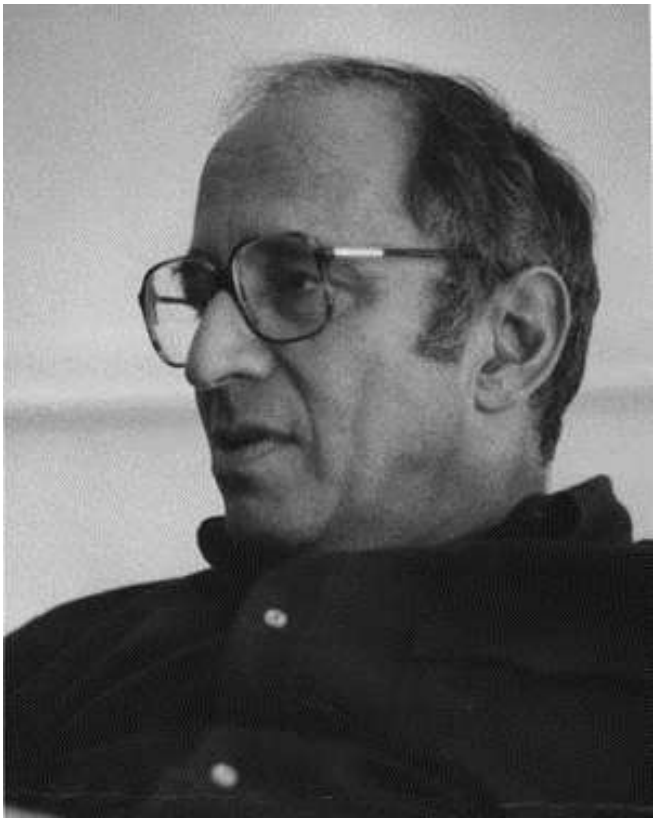
**The normal science**

Science is a product and feature of human civilization. Human development is determined by the dynamics of scientific progress.

In modern history and philosophy of science there are two main theories that claim to have discovered the regularities that govern scientific research. One basic idea belongs to Kuhn and is presented in "Structure of the Scientific Revolutions" (1959). The other main idea belongs to Lakatos and is described in "Falsification and Methodology of Scientific Research Programmes" (1970).

Imre Lakatos (1922-1974)

*After Lakatos:* research programmes could coexist and could be different in different scientific fields. Each research programme is built on a *solid core* of fundamental scientific concepts and around this core two protective layers should be done: *positive heuristics* - which shows the tools for obtaining the new scientific results and *negative heuristics* - which shows how to proceed when there appear experimental facts in conflict with the basic theory of the program. When contradictions with experiment found no authorization, core of the program is broken and this research program will be replaced by another one.



Thomas Kuhn (1922-1996)

*After Kuhn:* there are fundamental scientific results - paradigms that have two features - *longevity* under conditions of severe competition of the scientific ideas and *openness*, the possibility of finding in them and through them of new scientific results - that development of science Kuhn defined as *normal science.*

Throughout the 20th century science developed as a normal science. Nowadays, however, the situation has dramatically changed.

**The body of science**

In the body of science only the new scientific results are incorporated. Moreover**,** within the subject of science only reproducible phenomena and facts are taken into account. There are areas of science where this repetition of

the facts cannot be verified in laboratory. Then the ergodic hypothesis comes in use – "what ever happened has already happened other times and will continue to happen in the future."

New scientific results should be offered to the scientific community for recognition and evaluation. This is done through publication. Science has long created the media where it happens. This system here is designated as World system of referencing, indexing and evaluation (WSRIE).

The World system of referencing, indexing and evaluation is an environment for the publication of scientific papers, which after examining by anonymous and independent experts (peer-review) appear in full text in primary literature sources, most scientific journals (primary research journals), and then, in an abbreviated form (as abstracts), these publications are presented and classified in printed or electronic secondary sources, where the primary sources in question are included after an expert assessment on certain scientific and publishing criteria.

Such a system provides documentation and publicity of any new scientific discoveries that make up the body of science. The second level of this system (the secondary journals) is taken as a guarantee that what is published in the primary literature bears the marks of authenticity and can be considered as a basis for further studies by other researchers. The primary scientific journals exist for several centuries; secondary literature originated about 150 years ago. This two-level publishing system aims the stability of scientific process and prevents it from false or unfair information and other disorders. Journals which are not found in the second level of the world system are defined as *marginal* and the publication in such sources is not recommended.

The number of scientific journals, presented in the various components of would system of referencing, indexing and evaluation, is estimated at around 80 000. The marginal journals are more in number and their number

increases fast. In our days their number is estimated to 2 million (more recent estimation: 3 million).

**Post-normal science**

After overcoming the block separation of the world followed the rapid changes and the emergence of new phenomena in the world educational and research area. Elite higher education was been replaced by mass higher education, followed by a massification of research institutions and academic community. Massification of higher education has been accompanied by a parallel process of mcdonaldization of higher education, which is based on the idea that education is no longer a public good but a commodity; that finds justification in formal similarity of universities with business organizations. On those circumstances the construction of a common European educational space began. This unification was based on the Bologna Declaration. But the extended version of the Bologna Declaration (2001) opposes the process mcdonaldization in education: "Education is not a commodity, the student is not a client, the university is not a supermarket." The massification of higher education produced another problem - Bulgaria now has 277,239 students, but students in service public professions (public administration, economic management, law, etc.) are 45% and only 1% are students in chemical and physical programs.

With the end of Cold War research money ceased because it considers that the global war threats are over. The process of differentiation of science with solid barriers between the scientific disciplines – a mark of science of the 20th century, was replaced by a process of integration of sciences with an emphasis on interdisciplinary and multidisciplinary research methods in studying of natural as well as of social systems. This has affected all areas of science - even the old pedagogical disciplines amalgamated in the bulk science of education.

Because of the reduction of funds for research, society became sensitive to how this money is distributed among scientific organizations - the institutional funding was replaced with project financing. A triangle “academic community – society – government” was established; all three elements of this triangle are in a strong interaction each to other.

Under such conditions, so called *surrogate science* appeared; it is science, whose representatives did not look for wide publicity of what they offer as scientific results; their "results” are relevant only in their career development. Surrogate science is aggressive and it imitates the real science. The centuries-old system of referencing, indexing and evaluation came under threat - the number of marginal sources increase dramatically; duplicate structures are created - they provide "impact factor" of marginal magazines if paying; accreditation agencies arise aiming to legitimize in society the university diploma mills.

The normal science transformed into a *post-normal science* (Funtowicz & Ravetz, 1993).

**Thomson Reuters (WEB OF SCIENCE) and Elsevier (SCOPUS)**

With the development of information and communication technologies the world system of referencing, indexing and evaluation enhanced its capacity in terms of content and public accessibility. This system has two elite components - an American, created by Garfield as the Institute for Scientific Information, now Thomson Reuters and other - newer - European, created on the basis of Elsevier - its electronic image is SCOPUS.

These formations grade sources, which are under their control, on the basis of two quantities with intensive properties - *impact factor*, IF (Garfield, 1072) (Thomson Reuters) and *impact rank*, SJR (Gonzalez-Reveira et al., 2009) (SCOPUS). The values of these quantities are a measure of the degree of citation of articles that are in them. Calculation procedures in both cases are

different, so the numerical values of IF and SJR are different for a given magazine.

These two variables are characteristics of journals and are not characteristics of authors who publish in them. Therefore, these values cannot be used in assessing the scientific work of a researcher for the aims of his/her career development. These values show differences in various scientific fields. Therefore, comparison of scientific fields through them is unlawfully.

The only categorically clear is that the publication in sources with high impact factor and/ or impact rank gives a better chance such publications to be noticed, appreciated and used - at such publications the *response time* - the time from publication to its first quote, is reduced; and it is just the advantage of such publications.

**Evaluation of personal scientific activity**

There are only two scientometric variables that can be used to assess the personal scientific activity - *efficiency factor, e* and the *index of Hirsch,* h. Both variables account the citing of the scientific publications of the researcher. At higher citation the researcher has a place in science; in the absence of quotations the author is unrecognizable by international scientific community and no evidence exists that his/her research has some real value.

Scientific work is cumulative. Therefore, a quantity with extensive properties should be a quantitative measure of author's effectiveness. Certainly, a measure of the *productivity* of an author is the number of his/her publications (say *n*) but, the measure of papers' *usefulness* will be the number of citations or reviews (*k*) these publications are obtained in literature. Then measure the *effectiveness* of the scientific work of a scientist will be the product of two quantities (Toshev, 2005):

$$e = n \times k$$

It is essential that for eminent researchers the factor of efficiency will continue to grow and after ending of their scientific research.

If among the publications of an author can be found $h$ = 1,2,3, ... publications, each of which has at least $h$ citations, then the index of Hirsch (2005) for this scientist will be given with the number h.

Hirsch index is not calculated for the total scientific work of a scientist; calculations are close to some recent period, say 1996 – 2013. Therefore, the index of Hirsch is not a measure of the importance of scientific creativity of scientists. Rather, it is a measure of the relevance of their research to the present interests of the scientific community and the society as well.

Any researcher can see his/her h-index in SCOPUS or WEB OF SCIENCE. For this, the researcher should just write his/her name in these scientific databases.

**European status of the Bulgarian science: a comparative analysis**

If in the set of papers published in a certain period of time, say, last 15 years, can be found $h$ a number of publications, each of which has *at least h* citations, then the index of Hirsch will be $h$. This set can compile the publications of a researcher and then the number h will give his/her h-index. But it can also be papers published in a scientific journal for a given period of time. Then the index of Hirsch for the journal will be h. This set can consist of all the papers published for a given period of time by the whole research sector of a given country. Then the country will have index of Hirsch equals to h. Calculation of Hirsch indexes for a journal and for a country are new applications of this scientometric quantity, originally applied only to a single researcher. Full details in this respect can be found in the Analytical Center of SCOPUS.

Obviously, the values of the impact factor, impact rank and h-index of a scientific journal is a measure of its scientific prestige.

The value of the h-index of a country marks the status of country's research sector. Big values of this parameter imply a network of advanced scientific research organizations in different scientific fields with highly qualified academic staff, of actuality and relevance of the research carried out. So, this indicator can really be a measure of the scientific prestige of the state. Small values of h-index of a country indicate that this country has a peripheral presence (within the meaning of Shils (1975)) in the science development in the world.

**Table 1.** Science in European Union (source: SCOPUS)

| COUNTRY | h-index |
|---|---|
| 1. UNITED KINGDOM | 934 |
| 2. GERMANY | 815 |
| 3. FRANCE | 742 |
| 4. ITALY | 654 |
| 5. NETHERLANDS | 636 |
| 6. SWEDEN | 507 |
| 7. SPAIN | 531 |
| 8. BELGIUM | 502 |
| 9. DENMARK | 476 |
| 10. AUSTRIA | 416 |
| 11. FINLAND | 407 |
| 12. POLAND | 336 |
| 13. GREECE | 295 |
| 14. HUNGARY | 277 |
| 15. PORTUGAL | 269 |
| 16. CZECH REPUBLIC | 268 |
| 17. IRELAND | 181 |
| 18. SLOVENIA | 172 |
| 19. SLOVAKIA | 165 |
| 20. CROATIA | 161 |
| 21. BULGARIA | 154 |
| 22. ROMANIA | 153 |
| 23. ESTONIA | 148 |
| 24. LITHUANIA | 122 |
| 25. CYPRUS | 100 |
| 26. LATVIA | 94 |
| 27. LUXEMBURG | 92 |
| 28. MALTA | 70 |

Bulgaria occupies the 21st position in this list. It is not as good as a position, but it is not so bad as a result (Table 1).

**Table 2.** Science in Balkan countries (source: SCOPUS)

| COUNTRY | h-index |
|---|---|
| 1. GREECE | 295 |
| 2. TURKEY | 237 |
| 3. SLOVENIA | 172 |
| 4. CROATIA | 161 |
| 5. BULGARIA | 154 |
| 6. ROMANIA | 153 |
| 7. SERBIA | 86 |
| 8. MACEDONIA | 67 |
| 9. BOSNA AND HERZEGOVINA | 49 |
| 10. ALBANIA | 40 |
| 11. MONTENEGRO | 23 |

Obviously, our countries (Table 2) have no enough strong position in the world of science. This may be related to the formal reason - just few Bulgarian and Macedonian scientific journals are presented in Thomson Reuters and SCOPUS. So, a part of the scientific policy of the two countries should be an effort to increase the number of our academic journals in the World system of referencing, indexing and evaluation - this will increase the visibility of our science (Table 3).

**Table 3.** Bulgarian and Macedonian journals in Thomson Reuters and SCOPUS

| COUNTRY | WEB OF SCIENCE | SCOPUS |
|---|---|---|
| BULGARIA | 11 | 40 |
| MACEDONIA | 2 | 5 |

I should kike to note that one of the two Macedonian scholarly journals in Thomson Reuters is the *Macedonian Journal of Chemistry and Chemical Engineering*.

The index of Hirsch of three big countries: USA (h=1518); China (h=436); Russia (h=355).

Obviously the countries with highest indexes of Hirsch should be considered as *central* countries in the world of science (Shils, 1975). H-index = 1518 is a fantastic result – 1518 papers each of them has received more than 1508 citations (!); therefore, one should suppose these papers to build the golden core of the contemporary science.

**Recommendations**

*Researchers:* Anyone in science dreams to obtain new and essential scientific results and to realize a high quality research. Therefore, do not submit your manuscripts to marginal sources, because only the successful publications in high prestigious journals provide a good carrier development.

*Editors:* Introduce the peer-review procedures and improve your journals; then apply for inclusion the journals in the secondary research sources.

*Policy-makers:* Be acquainted with the contemporary trends of science policy in order to avoid or overcome the bad and wrong features of the post-normal science.

NOTES

1. Plenary lecture, presented at the 23rd Congress of Chemists and Technologists of Macedonia, Ohrid, 8-11 October 2014.

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