

Science -- What Is It?

PART I: METHODOLOGY OF SCIENTIFIC INVESTIGATIONS

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Science is an informational system. The approach of this article is to consider science from the point of view of production, recording, transmission, use, and selection of scientific information. The final aim of this system's functioning is the production of adequate knowledge about objective reality.

Science, being a complex self-organizational system, consists of structural units which perform different functions. Accordingly, there are different types of scientific information and scientific literature which has different earmarkings. Certain rules and traditions governing recording, transmission, and assimilation of information were formed during science's development. This feature of scientific literature, to reflect objectively certain processes and events, is used in different scientific analyses.

The key problem of scientific analyses is the adequate interpretation of data, and the establishment of the relationships between indicators and objective events. Clear representation (understanding) of the connection of certain information carriers with corresponding structures and events leads to adequate interpretation of data.

The reasonable question arises: Is it right to evaluate the state of the research field using only publications of scientists and institutions? The answer: not always, because formally organized structures might not include all scholars working on this problem.

Preliminary knowledge about relationships of scientific indicators and objective science events influences final conclusions considerably. Therefore, it is necessary to describe basic regularities of development of scientific studies and corresponding types of scientific literature. These standardizations reflect and fix the development of scientific studies.

The knowledge about certain subjects is connected with the creation of the research field. The problem is the basis of research field identification. Problem solving is different for separate groups of scientists. The research field is a structural unit of science's forefront, whereas scientific activity has a searching character. The conception of "research direction" is a part of scientific structure too, and it is a unit of less scale than the research field. Research directions are created on the basis of general approaches and ways of problem solution.

The notable feature of cutting-edge science is the informal organization. The scholars, working in one direction, do not have a formal organized group. The life cycle of the research field was a subject for many studies. These studies demonstrate many different phenomena, but general trends in the development of many research fields can be recognized. First of all, there is the desire of the research society to gain social recognition for new fields of study and to support their normal work and development. These trends are manifested more clearly at the levels of cognitive and social formation of research fields.

At the cognitive level (the level of knowledge system), the following processes occur: delineation of

problem; concretization; isolation from others; formation of complex cognitive norms; elaboration of scientific language for the communication in this field, conceptions, terms, general technology of investigations and interpretation norms; and creation of generally accepted archives of knowledge which are suitable for teaching.

On an organizational level, the following processes occur: the isolation of informal group from formal structures; establishment of own communication system; uniting of groups on the basis of newly-formed cognitive structures; and creation of new formal organizational units; establishment of public relations and public communications and supportive structures (financial, etc.), teaching of professionals.

These processes of social and cognitive growth are reflected in scientific literature. First, the author or several authors working either together or independently, present a new problem and new theme for study. First works are produced. If the scientific community becomes interested in it, the number of followers will rapidly grow. First time scientists might work autonomously, using original means (own methods, hypotheses, facts), and without including the experience of their colleagues. This leads to a community of authors who are working on the same theme, but using different sources of information and documents. This creates a non-organized community of authors. These authors cite mostly their own research or that of their nearest colleagues as references. When the number of such studies reaches a certain level, it becomes necessary to systematize and to generalize the information. This results in the publication of the first reviews.

When a certain amount of information exists concerning a specific area of study, authors are more informed about each other's results and achievements. Thus the non-organized community of authors is transformed. Groups develop particular methods or hypotheses. The variety of documents cited changes considerably. However, citations usually only consider the basic works in the field. The references cited by authors on a particular subject include a number of documents which show a stable pattern, and are being cited in every article on the subject. This is a sign of a scientific community which is consolidated on the basis of cognitive remedies described in key documents.

In the ideal situation, these processes lead to the birth of new specialties. Specialties are the structural unit of the profession. The profession forms as a result of social recognition of the scientific community's activity. Social recognition means that the results of research are introduced into the lives of everyday people. The published research serves as a basis for the teaching literature (textbooks). Thus, the profession is secondary to the research activity on the cutting-edge of science.

The nucleus of cognitive structures of the profession is the result. The specific informational function of the profession is assimilation and transmission of knowledge, taking into account the scientific work previously done. A high level of development of scientific focus is characterized by specific types of scientific literature (textbooks and monographs). This is a sign that the scientific focus of study has become a profession.

Thus, the number of studies, their themes and notes about scientific literature help to determine:

1. the stage of development, and the degree of cognitive and social "maturity" of the scientific focus or field;
2. the degree of consolidation of the scientific community and its dissemination of information (new journals, newsletters, seminars, conferences, etc.) help to illuminate and characterize

separate schools of scientific thought, and their cognitive means and unique approaches.

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