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INFORMATION AND COMMUNICATION ASPECTS OF FOUNDING AND OPERATING THE SCIENTIFIC SCHOOLS IN THE FIELD OF PUBLISHING AND PRINTING

Essential typological features of scientific schools are investigated, paying special attention to informational and communicational aspects of the problem. Peculiarities of scientific research organization in printing and publishing branches are revealed. A specific character of branch science consisting in the fact of close connection between scientific school formation and the activities of specialized higher education institutions is noted. The process of the establishment and development of the Lviv-Kyiv school of printing industry technologies, particularly regarding activities on development and application of photopolymer printing forms in printing production is analysed. On the example of the formation and the activity of the Lviv-Kyiv school of printing and publishing technologies the features of scientific school are listed. It is shown that scientific schools are formed under the influence of society demands, by the logic of science and practice development providing long-term fundamental and applied research and having essential achievements of public recognition in the homeland and abroad. Given this the functions of scientific schools are defined.

Keywords: *printing and publishing branch, scientific school, technology of printing and publishing industry, the Lviv-Kyiv scientific school of printing and publishing technologies.*

EMERGENCE AND DEVELOPMENT OF SCIENTIFIC SCHOOLS

The researcher's activities are aimed at not only studying or discovering a new knowledge, but also at disseminating and putting this knowledge into practice. In many cases, the scholars have disciples, however, the history of science has showed that not all of them did so. For instance, *A. Humboldt* and *Lomonosov* did not found any schools although they supported gifted promising students [1, 155; 2]. At the same time, there are many opposite examples that will be described hereafter. Naturally, in addition to signs of uniqueness and specificity, each scientific school as certain typological features typical for all scientific schools. This issue will be considered herein with a particular focus on information and communication aspects.

The establishment of scientific schools has old traditions and depends on many factors, including the socio-cultural specificity of various nations, the response of science development on specific features of social life, and the uniqueness of each historical period in each country. The last, but not the least is a special phenomenon of the scientific reality that is organically combined with subjective and personal qualities, availability of respective human resource capacity in the science, qualifications and skills of specific personnel, scope of their interests and national peculiarities of the educational system. From the generalization standpoint, the foundation of scientific schools mirrors the interaction of the two

eternal opposite trends, the differentiation and the integration into the science [3—5]. Actually, on the one hand, the establishment of each new school is a manifestation of differentiation in a certain field of research activity, on the other hand, it is an integration of cognitive, methodological, and organizational efforts of a large or a small group of scholars and researchers having a particular expertise.

The scientific school as phenomenon traces its roots back to ancient India and China. At the same historical period, scientific schools emerged in the ancient Greece. They are remarkable for combining the philosophical knowledge with the natural science [6—8]. Each of them has its own unique traits, scope of problems, underlying concepts, preferred methods and techniques of cognition.

This tradition of the ancient times spread over almost all historical periods since every time, the schools were competing with each other. Sometimes, the most famous, important, and largest by number of disciples and ideological and theoretical centers (research and educational establishments, other institutes) set leading trends of spiritual development of the mankind (in the medieval Christian philosophy, for instance, the Augustinianism and the Thomism, with the latter spreading its influence over various aspects of the world science development. Having evolved into the Neo-Thomism, currently, it belongs to the key directions of present-day philosophy). Among the well-known philosophies, there are the English materialism by Francis Bacon, the Cartesianism, the French materialism of the 18th century, the classical German philosophy represented by schools of *Immanuel Kant, Johann Gottlieb Fichte, Georg Wilhelm Friedrich Hegel, Ludwig Andreas von Feuerbach, etc.* These teachings and philosophies are well-branched, some of these branches are quite famous (the Young Hegelianism, the Marburg and the Baden (Freiburg) schools of the Neo-Kantianism).

The most prominent schools in the modern history are Machism, empiriocriticism, conventionalism, personalism, structuralism, analytical philosophy, and the Frankfurt school of social analysis. Today, this tradition is represented by the development of schools of hermeneutics, postmodernism, etc.

Differentiation and integration of such kind are typical for other fields of cognition, as well. For example, in psychology, there are not only clearly distinguished specific directions of studying the human mentality (psychophysics, psychophysiology, psychology of personality, comparative psychology, child psychology, educational, legal, engineering, social, and environmental psychology, etc.), but also fairly well-known schools, including the Wurzburg school, Gestalt psychology, psychoanalysis, behaviorism, introspective psychology, etc. In the history of language science, there are the schools associated with the activity of outstanding scholars of language *W. Humboldt, F. de Saussure, O. Potebnia, V. Dahl, O. Shakhmatov, N. Marr, etc.*

Naturally, there are scientific schools in nature science, engineering sciences, medical science and so on. Usually, the school is named after the founder of scientific field (Darwinism, Marxism or Bergsonism, Nietzscheanism); sometimes, the school name features the name of city or country, industry or sphere of science (the *Butlerov* Kazan school of chemistry). The accomplishments of the *Paton* Kyiv school of electric welding are well known all over the world. The same is true for the aerospace schools of *Yu. Kondratiuk* and *M. Keldysh*, the *Koroliov* and *Yangel* rocket and spacecraft design school, the *Antonov* and *Liulka* aircraft design school, the *Glushkov* cybernetic school, the *Amosov* surgery school, the *Filatov* ophthalmology school, the *Kopnin* philosophic school, and the *Dobrov* school of history of science.

Proceeding from the above mentioned considerations, one can conclude that the scientific schools are based on such pillars as the founder (the scholar or researcher whose ideas underlie theoretical and organizational framework of specific field of science), the geographical community of researchers and disciples of the school leader (as a rule, it is associated with the city where they

work), and finally, the most important, the ideological and theoretical framework. Its genesis is associated with the founder activities. Further the integrity of principles and targets of research is kept and deepened by the school traditions [9]. This means that the scientific schools emerge, develop, and die under the influence of objective reasons rather than because of the subjective will of certain persons. The reasons for their emergence and decay should be sought in the nature of science as social and historical activity [10].

The activities and development of scientific schools can be studied from various standpoints: worldview, methodological, historical, sociological, culturological, psychological, and organizational, etc. In our opinion, one of the most important factors in the present-day science is the information and communication aspect [11, 12]. The essence of this approach is that the diversified phenomena are considered by the researcher at the only angle, the information one, from the standpoint of analysis of information profile of very different processes. The other approaches are not abandoned, since everyone plays its valuable role in the cognition. The whole range of cognitive approaches to the reality should be considered as unity of complementary directions and cognitive techniques. This methodological context should be the framework for interpreting the specificity of information approach aimed at separating the only information aspect of reality.

INFORMATION AND COMMUNICATIVE ASPECTS OF ACTIVITY OF SCIENTIFIC SCHOOLS

In order to acquire a better understanding of the mentioned aspect of the issue of schools in science, it should be taken into consideration that the emergence of science of science as a separate discipline in the 20th century has been inextricably linked to the development of the information-centered concept of science whereby science is being examined as a continuous information process [13; 14, pages 6—10]. It is clear that this kind of mapping (and any other kind, as well) allows to gain insight into science and see substantially important features and tendencies of growth and development in it. It is this very aspect that has turned out to be in concordance with the era in which information phenomena have found themselves in the center of attention of many researchers, as can be testified by an utter railfall of works covering the information-related issues.

Thus, in this model, science presents itself as a «process of acquisition, accumulation, and logical processing of scientific information in order to produce new knowledge» [14, page 6]. In order to explicate this idea more precisely, let us cite a definition of another basic notion: «Scientific information is logical information that is being acquired in the process of cognition and is adequately reflecting phenomena and laws of nature, society, and thinking, and is also applied in social and historical practice» [14, page 73]. The matter under discussion is thus not merely the fact that this information is present (is circulating) in science but *how scientific it is*; the fact that information belongs to the realm of science to a certain extent (through its people, channels, sources, or facilities) does not yet confirm that it is of scientific nature. In this context, information which cannot be verified so far — or, which has been repudiated over time — can, on the other hand, not be considered scientific anymore. However, it is fair to note that works written by various authors also feature another interpretation of scientific information whereby scientific information is understood as information pertaining to the realm of science — that is, as one of the kinds of information present in society (alongside information pertaining to politics, economic life, arts etc).

As far as information angle is concerned, the scientific school is being characterized by a range of peculiarities that are visualized in a form of a diagram, see Fig. 1. And the first of these peculiarities consists in the fact that the founder of the school (or founders — if a school is being established on the basis of activities pursued by a team of scientists) has/have to be powerful generator(s) of ideas and not merely average subjects of certain

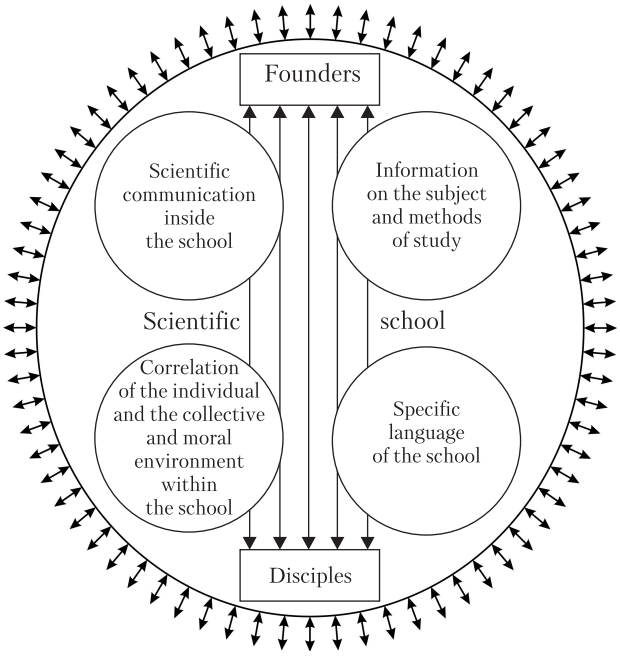

Fig. 1. Scientific school from informational standpoint (the arrows show directions of communication: science, practice, educatuon)

scientific and information processes. Thereby, one should take the following important epistemological requirement into due consideration: *there should always be a certain way leading from the cognitive image to the idea* [15]. Reference to the paradigm of general epistemology that we provided here can be justified by the fact that principal characteristics of scientific knowledge essentially include roots of the specifics of common human knowledge. Thus, without a circle of leading ideas stipulated by their founders, a scientific school just cannot come into being. However, ideas are only important in society and only possess sense for as much as they succeed in capturing the hearts and minds of other people. This means, first and foremost, that such ideas should be shared with others; and this requirement reminds us of the principal importance of another phenomenon, i.e. phenomenon of communication.

In theoretical information science, communication stands for information exchange taking place between people with the help of a sign system that is joint for them (it can theoretically be any kind of system, such as natural language, written language, special terminology, artificial language etc). Scientific communication — that is, *«cumulative amount of processes of provision, rendition, and acquisition of scientific information..., which comprise the basic mechanism of existence and development of science»* [14, page 45] has become one of the varieties of communication in society a long time ago.

The most important kinds of scientific communication processes are:

- library and bibliographic work of a scientist (or, to put it more broadly, work with a book, with a periodical, with a printed word, by and large);
- preparation of the results of research work to be published in any form whatsoever;
- public speeches made by scientists/academicians, their communication with colleagues online, exchange of preprint publications and imprints of publications;
- direct dialogue between scientists, exchange of opinions on the work in hand, visiting laboratories or departments and chairs of their colleagues, attending scientific and technical exhibitions;
- editorial, publishing, and printing processes that are necessary for the manuscript to get published (reviewing, editing, agreeing the text with the author etc);
- processes of dissemination of scientific publications (certain aspects of book trade).

All of the above constitutes *«actual scientific and information activities — that is, gathering, analysis, systematisation, processing, looking for and dissemination of scientific information»* [14, page 46]. This can be visualised in the form of the following diagram, see Fig. 2.

The above statements make it clear why, as one examines the issue of activity and development of scientific schools, is it best to speak of information and communication (and not merely information) dimension of it. Information and communication — are different albeit interconnected

phenomena; profound comprehension of either of them separately and both of them in conjunction allows one to better realise the essence of both information and communication in science. Understanding of this interrelation also allows to conduct a more profound study into a range of issues from the realms of general science studies and philosophy of science.

In the contemporary science, forms of communication undergo continuous enrichment and sophistication [16]. Suffice to remind oneself of anything and everything related to the development and usage of information and computer systems and cutting edge technologies. Or what was ushered into science by the information explosion (studies conducted by *D. Price* and other science scholars).

Development of scientific school is always determined, first and foremost, by the manner of communication inside it. Beyond any doubt, founders are the generators of ideas. But which attitude towards these ideas on part of their adherents and advocates might we consider optimal? Certainly, they have to support this circle of ideas and disseminate it in various manners — otherwise, the school will not emerge. At the same time, as is proven by the experience of the history of science, the strictly dogmatic attitude which the disciples and followers attain in relation to ideas and authority of the founders and managers of certain directions ultimately caused degeneration of scientific schools. The happy medium apparently consists in the fact that disciples and followers who are endorsing the fundamental strategic ideas of their tutors should not stop at that point and should proceed along the way outlined by the founders of the school. This means that communication inside the school must not become a monologue whereby the torrent of information only has one direction: from the teacher towards the disciples/followers.

Vocation of true disciples of a prominent scientist, a leader of a scientific school, consists not in being Yes Men of their teacher regardless of the specifics of any case; not in having no opinion at all

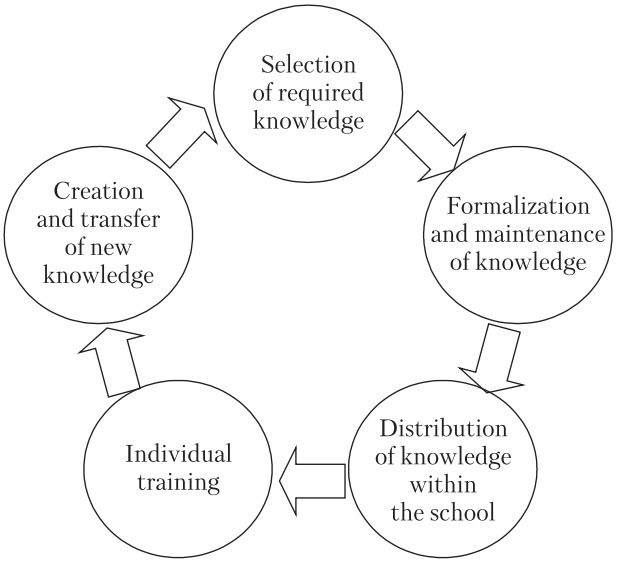

Fig. 2. Flowchart of information in the scientific school

and neither in having an opinion but concealing it. A healthy psychological climate in a school means that the disciple is entitled to enter into a dispute with the teacher and enables a broad scientific discussion to take place within the school walls. This specific detail of a perfect scientific communication within a school was once quite aptly worded by *I.V. Michurin*, «My followers have to be ahead of me, have to contradict me, have to even destroy my work — and continue it, at the same time. Only this consequent ruination will help create progress» [17]. Michurin School of experimental selection of agricultural cultures (like the school of *Luther Burbank* in the USA) was, as everyone knows, a very numerous school and had noticeable successes in the scientific and practical activity. Thus, the founder of the school was well aware of the meaning of the principle he set out.

In the predominant majority of realms of cognition of the world, it is crucially important for the activity of the scientific school to be based upon the practice of life, upon real facts of reality. As *I.P. Pavlov*, a well-known physiologist — and also a leader of a prominent school — famously said, «facts are the air of a scientist». Thus, the foundation for supply of information to scientists

should be the information about the facts from the corresponding realm of reality: be it natural or social. One just cannot replace this kind of scientific information with something inherently different. Thus, in the information and communication processes taking place inside the school as well as outside of it, this part of the problem has to be duly explored. Without any doubt, this does not mean that one can underestimate the significance of theoretical information or information of forecasting variety: a multifaceted and multistoreyed "building" of scientific knowledge has room for miscellaneous expressions and kinds of cognitive information whereby each such expression and kind plays its own unique role.

One of the characteristic traits of a scientific school is the specifics of language that are uniting all of the proponents of a certain circle of founding ideas and definite directions of their development. One cannot forget that *«a real scientific theory exists as a corpus of texts that has been processed by human minds»* [18]. The issue of external linguistic shell of knowledge is not only formally important but a substantial issue as well. In other words, the researchers of a school must always focus not only upon semantic but also upon linguistic and semiotic aspects of their work, problems of coding and decoding of scientific information [11, pages 59—70]. Language (in the broadest sense of the term, as a generic system of symbols) is the only available means of communication both inside the school and outside of it and fulfils the function of the basic instrument for communication not only within the circle of scientists but also in the grander scheme of things -- that is, in the social environment, by and large. Hence, incidentally, also arises the necessity to undertake a comparative analysis of the specifics of language in various schools. To some it might seem that the specifics of language is something more pertinent to humanities rather than sciences. But this is only the first impression, since both for the sciences and for the humanities, it is important to maintain concordance whereby various scientists are to define the same notion with the same term [19].

The basis for studies into scientific schools as far as information and communication aspect is concerned is, apparently, the understanding of correlation between individual and collective foundations in the activities of scientists. It is this very thing that is inherently related to the character of information that a scientist requires, its sources, and ways of procurement. At the one hand, it is quite clear how definitive the role of individual, personal foundations is: without a powerful inner drive, a person will simply never become a scientist. At the other hand, the entire history of science verifies the huge and ever increasing influence of collective foundations in the cognition of the world. «One important component of *Francis Bacon's* teaching about the leading role of experimental, inductive method in science was the thesis stating that, in order to use and develop such method efficiently, collective efforts of researchers are to be put in» [14, page 55]. It is precisely the perception of this that is the foundation of scientific circles formed back in the 17th century: the 'invisible collegia' (as opposed to the official university-based collegia). However, the emergence of collective forms of cognitive and scientific activity was something that took place way before *Francis Bacon's* times; these forms were born as actual philosophical (physicophilocophical) schools of the classical antiquity.

ORGANISATION OF SCIENTIFIC STUDIES IN PRINTING AND PUBLISHING BUSINESS

Certainly, as time passed, the character of a scientific work underwent a noticeable evolution and so did the forms of collective participation in its miscellaneous processes. It was increasingly perceived that joint efforts put in by researchers were capable of producing an entirely different result from a qualitative point of view — a result that would significantly differ from a simple arithmetic aggregate of these efforts. During the transition from the little science centered around small labs and universities to the contemporary big science of the industrial type [14, pages 10—11], forms of expression of collective foundations

have gone far beyond the walls of scientific schools per se and have moved into the realm of mass organization of scientific work. Speaking of the specifics of this process in the publishing and printing business, one should note that its emergence, development, and the present state are integrally linked to the institutions training specialists to be employed in it. This is, perhaps, the specifics of *branch* science in general: it is in the specialized higher educational institutions that the system of special information is being formed that is necessary for ultimate scientific work. In the future, this very system will fulfil the function of information foundation of a scientific school.

At the dawn of the previous century, neither the Russian Empire nor Austria-Hungary (which occupied the territories of present-day Ukraine) had any educational institution training specialists to work in printing and publishing business. Masters of printing were honing their professional skills on the fly, in the course of their actual practical work in the business. Since at the beginning of the 20th century, printing was regarded as a form of art, the first printing and publishing university departments in the Soviet Union were established in the early 1920s within High Art and Technology Workshops (VkhUTEMAS) in Moscow and later in Leningrad. In Ukraine, training programs for printing and publishing specialists on the level of higher education were launched in Kyiv Institute of Arts (currently Ukrainian National Academy of Fine Art and Architecture) where a department of printing and publishing was opened in 1923. Similar departments were later established in higher art education institutions in the cities of Kharkiv and Odesa [20; 21].

Ukrainian Institute of Printing and Publishing (pre-1994 name of the Ukrainian Academy of Printing) was founded back in 1930. That year, a decision was made to relocate printing and publishing departments from Kyiv and Odesa Art Institutes to Kharkiv — which at that time was the republic's capital — and merge them with the printing and publishing department of Kharkiv Institute of Arts (currently bearing the name of Kharkiv State Academy of Design and Arts) and create a separate higher educational institution providing training in the printing and publishing business [22].

A separate institute of printing and publishing was something that had to be created not only due to the demand in the sector but also in view of the need of the society to modernize itself throughout the first half of the 20th century. Elimination of illiteracy, transition to comprehensive obligatory secondary education, development of culture and literature, economic industrializations were not the only challenges that had to be faced; there were also other issues on the table such as democratization of the social life which meant that opportunities to accomplish a career in sciences and industries had to be made available to any citizen regardless of origin, sex, and income [23].

The institute's 'founding fathers' encountered serious problems with recruiting human resources: finding academic teachers and professors to fill in the corresponding positions within the institution was not an easy task as no precedent university-level institution specializing in printing and publishing had ever existed before in Ukraine. Lectures and practical sessions in specialized disciplines were conducted by highly qualified workers from the industry who had previous experience in management and administration. In addition to the human resources seconded from the industry, prominent scientists were also invited as visiting professors; these were subsequently assisted by talented researchers who ultimately became part of history of not only the educational institution but science in general.

As the institute was being set up, postgraduate studies were also launched to prepare academic resources for the printing and publishing sector. It was then that the first group of postgraduate students was enrolled by the academic research chair of the Ukrainian Institute of Printing and Publishing. In 1932, this academic research chair expanded into the Ukrainian Scientific Research In-

stitute of Printing and Publishing in Kharkiv and afterwards, most of the employees were working in both institutions at the same time [24, page 3].

During the second year of its existence, the institute developed into the Printing and Publishing Training Facility named after Mykola Skrypnyk and comprised of three departments: Technical Engineering; Economics and Technology; and Arts and Construction. In addition to that, the facility was also an umbrella institution for a technical school, worker's daytime and evening training schools in Kharkiv, and an evening worker's training school in Kyiv, all of the above having the statuses same as that of the 'departments proper'. The institute offered the following training programs for printing and publishing sector specialists: technical engineer of relief (letterpress) printing, surface printing, and intaglio; economic engineer; photographic technology specialist; printing and publishing chemical engineer [25, page 13]. The first party of printing and publishing engineers graduated in 1935 [26]. The alumni of the 1930s were most actively involved in establishment and development of domestic printing and publishing science.

The institute's activities prior to the Second World War featured the names of famous researchers from sundry fields of science, technology, and arts: *V. I. Kasiian*, academician at the Soviet Union Academy of Fine Arts, Hero of Socialist Labor, People's Visual Artist of the USSR and the Merited Figure of Arts of the Ukrainian Soviet Socialist Republic; *O.M. Leontiev*, academician at the Academy of Pedagogical Sciences of USSR and Russian Soviet Federal Socialist Republic, winner of Lenin's Prize for Science and Technology; *V.V. Danylevskyi*, double winner of Stalin's 2nd Degree Prize for Science and Technology; professors *Yu.V. Korshun*, *B.O. Rymarenko, A.Kh. Sereda*, artists *P.K. Holubiatnykov* and *V.M. Hagenmeister*. At the same time, scientists M.I. Syniakov and L.O. Kozarovytskyi who became well known to the public after WW2, commenced their scientific career in the printing and publishing institute.

By October 1941, the Printing and Publishing Institute in Kharkiv was shut down and resumed functioning as late as in August 1944 after the Soviet Army liberated the city from German occupying forces. In 1945, the institute was relocated to Lviv in the west of the country. In 1949, on the occasion of the 375th Anniversary of the first printed book published in Ukraine, the Executive Decree of the Soviet of Ministers of USSR the Institute was named after Ivan Fedorov (currently: the Ukrainian Academy of Printing and Publishing in Lviv). At the end of the 1950s, the institute created an affiliate Evening Department in Kyiv (currently: the Publishing and Printing Institute of the National Technical University of Ukraine «Kyiv Polytechnic Institute», and in 1960s, the General Technology Department was founded in the city of Khmelnytskyi (currently: Khmelnytskyi National University); also, from 2000 to 2014, Crimean Institute of Information, Printing, and Publishing Technologies was operating within the framework of Ukrainian Academy of Printing and Publishing in Lviv [25, pages 13—26].

The post-war history of the Academy (1950s—1980s) cannot be imagined without *M.T. Meleshkin*, associate member of the Academy of Sciences of UkrSSR; *O.L. Kulchytska*, Associate Member of the Academy of Architecture of UkrSSR, Merited Figure of Arts of UkrSSR, winner of UkrSSR State Taras Shevchenko Prize; *P.M. Zholtovskyi*, Professor and winner of the UkrSSR State Taras Shevchenko Prize; *A.K. Dorosh, R.I. Mashtaler, A.I. Petruk, K.V. Tir*, Merited Figures of Science and Technology; *Yu.O. Barnych, H.D. Tolstoi, V.H. Shpitsa*, Merited Figures of Education; *V.M. Savin, Kh.I. Sanotska*, Merited Figures of Arts; *M.M. Taranov*, Merited Figure of Culture, and many others.

From the early 1990s, the Ukrainian Academy of Printing and Publishing has employed the following scientists and pedagogues: *M.I. Dolishnii*, Academician at the National Academy of Sciences of Ukraine, Merited Figure of Science and Technology, winner of Ukrainian State Prize in the realms of Science and Technology; *M.M. Romaniuk*, Associate Member of the National Academy

of Sciences of Ukraine; *B.V. Durniak, V.A. Kravchuk, O.Ya. Krasivskyi, E.T. Lazarenko, O.P. Stetskiv, B.D. Semak*, Merited Figures of Science and Technology; *S.M. Hunko, P.L. Pashulia, O.M. Poliudov, M.V. Starovoit, V.M. Chaplyha*, Merited Figures of Education; *P. P. Greiser*, People's Visual Artist; *V.S. Hordeiev, S.I. Ivanov*, Merited Visual Artists; *I.I. Turskyi*, Merited Figure of Science and Education of the Crimea Autonomous Republic; *V.O. Khokhlov*, Merited Economist of the Crimea Autonomous Republic.

The aforementioned testifies to the assertion that the Institute of Printing and Publishing, throughout its existence, has employed scientists from major scientific centers of present-day Ukraine. In addition to this, one should also mind the fact that there were only two such specialized university-level institutions (one in Moscow and one in Lviv) that were training specialists to be employed in publishing business, printing, and book distribution. There were also two scientific and research institutes operating in Ukraine: the Institute of Printing and Publishing Industry in Lviv and the Institute of Special Printing in Kyiv, whereby both institutions employed predominantly alumni and scientists from Ukrainian Institute of Printing and Publishing named after Ivan Fedorov. Thus one can state that a study into the activities of scientists of the Ukrainian Academy of Printing and Publishing not only familiarizes us with the achievements, work, and legacy of the employees of a lone, however unique, educational institution but also provides an insight into the situation of scientists operating in the entire branch of nationwide industry.

As we return to the matter of the emergence and development of scientific schools in printing and publishing industry *per se*, one should highlight three major scientific schools that have consolidated in the sector: *the school of dynamics of printing and publishing machinery and equipment; the school of printing and publishing manufacturing technologies*; and *the school of diamond technology* that, in terms of organization, have been centered around three sectoral scientific and research labs (SSRLs) that have been operating within the framework of Ivan Fedorov Institute. In this case, the authors have restricted the scope of their research to the situation with technical sciences since the specialists in the sector had at that time been involved in economics, language, and arts studies.

CREATION AND APPLICATION OF PHOTOPOLYMERIC PRINTING PLATES IN PRINTING AND PUBLISHING INDUSTRY

If in the 1930s, at the very beginning of its existence, the printing and publishing institute and its sister scientific and research institute were small teams entrusted with assignments to train qualified engineers and provide technical support to the UkrSSR printing and publishing enterprises, by the end of 1950s—1960s, when domestic economy was fully restored after the war, another task came on the table: to launch and proceed with developments in applied scientific researches that might be implemented on an industrial scale.

It was precisely by the end of 1950s when the domestic *school of technologies in printing and publishing manufacturing* came into being — its history being inherently related to the history of Ukrainian Institute of Printing and Publishing named after Ivan Fedorov which was the place of its emergence and one of its founders, *Borys Vasyliovych Kovalenko*.

Development, implementation, and subsequent widespread application of photopolymeric materials in printing has intensified the development of the sector. As these materials were increasingly introduced, the technology of platemaking and printing processes changed dramatically; the technical, economic, and environmental indicators of printing and publishing industry greatly improved. Actual creation of printing forms with photopolymeric-based plate coating and studies into their technical and operation properties became a starting point in the emergence of domestic *school of printing and publishing technology*.

First attempts at practical application of photopolymeric materials in publishing and printing

were undertaken in the early 1950s when the Ukrainian Scientific and Research Institute for Printing and Publishing Industry initiated work in this direction [28]. Another scientific and research center that engaged itself in the implementation of photopolymeric technologies was the Ivan Fedorov Institute of Printing and Publishing in Lviv where, in 1957-1958, *B.V. Kovalenko* led the efforts in the establishment of a complex scientific and applied workshop commissioned to create photopolymeric materials and develop technologies employing these materials in producing printing forms also referred to as «photopolymeric printing plates» (PPPs). Initially, in their activities, the scientists from Ivan Fedorov Institute mostly focused upon studies into PPPs based on polymeric amides [29].

In 1962, first trials were performed on letterpress printing forms based upon polymeric amide mixes. These PPPs were successfully presented at the Soviet Union's VDNKh (Exhibition of Achievements of Popular Economy) in 1966 [30]. Water-soluble polyamides have also been applied to create screen photopolymeric printing plates. As we describe the following works completed by the Sectoral Scientific and Research Laboratory, we would like to deliberately highlight those works that had been executed jointly with third party organizations. This we do in order to enable the reader to at least partially visualize the scope and volume of the executed works and the number of counterpart organizations engaged in the cause of resolving of the subject scientific and applied assignment [31—34].

The year 1964 saw the publishing of the first issue of cross-sectoral republican scientific and technical collection of publications entitled «Printing and Publishing Business». State Committee for TV and Radion of the UkrSSR appointed the Ivan Fedorov Ukrainian Institute of Printing and Publishing as the flagship institution involved in the preparation of the collection. The collection featured articles covering the main areas of scientific researches that have been accomplished by educational, scientific, and research institutes, and on UkrSSR enterprises exploring technologies of printing and publishing, printing materials, organization, economics, and technology of printing and publishing and similar matters. Initially, the collection only contained texts prepared by authors from within Ukraine; eventually, its geography expanded and the collection started to publish works by authors from other Soviet Republics as well — and then also from outside the Soviet Union. This collection was a crucial asset enabling all interested parties to get familiar with development, implementation, and application of photopolymeric technologies in printing and publishing [35].

In 1968, the Ukrainian Institute of Printing and Publishing named after Ivan Fedorov established, within its framework, a Sectoral Scientific and Research Laboratory for PPPs of State Committee of Publishing of the Soviet Union; this Laboratory coordinated works on development and implementation of PPPs in the country's printing industry. Its first scientific team leader was *B.V. Kovalenko*. At the same time, the Ivan Fedorov Institute joined efforts with Kyiv Affiliate of All-Union Scientific and Research Institute for Complex Problems in Printing and Publishing (currently the Ukrainian Scientific and Research Institute for Special Printing) to implement PPPs to produce printing forms for intaglio and flexography.

In 1969, the Inpoligrafmash-69 International Exhibition was opened in Moscow; this exhibition intensified interest in the PPPs and their practical application in printing and publishing. Thus, in 1960s-1970s, the All-Union Scientific and Research Institute for Chemical Design developed positive working coatings based upon naphtoquinone diazides to be used in the production of lithographic (offset) printing forms and plates. At the same exact time, the Institute of Chemistry of High Molecular Weight Compounds of the Academy of Sciences of the UkrSSR launched studies into creation of elastic form materials based on oligourethane acrylates and protective photosensitive layers. In Kyiv State University named after Taras Shevchenko as well as in the All-

Union Scientific and Research Institute for Chemical Design, joint studies have been undertaken into the development of plate coatings based upon styrene copolymer and maleic anhydride (styromal) and cellulose ethers. Scientists from the Institute of Physical Chemistry named after L.V. Pysarzhevskyi of the Academy of Sciences of UkrSSR have developed a place coating named *Fotoset* to be used in production of screen printing forms. The Ukrainian Scientific and Research Institute for Printing and Publishing Industry developed liquid photopolymeric materials to be used in the production of *Likofot* letterpress printing forms and solid photopolymeric materials based upon cellulose acetosuccinate and polymethacrylate. At the same time also explorations were commenced into ways to produce PPPs in the industry and the first prototypes of technological equipment for their production have been created.

In addition to this, studies into liquid photopolymeric materials based on oligourethane acrylates in the Sectoral Scientific and Research Laboratory for Photopolymeric Materials continued as the Lab has been managed by Professor Kovalenko's disciple, *Eduard Lazarenko* [36]. During this period, the Laboratory established scientific and production contacts with leading scientific institutions in Moscow, Leningrad, Kyiv, Kharkiv, and Donetsk as well as scientists from German Democratic Republic.

In 1970s, industrial production of letterpress PPPs was launched: *Tselofot* (plate coating forms based upon cellulose acetosuccinate) in Pereiaslav-Zaleskyi (Yaroslavl Oblast/Region of Russian SFSR) — developed by Ukrainian Scientific and Research Institute for Printing and Publishing Industry; plate coating forms based upon polyamides in Mozhaisk (Moscow Region) developed by Ivan Fedorov Printing and Publishing Institute in Lviv.

In 1976, due to the increasingly demanding environmental requirements pertaining to printing and publishing industry, the Ukrainian Scientific and Research Institute for Printing and Publishing Industry initiated scientific investigations to create water soluble plate coatings for printing forms based upon polyvinyl alcohol. These PPPs were named Hidrofot. The industrial-scale production of these forms was launched in early 1980s in the city of Shostka, Sumy Region of Ukraine. At the same time, works on production of enhanced forms, *Tselofot-2* and *Tselofot-3* were underway; prototype industrial equipment was manufactured that was producing PPPs with plate coating based upon liquid and solid photopolymeric materials; and technologies for printing of books, magazines, and jobbing with photopolymeric materials were also being actively implemented.

At the beginning of 1980s, the Sectoral Scientific and Research Laboratory for PPPs, which since 1982 had been managed by *Roman Mervinskyi* (disciple of *B. V. Kovalenko* and *E. T. Lazarenko*), launched works focused upon development of solid photopolymeric materials to produce forms for flexographic printing. In 1987, in Shostka, first experimental industrial prototypes of such forms were produced, bearing the name of *Fleksofot*. During this time, the joint efforts of Ivan Fedorov Ukrainian Institute of Printing and Publishing and L. V. Pysarzhevskyi Institute of Physical Chemistry of the Academy of Sciences of UkrSSR were reinforced by participation of Donetsk Ukrainian Scientific and Research Institute of Plastic Materials. This triumvirate-style co-operation led to the creation of water soluble liquid photopolymeric materials based upon epoxyacrylates.

Throughout the 1980s, domestically produced PPPs have been applied to print newspapers. The necessary technological equipment was created and industrial production of Hidrofot and Fleksofot forms was launched. A substantial number of highly qualified professionals was trained [24, 38—40]. Technical inventions of almost all developments was confirmed by corresponding copyright documentation: only E. T. Lazarenko et al (with co-authors) obtained over a hundred copyright certificates of the Soviet Union and patents for inventions from USA, West Germany, France, and Japan.

By the early 1990s, the Ivan Fedorov Institute completed the development of plate coatings

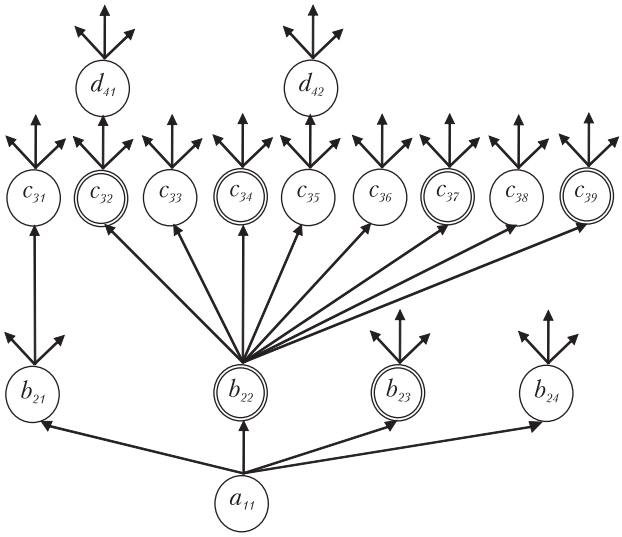

Fig. 3. Genealogy of the school for the printing production, where DSc are marked as dual circles, CSc as circles. Letter symbols are explained in Table

based upon water soluble photopolymeric materials and produced sample PPPs out of these photopolymers. At the same time, the Ukrainian Scientific and Research Institute for Printing and Publishing Industry designed a plasticized water soluble compound based upon polyvinyl alcohol, the compound being used to produce photopolymeric materials by applying the method of extrusion. Industrial scale production was launched as printing forms with these plate coatings were mass produced as *Fotoplast-F* items in Lutsk, Volhynian Region of Ukraine.

In 1992, in Lviv, *Volodymyr Kravchuk* initiated the foundation of *Ukrainian Polymer Journal*, a periodical in the English language which, among other things, was assigned a task to inform the scientific community about works in the realm of creation and application of photopolymeric materials mentioned above [41]. The chief editor of the magazine was the academician of the National Academy of Sciences of Ukraine, *Yu. S. Lipatov* whereas his deputy was Professor *V. A. Kravchuk*. Unfortunately, the premature death of professor Kravchuk as well as financial and organizational complications that had emerged afterwards led to the suspension of the journal's publishing in 1995.

The 1990s were marked by further expansion of the area of application of liquid photopolymeric materials: scientists from the Ivan Fedorov Printing and Publishing Institute have been implementing the technology of plate printing from screen PPPs based upon methylacrylamide modified polyvinyl alcohol; liquid photopolymeric materials were developed based upon oligoester acrylates to produce optical media carriers; and solid photopolymeric materials applied as viscous materials for diamond tools.

SCIENTIFIC SCHOOL OF THE TECHNOLOGY OF PRINTING AND PUBLISHING

Within the scope of activities of the Sectoral Scientific and Research Laboratory for PPPs, three main directions of scientific and research works have appeared: in addition to and at the same time as the studies into the application of oligoester acrylates to produce PPPs for letterpress printing (efforts led by *E.T. Lazarenko* and his disciples), development of another direction was also underway, specifically: production of PPPs for screen printing based upon water soluble polyamides. Printing forms produced with the application of these compounds were used not only in printing and publishing but also in the instrument making industry, to produce circuit boards. Efforts in this direction were led by *V.A. Kravchuk*. In addition to the activities pursued by disciples of *B.V. Kovalenko*, there was also a third direction within the sectoral scientific and research lab: works managed by *Volodymyr Shybanov* pertaining to studies into kinetics of radical polymerization, creation of new photoinitiators and compounds to produce flexographic printing forms [42].

One should note that when a scientific school succeeds in resolving a truly significant task, this also has a synergic effect urging scientists to join their efforts and provides a momentum to the development of adjacent sciences. In our case, *B.V. Kovalenko, V.A. Kravchuk, E.T. Lazarenko, O.F. Rozum, Yu.P. Yakhymovych* and their disciples working on the studies into photopolymeric materials to be used in production of printing forms and their ope-

rating properties were assisted by other scientists not only from Lviv and Kyiv but also from other cities across the Soviet Union and from abroad as well. These were, particularly: *F.I. Dubovytskyi*, Associate Member of the Soviet Union Academy of Sciences; *Yu.S. Lipatov*, Academician at the National Academy of Sciences of Ukraine; *O.O. Berlin*, Academician at the Russian Academy of Sciences; Professors *Yu.P. Hetmanchuk, L.P. Geliazetdinov, Y.Y. Dilung, B.O. Zaitsev, V.O. Kalibabchuk, V. Kenig, L.A. Kozarovytskyi, V.I. Kostetskyi, M.H. Kuvshynskyi, T.E. Lipatova, V.V. Mahdynets, A.F. Masliuk, V.H. Matiushova, R.M. Mashtaler, Yu.M. Nizelskyi, A.F. Nikolaiev, M.M. Polianskyi, Yu.P. Selivanov, V.H. Syromiatnikov, A.N. Tynnyi, R. Trauzeddel, V.O. Khranovskyi, V.I. Sheberstov, A.V. Shevchuk, V.P. Sherstiuk, V.V. Shylov, Y.Y. Yatchyshyn, Ye.D. Yakhnin* and others.

In over twenty years of the Lab's intensive activity, a substantial amount of scientific research and prototype construction works have been conducted aimed at introduction and implementation of a wide range of new photopolymeric materials in printing and publishing, instrument making industry, electronics, paint and coating industry, and other sectors of economy.

In addition to the substantial scientific and economic outcome, these works also received public acclaim and recognition: in 1996, an Executive Order of the Ukrainian President was issued awarding *V.A. Kravchuk* and *E.T. Lazarenko* the titles of Merited Figures of Science and Technology of Ukraine — for their substantial personal contribution into the preparation of highly qualified specialists for printing and publishing, and for their productive activities in areas of science and pedagogics [43]. In the same year, the team of scientists from the Institute of Physical Chemistry named after L.V. Pysarzhevskyi of the National Academy of Sciences of Ukraine (*V.M. Hranchak, Y.Y. Dilung*),

Scholars Belonging to the Printing and Publishing Techniques School

Legend on Fig. 3	Name	Other data		
		Year of CSc thesis defense	Year of DSc thesis defense	Number of theses defended under supervision
a_{11}	Kovalenko, B.V.	1954	—	9
b_{21}	Yakhymovych, Yu.P.	1964	—	2
b_{22}	Lazarenko, E.T.	1969	1990	38
b_{23}	Kravchuk, V.A.	1971	1991	8
b_{24}	Rozum O.F. (Kyiv)	1972	—	4
c_{31}	Baranovskyi I.V.	1984	—	1
c_{32}	Mervinskyi R.I.	1975	1999	6
c_{33}	Zapotochnyi V.Y.	1980	—	2
c_{34}	Velychko, O.M. (Kyiv)	1984	2006	6
c_{35}	Shablii I.V.	1984	—	2
c_{36}	Onyshchenko, T.I.	1988	—	2
c_{37}	Havenko, S.F.	1990	2002	13
c_{38}	Mayik V.Z.	1993	—	4
c_{39}	Jakuciewicz, S. (Warsaw)	1985	2011	2
d_{41}	Miklushka, I.Z.	1992	—	1
d_{42}	Khamula, O.G.	1999	—	2

Institute of Chemistry of High Molecular Weight Compounds of the National Academy of Sciences of Ukraine (*S.S. Hudzera, V.K. Hryshchenko, A.F. Masliuk, V.V. Mahdynets*), of Kyiv National University named after Taras Shevchenko (*M.H. Kuvshynskyi, Yu.P. Hetmanchuk, V.H. Syromiatnikov*), and Ukrainian Scientific and Research Centre for Special Printing (*A.V. Shevchuk*), for the collection of scientific works entitled «Scientific Grounds for Creation of Photosensitive Materials and Methods of Registration of Optical Information and their Application in High-End Technologies» have received a Ukrainian State Prize in Science and Technology by virtue of an Executive Order of the Ukrainian President [44].

Its substantial achievements notwithstanding, the Sectoral Scientific and Research Lab for PPPs suspended its work as far back as in 1993. The main reason quoted then as the explanation was lack of investments into scientific and applied developments: the private sector was not interested in provision of funding for long term projects and the public-funded structures were not only not able to fund them in full but also unable to find acceptable mechanisms to control efficiency of usage of the budget funds spent. Thus, the change in social and political circumstances also forced scientists that belonged to the school switch to matters pertaining to resolving of other problems in technology of publishing and printing [45—47].

Let us now try to visually depict the genealogical tree of the *school of printing and publishing technology*. Due to the fact that a substantial number of scientists have been related to its activities in over half a century, let us try to build this chart by applying the Biblical principle of «Abraham begat Isaac, Isaac begat Jacob, Jacob begat Judas and his brothers...» [48] — that is, Figure 3 shall only display those representatives of the school who themselves trained disciples. The term 'disciples' here stands for those scientists that have executed and defended a dissertation under the tutorship and/or with the advice of a scientific tutor (consultant) pertaining to the school that is being researched. At the initial level of Fig. 3, thus, we can encounter *B.V. Kovalenko* (a_{11}); next level hosts his disciples, ranging from *Yu.P. Yakhymovych* (b_{21}) to *O.F. Rozum* (b_{24}); level three has disciples of disciples of Professor Kovalenko: c_{31}..., c_{39} (these are described in greater detail in the table). By applying these restrictions, we get the opportunity to observe a simplified depiction of links between the members of the school: its genealogical tree, in other words.

This genealogical tree (see Fig. 3 and Table) clearly shows that the school of printing and publishing technologists may well be dubbed the *Lviv-Kyiv School* as the disciples of *Oleh Rozum* and *Olena Velychko* have been working in the Printing and Publishing Institute of National Technical University of Ukraine «Kyiv Polytechnic Institute» ever since its inception as Kyiv Evening Department of Lviv Ivan Fedorov Printing and Publishing institute. Works accomplished by Kyiv representatives of this school have also gained proper acclaim: in 2013, the group of disciples of Professors *P.O. Kyrychko* and *O,M. Velychko*, specifically: *Ya.V. Zorenko, A.V. Neskhoziievskyi* and *V.M. Skyba*, for their work entitled «Scientific Foundations for Stable Reproduction of Text and Illustrations Using Modern Printing Devices» received the annual Ukrainian Presidential Award for Young Scientists [49].

B.V. Kovalenko's perspicacity and strategic vision back in the late 1950s and the early 1960s allowed him to view the multitude of the then-pressing scientific problems and single out one promising problem to deal with, specifically: to create and develop printing forms with plate coating based upon photopolymeric materials and conduct an in-depth study into their technological and operational properties. Throughout the 1960s-1970s, this area of scientific developments and researches attracted the attention and efforts of specialists from various chairs of the Ivan Fedorov Institute of Publishing and Printing who teamed up within the Sectoral Scientific and Research Laboratory of Photopolymeric Printing Plates (PPPs) of the State Committee of Publishing of the Soviet Union. This lab eventually became the actual foundation for the *domestic school of printing and publishing*

technologies. B. V. Kovalenko laid the foundation and E. T. Lazarenko, throughout the 1980s—1990s, completed the formation of the school in accordance with logical principles. The school that has established thereby was characterized by an atmosphere of striving for creative innovation, active interaction with scientists from other scientific outlets both nationwide and from abroad, and engaged the younger generation in its processes. The activity of the Sectoral Scientific and Research Lab was aimed at creation and development of new technological processes and materials, merging the training/educational processes with scientific studies into problems faced by printing and publishing industry, and development of the country's economy. The implementation of recommendations drafted by the Sectoral Scientific and Research Lab for PPPs allowed to create high quality and low cost printing forms for letterpress, surface printing, intaglio, and screen printing using domestically produced materials with a serious economic effect.

Representatives of the school are currently being employed by scientific research and training institutions and in the industrial enterprises of Ukraine as well as Russia, Poland, Germany, Syria, and Tunisia. They are maintaining creative and professional contacts with scientists from the Institute of Chemistry of High Molecular Weight Compounds of the National Academy of Sciences of Ukraine, Kharkiv National University of Radioelectronics, National University «Lviv Polytechnic», Moscow State University of Printing named after Ivan Fedorov, Belarus Technological University, Technological University of Kaunas, Warsaw Polytechnic, Łódź Polytechnic, and other research and training facilities. Current work of the Lviv-Kyiv School of Publishing and Printing is also reflected in publications prepared by its representatives and published in the *Science and Innovations* (Nauka i Innovatsii) magazine on a regular basis [50—52]

CONCLUSIONS

Existence of a scientific school is not possible without a formation of a core with strong and long-standing roots as well as multiple branches, since its emergence is related to the activity of founders; subsequently, this unification of principles and guidelines of scientific exploration is supported and enhanced by the traditions of the school. The analysis that has been conducted allows us to assert that, in addition to the aforementioned features peculiar to a scientific school such as the personality of the founder(s), a certain common traits among disciples and followers of the school's leader in terms of geography or manner of organization; focusing of the members of the school upon certain content, ideas, and theories (one should also mention the creation of a scientific direction borne out of the school's activities), public appreciation of the results of the school's activities within its homeland; and the thing which Yu. G. Saushkin, a prominent geographer and scientist, referred to as 'international acclaim' — that is, the fact of the school being known abroad. It is worth mentioning that scientific schools initially emerge as local/national schools and then they become known abroad as they gain followers in other countries. The fact that a school is to be known abroad is an obligatory precondition for its recognition as a separate entity; unless this precondition is observed, we might risk filling in the pages of the history of science with names of self-declared small town 'schools' which in fact are of no real significance and have no real recognition [1, pages 155—156].

The case in point describing the emergence and activities of one of the scientific schools in the printing and publishing sector — the Lviv-Kyiv School of Printing and Publishing Technologies — we can see that scientific schools are being borne out of social demand, through the very logic of development of science and practice; they emerge and revolve around large, industrious, and focused scientists — that is, a *scientific school* is a team of scientists comprised of team leader(s) and disciples conducting fundamental and applied studies in a certain area for a prolonged period of time and have important achievements recognized by the public both domestically and internationally. By applying this definition, one can highlight the following functions of a scientific school: the *research*

function (in order for a school to be deemed as existing, it is to possess a program of studies/researches — even if it is not a formal program in the shape of a document but a 'road map' in the head of the school's team leader — wherein and/or whereby the object of the studies is defined and the tasks are stipulated; the *pedagogical* function which means provision of training to highly qualified pedagogic human resources; the *familiarization* function which means that the members of a scientific school should familiarize the scientific community with the results of the work they do through speeches at conferences, publication of the results of the studies so that these results can be critically examined and suchlike activities; and finally, *ability to self-develop* as the long-term existence of a scientific school is only possible if, in the course of accomplishment of principal tasks of the study program this does not lead to depletion of the object of the study and if it enables one to ascertain new priority goals for subsequent work undertaken by the school.

In our time, the principle of collective nature of work is profoundly affecting the entire structure of science, core to shell, on all of its levels and in all of its aspects. This assertion has already become a common knowledge to which almost everyone has gotten accustomed and no specific arguments need be presented to verify it as genuine: in most cases, advantages of the collective nature of a scientific work are something that is merely reported as a fact [53]. Studies into information aspect of science commenced back in the 20th century are far from being complete. Plenty of miscellaneous questions have surfaced with it, most of them pertaining to the matter of development of scientific schools. It is, for instance, important to study the correlation between informative performance of works written by the school's founders compared to works written by the followers of their ideas. Or, there is also the matter of criteria of productivity of certain tools applied or means resorted to in order to put information and communication processes into being. Given that a lot of such problems exist, studies in this area should certainly be continued.

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ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНІ АСПЕКТИ ФОРМУВАННЯ І ФУНКЦІОНУВАННЯ НАУКОВИХ ШКІЛ ВИДАВНИЧО-ПОЛІГРАФІЧНОЇ ГАЛУЗІ

Розглянуто притаманні науковим школам певні типологічні риси, особливу увагу приділено інформаційно-комунікаційним аспектам проблеми. Розкрито особливості організації наукових досліджень у видавничо-поліграфічній галузі. Відзначено специфіку галузевої науки, яка полягає в тому, що в ній формування наукових шкіл тісно пов'язане з роботою спеціалізованих вищих навчальних закладів. Проаналізовано процес утворення та розвитку львівсько-київської школи технології поліграфічного виробництва, зокрема роботи зі створення та застосування фотополімерних друкарських форм у поліграфічному виробництві На прикладі виникнення й діяльності львівсько-київської школи технології поліграфічного виробництва перелічені ознаки наукової школи та показано, що наукові школи формуються суспільними потребами, самою логікою розвитку науки та практики, протягом тривалого часу виконують фундаментальні та прикладні дослідження з певного напрямку і мають вагомі досягнення, що отримали громадське визнання на батьківщині та за кордоном. З урахуванням цього окреслені функції наукової школи.

Ключові слова: видавничо-поліграфічна галузь, наукова школа, технологія поліграфічного виробництва, львівсько-київська школа технології поліграфічного виробництва.

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ИНФОРМАЦИОННО-КОММУНИКАЦИОННЫЕ АСПЕКТЫ ФОРМИРОВАНИЯ И ФУНКЦИОНИРОВАНИЯ НАУЧНЫХ ШКОЛ ИЗДАТЕЛЬСКО-ПОЛИГРАФИЧЕСКОЙ ОТРАСЛИ

Рассмотрены присущие научным школам определенные типологические черты, особое внимание уделено информационно-коммуникационным аспектам проблемы. Раскрыты особенности организации научных исследований в издательско-полиграфической отрасли. Отмечена специфика отраслевой науки, которая состоит в том, что формирование научных школ в ней тесно связано с работой специализированных высших учебных заведений. Проанализирован процесс образования и развития львовско-киевской школы технологии полиграфического производства, в частности работы по созданию и применению фотополимерных печатных форм в полиграфическом производстве. На примере возникновения и деятельности львовско-киевской школы технологии полиграфического производства перечислены признаки научной школы и показано, что научные школы формируются общественными потребностями, самой логикой развития науки и практики, в течение длительного времени выполняют фундаментальные и прикладные исследования в определенном направлении, имеют весомые достижения, которые получили общественное признание на родине и за рубежом. Исходя из этого очерчены функции научной школы.

Ключевые слова: издательско-полиграфическая отрасль, научная школа, технология полиграфического производства, львовско-киевская школа технологии полиграфического производства.

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