

BIBLIOMETRIC STUDIES OF THE MAGNETIC FLUIDS RESEARCH BRANCH

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<Bibliometrics:> Bibliometrics is a set of methods of quantitative assessment of documents (papers, books, theses etc.), their elements and collections. Bibliometrics methods can be divided into 4 major groups: the methods for evaluation of productivity of authors, journals etc. (including mere count of documents); methods for evaluation of the documents use by scientific community and, correspondingly, the value of documents (including the particular method of citation analysis); methods for evaluation of the scientists attitude to the documents; methods for evaluation of the content of the documents [1]. <Prerequisites for bibliometric research in the field of magnetic fluids:> By initiative of Dr. B. Berkovski the publishing of "the magnetic fluids bibliographies" was launched immediately with the publication of the Proceedings of the 2nd International Conference on Magnetic Fluids (ICMF). Such data collections are a steady source for some kind of bibliometric research fulfilled by means of documents count. Among the other suitable data files the "MAFLI" database developed at the Laboratory of thermomechanics of magnetic fluids of the Belarusian State Polytechnic Academy might be mentioned. <The initial state of arts of bibliometric studies of magnetic fluids research branch:> Bibliometric research by means of mere count of articles and patents is being regularly fulfilled with the use of "Magnetic fluids bibliographies" as an information source; it is followed by regular publication of some of its results as "Introductions to the magnetic fluids bibliographies" in ICMF Proceedings.

<The present state of arts — review of our original studies:> In 1992 the reporting author fulfilled two bibliometric studies of the magnetic fluids research branch with the use of citation analysis. The first study was an attempt to evaluate the impact of various authors in the development of the research branch by means of using their citedness characteristics reported in the "Science Citation Index" (SCI) [2]. The outcome of this study was somewhat paradoxical: it was demonstrated that by means of the use of the SCI data it is not possible to make any reliable conclusions on account of the individuals impact when such a compact domain is under analysis and while its members are involved also in other branches of science.

The second study was based on the assumption that conferences proceedings reflect most characteristic papers by the moment. (However, while not a single journal entirely specialized in the magnetic fluids exists, the proceedings of ICMF are the only formally restricted source of citations) As it was demonstrated that the SCI is of a little use in the case of magnetic fluids research evaluation, *de visu* complex citation analysis was fulfilled. Among the results of this study made of the citations in the ICMF-5 Proceedings there were: 1) the list of cited periodicals; 2) the list of the disciplines of their appurtenance featuring somehow the structure of inter-disciplinary liaison; 3) citedness figures of personalities (with and without self-citations, accounting only the first co-authors (as in SCI) and all the co-authors, regardless the number of cited documents and taking this data into account; 4) the chronological structure of the cited references; 5) the spices structure of the cited documents [3]. This study demonstrated again and from other viewpoints that the SCI mode of citation count is not valid, while the cited authors list that was developed in the described study is already of a certain use for evaluation of the authors' impact in the development of the research branch.

It was concluded (and proved — in a way) that data like calculated in [3] are applicable for a quantitative judgment of the progress of a research branch under a bibliometric study [4;5]. Accordingly, the research was fulfilled to follow up the dynamics of scientific progress in the magnetic fluids research branch *per se* (by comparison of the citation structure in the ICMF-5 and ICMF-6 Proceedings) and in its sub-branch "biomedical applications of magnetic fluids" [6-8] (by studying the citation structure not only in corresponding papers in the Proceedings, but also in

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abstracts. Various counts of productivity — of the authors, laboratories, universities, countries etc. — were also performed in this second part of the study.) The results were presented at the ICMF-7, but as for the first part of the study, the results, unfortunately, remained unpublished.

Therefore, some conclusions of these works are worth mentioning. We came to the conclusions that during the period between the ICMF-5 and ICMF-6 were held, the activity of magnetic fluids researchers generally increased. At the same time, the domain of the magnetic fluids researchers seemed to reduce a bit the quantity of the literature items used in the creative work and enlarged the part of older literature to be used. Nevertheless, the domain sufficiently expanded the thematic scope of the used literature and made a greater use of generalizing, summing-up, cumulative publications. New names of the citation leaders that have appeared in the ICMF-6 Proceedings seem to be a symptom of a normal creative development of the research branch.

As for the biomedical applications, the productivity has increased in all the possible manners (number of papers, authors, institutions, "invisible colleges", countries of the origin etc.). Cognitive basis (reflected in the structure of the cited literature) has been very much improved as it could be concluded from the magnitudes of the average number of references in the corresponding papers published in the ICMF-6 Proceedings and in the corresponding ICMF-6 abstracts as compared with the ICMF-5 ones. (This is radically different from the analogous data related to the whole collections of the ICMF-5 and ICMF-6 papers.) Concerning the chronological structure of the cited references, the references became "older", but not so dramatically as in case with the whole ICMF-6 Proceedings.

Also, in general, there is a lot of bibliometric evidences (*indirect*, of course) that ground the opinion that the sub-branch "biomedical applications of magnetic fluids" is being developed more successfully than the whole magnetic fluids research branch. A substantial progress in the development of the sub-branch is also reflected by the fact that the number of cited authors increased in 2.5 times, the cognitive basis was influenced not only by more publications, but, also, by publications produced in a greater number of disciplines etc.

<The challenge:> When the ICMF-7 Proceedings were published, the small amount of the papers published in the Proceedings volume might indicate not only an unusual rigorism of the papers selection, but also made us think that the distance of the air flight to India (the country that hosted this last conference) could prevent a lot of the specialists from participation. Therefore, could the ICMF-7 statistics be treated as reliable? So, again, some theoretical problems of bibliometrics arise during the fulfillment of bibliometric pilot studies of magnetic fluids research branch, while the research branch itself awaits for its further bibliometric exploration.

<Acknowledgments:> The presenting author expresses his cordial thanks to Prof. V. Bashtovoi for helpful ideas and discussions in 1992-94. Dr. Stuart Roath who suddenly deceased in 1997 was the person who encouraged us to keep on working in the chosen direction in 1993-95. The very helpful discussion of some of the results and ideas took place during ICMF-7 in India, and a lot of attendees made their useful remarks. Among the others, Dr. R. Rosenzweig's opinion was very important, and the very special thanks ought to be expressed to Prof. A.M. Figueiredo Neto (Brazil). We are thankful also to Dr. B.V. Reddi, Prof. Mehta and his student Kishouri (India), Dr. S. Taketomi (Japan), Prof. M.S. Tagirov (Russia), Prof. V. Iusati, Dr. D. Haseganu, M. Balasoiu, M. Pachis (Romania)

<REFERENCES:> [1] Lazarev V.S. Notion of a document: a center of "gravity attraction" for getting metrics together; *Scientometrics* 30 (1994) N 2-3: 511--516, [2] Lazarev V.S. When Science Citation Index is of no use... ; in: *Information Science and the Science of Science: Proc. of the 3rd International (5th Tambov) Conference*. Ed. By V.M. Tyutyunnik, Tambov, 1994: p. 43--44, [3] Lazarev V.S. Bibliometric studies of the Proceedings of the 5th International Conference on Magnetic Fluids. Structure of bibliographic references as an indicator of the cognitive basis of the research branch; *Magintnaya Gidrodinamika* (1993) N 1: 109--116 (in Russian), [4] Lazarev V.S. Bibliometric investigations of the international conferences proceedings; in: *Fourth International Conference on Bibliometrics, Informetrics and Scientometrics*. September 11-15, 1993, Berlin, Germany: Book of Abstracts, Part I, S.I., s.a: p. 155--157, [5] Lazarev V.S., Yunusova D.A., Safonenko O.K., Karas G.A. International scientific conferences proceedings as a subject of scientometric studies; in: *EASST (European Association for the Study of Science and Technology) Conference on Science, Technology and Change "New Theories, Realities, Institutions"*: Abstracts. Ed. by Janos Farkas, S.I., s.a: p. 180, [6] Lazarev V.S., Safonenko O.K. Specific features of biomedical applications of magnetic fluids as a research branch (as revealed by means of bibliometric study); *IASLIC Bulletin* 39 (1994) 2: 49--62, [7] Lazarev V.S., Yunusova D.A., Safonenko O.K. Magnetic fluids-based technologies in biomedicine: a bibliometric review (1989-1992), *ibid*: p. 182, [8] Roath S., Lazarev V.S. Recent development of the major applications of magnetic fluids in medicine and biology (drugs transfer, cell separation and image techniques): some practical possibilities and some present characteristics of the research activity; in: *Transfer Processes in Biomedical Problems. International School-Seminar*. Minsk, Belarus, May 15-21, 1995: Book of Abstracts, Minsk, 1995: p. 96-98.