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METHODOLOGICAL BASIS OF HISTORICAL RESEARCH IN AN INTERDISCIPLINARY CONTEXT

The goal is to study the process of interdisciplinary interaction of historical science with social, human and natural sciences, the changing configuration of interdisciplinary fields and the redistribution of the intra-disciplinary hierarchy of scientific disciplines

Significance is in the process of interdisciplinary interaction of historic sciences with such complex sciences-integrators as mathematics, informatics and institutionalization of them on the junction of quantitative history and historical informatics that had been stipulated besides objective inner development regularities of a historic science, strong influence of processes of mathematization, informatization and computerization on all branches of research cognition, swift growth of tendencies to the integration of social and natural sciences in conditions of humanity transition from industrial society to informational.

Findings – discovery is revealed in the fact that the objective character of interdisciplinary approach to the historical investigation in the second half of 20th century was linked first, with the realizing of only “brunch” disciplinary approach insufficiency in research theoretical mastering of historic reality and vivid inclination to integral, systematic consideration of historical objects, phenomena and processes; secondly, with difficulties in operating with immense amount of knowledge and swiftly growing flow of new information; thirdly, including mass historical sources into research circulation; fourth, with the necessity of application parallel with descriptive, quantitative and formalized methods of analyses of historical sources, especially of mass character, and effective use of new informational technologies in the process of revising and presenting source information knowledge.

Key words: Methodology, Historical Research, Interdisciplinary, Informatics, Mathematics, Historical Informatics.

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Пәнаралық контекстегі тарихи зерттеулердің әдіснамалық негіздері

Мақаланың мақсаты тарих ғылымының әлеуметтік, гуманитарлық және жаратылыстану ғылымдарымен пәнаралық байланысын, пәнаралық өрістер конфигурациясының өзгеруін және ғылыми пәндердің пәнішілік иерархиясын қайта бөлуді зерттеу болып табылады.

Маңыздылығы – тарих ғылымының математика және информатика сияқты кешенді интеграторлармен пәнаралық өзара іс-қимыл процесі және олардың квантитативтік тарих пен тарихи информатиканың түйіскен жерінде институционализациясы, тарих ғылымының дамуының объективті ішкі заңдылықтарынан басқа, математика, ақпараттандыру және компьютерлендіру процестерінің ғылыми танымның барлық салаларына күшті ықпалымен қатар, адамзаттың индустриялық қоғамнан ақпараттық қоғамға көшуі жағдайында әлеуметтік-гуманитарлық және жаратылыстану ғылымдарын интеграциялауға үрдістердің қарқынды өсуімен байланысты болды.

Нәтижелері – ХХ ғ. екінші жартысында тарихи зерттеуге пәнаралық көзқарасты объективациялау, бірінші кезекте тарихшылардың тарихи шындықты ғылыми-теориялық игерудегі «салалық» тәртіптік көзқарастың жеткіліксіздігін және тарихи объектілерді, құбылыстар мен процестерді интегралдық, тұтас (жүйелі) қарауға деген нақты тартымдылықты түсінуден; екіншіден, жинақталған білімнің үлкен көлемі мен жаңа ақпараттың қарқынды өсіп келе жатқан ағынымен; үшіншіден, ғылыми айналымға дәстүрлі тәсілдермен деректемелерге талдау жасау

қиын болатын жаппай тарихи деректерді енгізумен; төртіншіден, тарихи дереккөздерді, әсіресе жаппай сипаттағы талдаудың сипаттамалық, сандық және формальды әдістерімен қатар қолдану, қайта өңдеу және деректік ақпаратты білім беру процесінде жаңа ақпараттық технологияларды тиімді пайдалану қажеттілігімен байланысты болды.

Түйін сөздер: методология, тарихи зерттеулер, пәнаралық байланыс, информатика, математика, тарихи информатика.

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Методологические основы исторических исследований в междисциплинарном контексте

Целью статьи является изучение процесса междисциплинарного взаимодействия исторической науки с социальными, гуманитарными и естественными науками, изменений конфигурации междисциплинарных полей и перераспределение внутридисциплинарной иерархии научных дисциплин.

Значимость – процесс междисциплинарного взаимодействия исторической науки с такими комплексными науками-интеграторами, как математика и информатика, и институционализация на их стыке количественной истории и исторической информатики были обусловлены, помимо объективных внутренних закономерностей развития самой исторической науки, сильным влиянием процессов математизации, информатизации и компьютеризации на все отрасли научного познания, стремительным ростом тенденций к интеграции социально-гуманитарных и естественных наук в условиях перехода человечества от индустриального общества к информационному.

Результаты – выявлено, что объективация междисциплинарного подхода к историческому исследованию во второй половине XX в. была связана, в первую очередь, с осознанием самими историками недостаточности только «отраслевого» дисциплинарного подхода в научно-теоретическом освоении исторической действительности и явным тяготением к интегральному, целостному (системному) рассмотрению исторических объектов, явлений и процессов; во-вторых, с трудностями оперирования огромным объемом накопленных знаний и стремительно растущим потоком новой информации; в-третьих, с включением в научный оборот массовых исторических источников, трудно поддающихся источниковому анализу традиционными способами; в-четвертых, с необходимостью применения, наряду с описательными, количественных и формализованных методов, анализа исторических источников, особенно массового характера, и эффективного использования новых информационных технологий в процессе переработки и представления источниковой информации в знания.

Ключевые слова: методология, исторические исследования, междисциплинарность, информатика, математика, историческая информатика.

Introduction

Urgent necessity of contemporary historical knowledge is an attentive, critical consideration and evaluation of research principles and methods accumulation inherited from the preceding stages of historical science, thoughtful study of its gnosiological premises and grounds, simultaneous search of new paradigms in humanistic way of thinking, methodology of historical research. As notes A. Ya. Gurevich “this is inseparably connected with another urgent task, namely with exposure of leading tendencies of present-day methodology, new arising problems” (Gurevich, 1996: 8), formation of new theoretical syntheses on the basis of joining humanities with

natural sciences and mastering non-trivial ways of historical sources usage.

According to a famous French historian methodologist M. Emar, history “should be open for all ideas and hypothesis offered by other disciplines” studying society, its methods and the ways of formulating questions should be considerably renewed” (Emar, 1995: 15).

The search of scientifically reasoned directions in the reconstructed history research field where methodological pluralism and methodological tolerance co-exist, the idea of interdisciplinary promote the decision of many problems for planning, organizing and making regulative the high level of research works.

Intellectual “dialogue” of historical science with other scientific directions

An important prerequisite for actualization and potential wide-scale enclosing the idea of interdisciplinary to the study of historical facts, phenomena and processes in the second half of the 20th century became a unique phenomenon called “information explosion”. Its essence is expressed in expanding pace increase of scientific knowledge in the course of intellectual promotion among human society. So, for instance, the beginning of our era required 1750 years to double scientific knowledge, the second redoubling had happened in 1900, the third in 1950. Consequently the total amount of knowledge doubled each decade, since 1970 – every 5 years, since 1990 every year (Negodaev, 1999: 179). Such data may be given for comparison: that amount of knowledge, that amount of information accumulated during XVI, XVII centuries, the second half of the 20-th century was supplied in a week (Epstein, 2014: 1).

Formation of great flow of information was stipulated by extremely swift growth of documents, reports, theses, presentations, etc. where the results of research studies were stated; permanent growth of periodical scientific publications and monographs; the appearance of various data base, usually recorded on a tape of a computer and because of this not included into the sphere of action in social communication system among wide range of researchers. So, in 1665 the first scientific journal was published, in 1985 there were thousands of scientific journals but in 1986 the number of publications shifted across hundred thousand (according to scientists annually 5 mln. articles were published) (Negodaev, 1999: 180).

“Information explosion” in the middle of 1950-ties entailed informational crisis, displayed in contradictions between exponent increasing volume of information and limited possibilities of its perception and processing. Search for solving such contradictions gave impulse to a swift development acceleration of scientific technical progress, increase in the quantity of inventions in the field of information refinement, reduction of their practical realization use. So, if it had taken 100 years to acquire steam engine machine, steam locomotive – 34 years, automobile – 27 years, then for the improvement of transistors and microprocessors necessary for promoting ECM (element basis of calculator machine) – more than 5 years, but laser necessary for producing laser optical CD discs or laser printers – 2 months. In 1956 when the first computer hard disk was invented, the

system of one information megabyte cost (according to present the price) was \$78,000, but a “super-computer” with the similar hard disk weighed more than a ton, in the middle of 1970-ties micro-computer or it was called a personal computer at the cost more than a \$1,000 and weighed about 5 kilos and its memory comprised 256 megabytes (Evans, 2010). Thus, it had taken 15 years for the transition of humanity from mechanical and electrical means to electronic information processing.

In the historical science “information explosion” provided the emergence of new source of various information and new factual data expiring the researchers to look for more perfect ways of their analytical investigation. In such conditions the historians had to encounter not only considerable mass of accumulated historical and historiographical sources but also great amount of new sourceful base qualitatively manifested in forms and content.

Diversity of sources put forward new tasks before theoretical and applied source study, problems with their systematization and classification depicting their peculiarities, general and specialized in each group of sources. On the other side there appeared consistent tendency to the increase of informational feedback earlier introduced into scientific resource circulation.

A special interest is given by researchers to non-required or restrictedly required sources of mass character containing qualitative and, in a greater degree, quantitative information which is extremely difficult in some cases, particularly impossible to analyze by traditional means. In a greater degree the necessity of mass sources analyses, especially peculiar for the 20-th century and reflecting mass phenomena and processes of historical development of a society demanded from historians the elaboration of a complex, interdisciplinary approach to the study, attraction and approbation of mathematical, formally quantitative methods, computer is investigations including by this processes of mathematization and computerization of historical sciences.

The history of science proves that “information explosions” and accompanying them “informational revolutions” considerable scientific discoveries in the field of exact and natural sciences, advanced techniques and more perfect technologies in analyzing the information directly or indirectly affected the promotion of social sciences and the humanities, their striving to change configurations of interdisciplinary fields of integration, redistribution of inner disciplinary hierarchy of scientific subjects and appearance of new, more effective methods of gaining knowledge and ways of its presentation, but on

a more higher level to trans-disciplinary integration, i.e. integration of scientific notions, theories and methods in philosophical conceptions.

This statement is equally related to the historic science. It is known that on all stages of its development two interrelated and variously directed tendencies of historical cognition are followed: integration (ratio from “much” to “single”) and differentiation (ratio from “single” to “much”) each of tendencies having dominating importance from time to time. Separate scientists-historians connect this situation with the dominance in intellectual academic environment that directly depends on the level of a society promotion, it’s transitional or stable character, generalizing (summarizing, complex solving of cognitive problems for revealing definite tendencies and regulations of historical processes) or individualizing (detailed, profound study of various sides of phenomena and processes) approaches to historical researches, determining their influence as a variable quantity, changing like sinusoid experiencing rises and falls (Ionov, 1996: 61). If integration, in a considerable degree, is a consequence of trans-scientific reflection over it, differentiation or disciplinary dismembering as an objective process is caused by practical necessity to study and new disciplinary fields inside historical sciences more professionally oriented and specialization as researchers, so practical workers.

Really, historic investigations of the end of the 19-th century and the first half of the 20-th century are characterized by predominance of differentiated study of processes and phenomena, by development of theoretical problems on its own base; the second half is characterized by integrity and interdisciplinary investigation including mathematical, other formalized methods, research methods from various areas of knowledge acquiring dominating place. The degree of intensity in integration processes of science of the 20-th century demonstrates the following fact: at the beginning of the century there were 150 sciences but to the end of the century it admitted more 2000 (Nisanbaev, 1996: 46). Researchers haven’t yet counted the number of “out flowed” adjacent scientific disciplines and the number of the arising lately, more than in half-century period of new directions on the juncture of a “diverse vector” and “closely related” sciences but even the first glance at the present-day situation will allow to judge that the majority of historic disciplines, earlier considered auxiliary, has gained a new sovereign status in the system of social sciences (for example, source study, ethnology, etc.) which in its turn, in line with contemporary episte-

mological situation served the basis for new scientific tendencies.

As a result of frontal extension of integrative processes in the second half of the 20-th century new complex investigation methods appeared and developed, for instance, such as systematic structural, analytical-synthetically, hypothetical-deductive, informational, etc. actively applied in contemporary historical researches. Application of new methods has brought to the change of correlation between them and traditional ones, but in no case to the loss of their significance, furthermore to the disappearance from scientific circulation as traditional methods seem to be steady and have the tendency to permanent improvement, development and hereby continue to be actively used in a historic science. For example, “classical” specialized research synchronic and diachronic investigation methods have transformed into systematic diachronic and systematic synchronic methods due to the development of the system theory plunged into the study of complex integral components of historical reality and introducing structural functional analyses into the historian’s practice.

In the field of epistemology integration processes are linked with polymorphic scientific knowledge resulted from the diversity of the world. But in “the diversity of the world existing sciences necessarily exposed some invariant elements. Only in such conditions it is possible to join the integration process for great number of various sciences as adjacent, so remote from each other” (Nisanbaev, 1996: 47).

Nowadays integrative processes are increasing and we can state that intensive intellectual “dialogue” of the historical science with other human directions, natural on one side and technical on the other side, their mutual inclination, rapprochement, in some cases such interpenetration acquire immanent features of modern historical cognition. Formation of the so-called cognitive sciences within the last decade served as an example of synthesis of informatics with precisely, historiography, source study, structural linguistics and anthropology, one of directions in modern analytical history – cognitive history the concept of which was worked out by a Russian scientist A.N. Medushevsky (Medushevsky, 2009).

Historical information chosen in this work as a subject of investigation is a classical example of interdisciplinary interaction (junction) of history, source study, applied mathematics, mathematical statistics and informatics. It should be noted that

the process of differentiation in historical sciences going on to have the place and is reflected by the appearance of such sub-directions as, for instance, historical localities, history of daily occurrence, oral and gender history and so on. But to speak about “pure” differentiation is not correct as in the limits of the historical science at “exfoliation” of a new sub-direction there happen processes of intra and interdisciplinary integration by establishing stable links between differing from each other theories and approaches on the basis of fundamental rights and principles and by applying methods bearing interdisciplinary character or methods and results achieved in other scientific disciplines.

Integrative processes in contemporary sciences including historic, present by itself a very complicated multidimensional socio-cognitive phenomenon. Structurally it includes such elements as integration of research knowledge; cooperation and interchange of scientists on the basis of creative (productive) communication activities of different specialties and disciplines; complexity (interpenetration) of scientific achievements in various institutions; formation of an integral subject in scientific cognition; interchange of material technical means and research methods at carrying out new scientific investigations, etc. (Nisanbaev, 1996: 44).

The process of interaction as inside each of structural elements, so between them leading to interpenetration, generalization, concentration of research activity, methodology, knowledge and information is called integration. It is supposed that in solving general, complex cognitive problems; traditional objects of scientific disciplines pursue common scientific investigation purposes and present the unified system of cognitive means.

Historic sciences observed types of integration peculiar for the research cognition. First of all, epistemological field of study mark that an image-making strong type is connected with the synthesis of research knowledge of those sciences that participate in the occurrence of new integral, “frontier”, “jointing” demography, historical professional study, historical informatics, etc. Thereto, in the methodological view the integration process is accompanied by borrowing methods, methodology, investigation technology, extending fields of their application, introduction of new ideas and notions.

An extremely important factor in this type of integration is presented by the priority of preserving investigation area of the same science which

“initiates” interdisciplinary interaction of collective efforts of scientists with various specialties.

In counterpoise of a strong type to a light one not always brings to the emergence of a new scientific discipline and is realized in the course of a concrete interdisciplinary complex investigation. For example, a historic source appears to be a single object of various social humane sciences even at different subjects of study, by this it provides the united ground for interdisciplinary investigations and integration of sciences (Danilevsky, 1998: 7). That’s why while using specialized sources in governmental legal sciences, linguistics, literature, arts, statistics and other research directions there are interrelations, interpenetration of methods and methodologies of historical investigation establishing interdisciplinary scientific contacts.

In the framework of historical sciences a private image-making type is extremely important (a common type of integration is applied in studying one global object by different sciences, for example, investigation of space). It is manifested in studying endogenic, interdisciplinary synthesis with the help of so-called vegetative mechanisms for creating new adjacent historic disciplines such as sphragistics, numismatics, vecsillographics, etc. But even in this case interdisciplinarity is not expressed in a refined type but it is combined with exogenic, interdisciplinary synthesis. For example initial theoretical grounds of semiotics, its principle ideas and methods necessarily presented at object and phenomena investigations of above-mentioned sub-disciplines.

It should be noted that the historical science by its nature is interdisciplinary. First, determination of historic events and phenomena is multilevel as a combined act in nature-climatic, biological, economic, socio-psychological, cultural ethnic, ideological and other determinants that set up, what we call historical processes. That’s why historical theories describing the course of historical processes in this or that spatially time interval inevitably include corresponding regularity and phenomena of biological, geographic, physical and other disciplines into its own “arsenal” of cognitive knowledge. For example, national climatic and natural landscape conditions of the territory of Kazakhstan are the subject of physical geography and geomorphology but simultaneously they form the subject of nomad study stipulating rational explanation for emergency and development of a nomadic society (Erofeeva, 2011). The nature of radioactivity, its influence on living organisms is studied by corresponding branches of physics, biology, genetics, but the

search and interpretation of sources of natural radiation is studied by a geological sciences. But without application the knowledge gained by above-mentioned disciplines cannot be presented by archeological or anthropological investigation. But as far as the narration concerns, it is determined by the definite amount and quality of information due to the duration (time interval) between a creator of a historic source and contemporary researcher but this kind of barrier is eliminated not only by expansion of investigation source base but also by a deep penetration into the object structure, bearers of bygone (past) information, on the account of attracting new methods of study, technologic and technical means of natural sciences: mathematical statistics, informatics, computing mathematics and so on, the promotion of which is becoming one of the significant terms in the development of historic sciences.

Thus, interdisciplinary is the immanent quality of any research in historical reconstructions and is based “on the one hand on the object of specification in historical cognition, its multi-level determination, on the other hand on the specification of object cognition reasoned by its temporal distance” (Uibo, 1990: 81). It should be noted that in the ontological aspect practically in all concrete historical studies there actually found elements bearing in this or that degree the interdisciplinary character (for example, application of conceptual categorical apparatus, separate research ways and methods of other disciplines) but they cannot be considered as means of interdisciplinarity (Studennikov, 1995: 51).

In general a satisfactory model of interdisciplinary historic study should incorporate in itself all stages of a research activity:

- their direction to interdisciplinarity;
- search and discussion of interdisciplinary problems, defining the research tasks and formulation of its contextual hypothesis taking into account the information about the rate (level) degree of the problem outlined by other researchers;
 - realizing the selection of adequate historical sources characterizing the object under study and defining the conditions for application, limitation of used methods of their processing;
 - defining the correlation of historical, social, humane and natural scientific components of interaction;
 - formation of interdisciplinary research team and arrangement of research corporation;
 - choice of methods of analysis meeting the character of stated tasks;

- field of interdisciplinary interaction of a science or sciences and their empiric, operational interpretation;

- clarification of application opportunities of these or those new informational technologies and technical means, modeling the data, presentation of historical information source in a typed form;

- discussion of the contextual interpretation of investigation results approving or disapproving outlined study hypothesis.

In the course of interdisciplinary historic research it's extremely important to apply correctly methods for interaction of sciences reasoning it by the fact that methods are established on an objective real theoretical system, that's why they are correct by their essence, only their practical appliance may be incorrect.

Alongside with interdisciplinary and intra-disciplinary types in a practical science there also emphasized supra-disciplinary and trans-disciplinary types of integration (Uemov, 2004: 6-7).

In the context of our study interdisciplinarity and supra-disciplinarity present great interest of historic informatics is the result of interdisciplinary interaction (on the junction) of several fields of science, supra-disciplinary type of integration connects the historical science with mathematization and informatization adding principles and methods of a general theory system, information theory, synergetics and so on.

The main task of interdisciplinarity as of a methodological principle is the reflection of a systematic structure of realities under study. The principle of systematization oriented scientists to the study of historical processes as something unified, complex, mediate interaction of various elements and relations (material, spiritual, economic and political, etc.). The investigated object, phenomenon or process is considered from the point of view of its “integrity system having the appropriate structure which is characterized by this or that building, i.e. by copulation of elements and also by a definite type of interconnection of these elements, peculiar features and value. The basic research task is in the revealing of the structure, interrelations and depiction of their quality peculiarity” (Garskova, 1984: 4-5).

Systematic reorganization of knowledge, application of basic theory system principles and systematic approach allow the historians to overcome contradictions expressed by their perception limitation and by acquisition of swiftly expanding stream of information. Systematic approach and connected with it structural analysis inevitably bring a researcher to a complex, interdisciplinary

study of the chosen object, phenomenon or process, the success of which stipulated not only by using principles and methods of various sciences, but by combining new “inter-connection” methods (for example historical systematic method) but also by active interaction of scientists presenting these sciences.

Interdisciplinarity presupposes wide use of research information out of dependence on its disciplinary belonging, i.e. presents methodology formation of real synthesis of research achievements in various subjects. Among the last a special place is occupied by fundamental and complex sciences-integrators as mathematics and physics cybernetics and informatics, sociology and synergetics, etc.

In this number an integral science appears to be complex and historical (in comparison with other concrete social, human sciences) because the object of the cognition comes forward as a combination of phenomena in social life during the whole history of a society (Kovalchenko, 2003: 55). Besides, a historical science is in harmony with sociology, though the matter on correlation of sociology as generalizing and history as a concrete science still calls for scientific dispute; practically indisputable that due to history sociology reveals general tendencies of modern society development, history proceed out of knowledge and generalizations worked out by sociology (Repina, 2013). Studies in both research tendencies are held in an interdisciplinary context as much depends on what and whose field (sociologic or historical) research is conducted. One of manifestations of deepening interactions and interpretations between sociology and history may serve the formation and development of new research discipline-sociology of history. In addition to that, a high level of abstraction peculiar for sociological research defines close contacts of sociology and history with social philosophy and historiography.

In connection with this issue it is necessary to pay attention to contemporary *Modus Vivendi* of historic sciences among other social and human disciplines. I.M. Saveliyev and A.B. Poletayev suggest considering similar interdisciplinary interactions in two basic forms which they designate as “strategy appropriation” and “address to the past” (Saveleva, 2005: 75). In the first case an interaction, while solving a concrete historical task, is realized, basically, in the form of theory application from various social and humane sciences, historical methods as a result of which develops “mono-model of interaction: a social discipline corresponding to a historical sub-discipline, choice of a macro (later micro) theory, its

application to historical materials” (Saveleva, 2005: 75). Interdisciplinary interactions in the second case are connected with the use of historic theories and methods, historical data in the study of concrete matters in social and humane sciences. In this context the appearance of interdisciplinary tendency (for example, social history – historical sociology or economic history or historic economics) caused the action of historical and other sciences, thereby the study may be conducted autonomously in the limits of two disciplines or only in one of the disciplines (Saveleva, 2005: 76).

To our point of view inner demand of a historical science in extending theoretical methodological basis on account of adopting methods, methodologies and technologies not only adjacent but also exact sciences is reasoned not only by notorious theoretical “crisis” in history, but also by present-day state of historical cognition in the “structure of which the so-called out-of-source knowledge becomes more and more significant, i.e. knowledge contained in historic sources not directly but developing, thanks to the study improvement” (Mogilnitsky, 1989: 9).

Methodological reflection of historians and publication of their researches on a interdisciplinary and supra-disciplinary levels most of all determined by such distinguished phenomena as mathematization, machinating (computerization and informatization, stipulated, in the middle of the 20-th century, by considerable advances in applied and computing mathematics, electronic mathematics and later (from the middle of 1980-ties) computing techniques. That fact that a contemporary historical science more often addresses to mathematics and informatics tells about the development of the science on the way of the quality research has achieved sufficiently high level of promotion and now is experiences definite need in quantity concretization.

Mathematization and informatization of historical sciences precisely brought to institutionalization of quantitative history, computing source study and historical informatics. Practical value of the results gained in half-century research by scientists’ activity, representatives of various scientific directions on the junction of traditional history, classical source study, applied mathematics and informatics, at present calls no doubts, moreover, separate researches especially in the field of economic history are rewarded by the most prestigious international prize in the field of science – Nobel Prize – for new interdisciplinary approaches in the study of historic phenomena and processes (Borodkin, 2001: 119).

In 1987 I.D. Kovalchenko noted that “quantitative and mathematical methods, electronic computing machines are those most effective methods and technical means that revolutionize a historical science. Further progress is impossible without its wide application. This is fair not only in respect to natural and technical sciences but also to social, humane sciences including a historical one. Besides, quantitative methods are more complicated than traditional, dominating in humane researches” (Kovalchenko, 2003: 17).

Of course, interdisciplinary interactions of historical sciences with mathematics and information shouldn't be absolute as there exists definite limitations in the use of these or other methods, methodologies and technologies for exact science in historical research, moreover neither mathematics, nor informatics encroach upon the “sovereignty” of a historical science but they are considered as supplementary methodological and methodical “instrumentality” in getting more objective and reliable knowledge about the past, provide historical researches to lead out on a more higher level of source study synthesis, help to solve the problem of qualitative treatment of historical sources, especially of mass character, to characterize tendencies and regularities of social development more accurately, etc.

In a unified system of interdisciplinary interactions there arise the necessity in the use of automatized and computerized informational systems, systematic approach, heuristics and computing techniques. This undoubtedly stipulates the choice of operation succession in integrated scientific research, in accepting adequate decisions for further course of cognition of a definite complicated scientific object.

A historian shouldn't use an empirical approach in his research that imply an experienced character of natural scientific knowledge, presence of a dimension mechanism and comparison with the standard, measuring the majority of units having structural character, realizing measuring mistakes and statistical character of any experimental materials. But he may address to the model approach with the help of which the subject objectivism of an ideal image of phenomena or processes is created. Such an image should be created and reconstructed.

Methods of mathematical modeling of historical processes are applied to history for several decades and bring to the results impossible to gain by application traditional methods (details: Kovalchenko, 2003: 373-433).

Mathematical recessing and analyses of quantitative indexes reached in the result of measuring historical phenomena under study, in the framework of stated research task may be conducted with various purposes and various methods in the aspect of content depiction, essence out quantitative measures of qualitative determination of phenomena and processes of historical development, i.e. in ontological aspect the application of mathematical methods has two levels. The first level consists in measuring these or other signs by sufficiently not complicated recessing of gained results by methods of mono-measured statistical analyses (calculation of middle and percent meaning and their typical mistakes, indexes of various sign and meanings, so on). The second, considerably higher level of applying mathematical methods contains in “such mathematical developing quantitative indexes in the system which depicts the essence of the reality under study in a formalized mathematical form, i.e. in the form of its models. For constructing a model it is necessary to use a more complicated mathematical apparatus (for example, poly-measured statistical analysis – S.Zh.) and, as a rule, the use of computer” (Borodkin, 2009: 7).

It is confirmed that the practice of interdisciplinary interaction of a historic science with other research direction, on its initial stage, the enclosure of methodological instruments for adjacent sciences is carried out on the stage of concrete historic researches realization (doesn't matter whether this field is economic history, political or social history, so on) but then there appear objective requirements for application of theoretical problems. So, quantitative history, only in a few decades transferred to accent of solving analytical tasks to the study of historical source specifics and its affect on the choice of adequate data recessing ways on computer. The discourse goes about consideration of historic sources in the light of information theory and semiotic approaches, setting up concepts and methods of mass source analysis (Kovalchenko, 2003: 119-140).

The informational approach to the research of various issues of source study has in the history of methodology the same meaning as a systematic approach to the research of historical objects, phenomena and processes.

As G.B. Mozhayeva notes “...logics of humane sciences development at present moves to the tendencies of interdisciplinarity, integration and consequently, to the search of common scientific methodology which would allow not only to join instruments of separate sciences but also to draw

up common grounds for the research of human and natural sciences.

Interdisciplinary research is more effective if there exist a common object serving as a direction for methods in various sciences. Such an object for interdisciplinary research is information. Information theory may be considered as a common research methodology in the aspect of which the society and an individual are estimated as the result of informational interactions” (Mozhayeva, 2014:1).

Hereby, in contemporary conditions, there appears not only the problem of extending research methods arsenal but the search for a universal scientific platform that will let to realize interdisciplinary researches effectively.

Speaking about scientific knowledge integration, interdisciplinary and supra-disciplinary approaches to historical researches, we cannot avoid one more factor which nowadays renders essential influence on the extension of methodological field in historic sciences. The speech is about the presence of synergy conception and closely linked with it the chaos theory. As L.I. Borodkin notes “synergetics proceeds from the fact that a liner character of processes development and the state of balance is not dominating in the reality; researcher’s great attention deserves the unpredictable character of systems under study at the period of their unsteady development, bifurcation point, in which small, occasional fluctuations may render strong effect on process trajectory (conditions when “balance” generally considered as a traditional direction, fluctuations have little influence on the process course). The occurrence of “chaos” at the point of bifurcation doesn’t mean the disappearance of order; it means that the process of dynamics become *internally* unpredictable (not as a reason of external causes). Basic question discussed by historians in this connection is the effect of accidance, which is principally impossible to predict or to oversee, on the general development character of processes under study. This matter is closely connected with new approaches to study alternatives of social development appearing on the point of bifurcation” (Borodkin, 2003: 1).

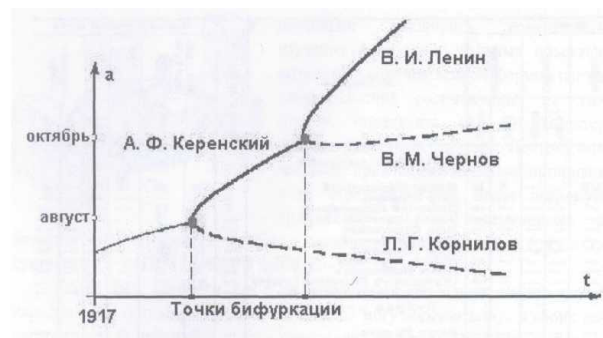
Within last decades, mathematicians become initiators in active solvation of problems in application of synergetic ideas to historical sciences. Their joint efforts with historians have brought today to institutalization of a new interdisciplinary direction-mathematical history which deals, basically, with creation and research of explanatory models in a historical society development, capable to show reasons of this or that phenomenon

appearance and also models, comprising as regular, so irregular repeated processes, including non-liner, “chaos” states, phase transitions, taking into account stochastic phenomena, etc. (Grinin, 2008).

It’s necessary to underline that on the post-soviet space the problem of acquiring methodology of synergetic paradigm in historical science, belongs to L.I. Borodkin and his followers, who analyzing discussions of 1990-1995 on pages of external research editions (“Social Science History”, “Historical Social Research”, “History and Theory”, etc.) concerning ways of synergy application in history, single out general historic problems that may be studied under guidance by separate synergy conceptions on:

- a display of «chaos» peculiarities in sequence of historic events interpreted as «extreme perception of a final results in a small change of initial conditions («butterfly effect») and affect of small reasons even on to a behavior of a separate person, on the course of social processes;

- existence of the so-called points of bifurcation (points of probable trajectory choice of alternative ways in events development) in historical processes, in this case history is presented “not developing in a unified bed, but, on the contrary, on uninterrupted rejection of non-mastered really existing ways” (Borodkin, 1998: 6). Figuratively this statement on alternative events development on the eve of October, 1917 in Russia, is given on Picture 1.



Picture 1 – Probability of alternative event development in Russia to October, 1917.

- unified historical notion “occurrences – necessities” (described by means of non-linear dynamics), according to which on the earlier stage of any historical process development a priority role is played by occasional factors (fluctuations), but in the process of development as a result of theory on self-organization of any system “from chaos”

there appears “order” giving this process a unified direction in the course of which, in its turn, crossing points of bifurcation, it is reviewed by unpredictable new ways chaos (Borodkin, 1998: 7);

– intra-systemic character of unpredictable origin of conduct of a historic situation under study is considered as an integral system;

– application of self-organization law to social processes peculiar for any evolutionary system in nature.

Of course we can dispute about the application of conceptions and synergetic instrumentality to the study of unstable and transitional processes and phenomena in historical society development, but separate philosophers actively working at problems of fundamental methodology in research cognition, predict, that in the nearest future interdisciplinary interaction methods of systematic, synergetic and informational approaches will comprise the nucleus of scientific cognition methodology for nature, human and society (Kolin, 2000: 23).

Supra-disciplinarity of synergetics is based on three spheres of scientific space: subject knowledge, philosophical reflection and mathematical modeling and is still on the stage of its establishment and on initial stage of penetration into the science.

Conclusion

Thus, interdisciplinary approach of objectification to historical researches in the second

half of the 20-th century was connected, at first, with the realization historians the inefficiency of only “branch” disciplinary approach in scientific theoretical acquisition of historical reality and obvious inclination to integral, systematic consideration of historical objects, phenomena and processes; secondly, with difficulties in operating with huge amount of accumulated knowledge and extremely growing stream of new information; thirdly, with including mass historic sources into research circulation, sources difficult to analyze by traditional ways; fourth, with the necessity of application alongside with descriptive, quantitative and formalized methods of historical source analyses especially of mass character and effective use of new informational technologies in the process of interpretation and presentation of source information into knowledge.

The process of interdisciplinary interaction of a historical science with such complex research-integrators as mathematics and informatics, institutionalization on the junction of quantitative history and historical informatics was stipulated, besides objective inner regularities of a historical science development, by strong affect of processes of mathematization, informatization and computerization on all branches of scientific cognition, swift growth of tendencies to integration of social humane and natural sciences in conditions of transition of humanity from industrial society to informational.

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