

Publications by P. Khavliuk on the history of crafts and technologies

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Abstract.

The aim of the article is to characterize P. Khavliuk's scientific publications dedicated to the history of crafts and technologies in order to determine the main directions and key ideas of his research. **The research methodology** is based on the principles of historicism and objectivity. General scientific methods of analysis, synthesis, systematization and generalization, as well as the comparative-historical method, have been applied. **The scientific novelty** of the work lies in the fact that for the first time, P. Khavliuk's publications dedicated to the history of crafts and technologies have been comprehensively characterized, the main directions of his research and key ideas regarding the development of ancient crafts have been identified. **Conclusions.** P. Khavliuk emerges as an archaeologist and historian who was not afraid to revise established theories and sought to comprehensively illuminate the history of ancient crafts and technologies, taking into account the results of his own archaeological surveys and excavations, primarily in the Southern Buh region, using a complex of research approaches, including experimental archaeology, comparative analysis, and integration of data from various scientific disciplines. The scientist's attention was drawn not only to purely technological aspects but also to economic and social aspects of craft development. The main directions of P. Khavliuk's research encompass pottery, metallurgy, millstone production, and jewellery making of various cultural groups and periods: Zarubyntsi and Chernyakhiv cultures, early Slavs, and Uliches. Key theoretical foundations of P. Khavliuk's works include rethinking the role of local traditions in the development of crafts, particularly insisting on the independent development of Ulichian jewellery making. He also made an important contribution to understanding the evolution of millstone production technologies, ceramics, and metal items. Based on archaeological findings, the researcher drew conclusions about the level of craft development, production specialization, and trade connections, considering the development of crafts in a broad economic and social context. It is important to note the evolution of P. Khavliuk's ideas throughout his scientific career. His later works demonstrate a more critical approach to established theories and a deeper understanding of the complexity of cultural interactions in craft development. Although P. Khavliuk's works contain a deep analysis of many aspects of ancient crafts, he also pointed out the need for further research, particularly in the field of cultural influences and technological exchanges between different tribes and cultures.

Keywords: archaeologist, Zarubyntsi archaeological culture, history of crafts and technologies, P. Khavliuk, archaeological site, Slavic peoples, Chernyakhiv archaeological culture.

Публікації П. Хавлюка з історії ремесел і технологій

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Анотація.

Метою статті є охарактеризувати наукові публікації П. Хавлюка, присвячені історії ремесел і технологій, щоб визначити основні напрямки та ключові ідеї його досліджень. **Методологія дослідження** ґрунтується на принципах історизму та об'єктивності. Застосовано загальнонаукові методи аналізу, синтезу, систематизації та узагальнення, а також порівняльно-історичний метод. **Наукова новизна** роботи полягає у тому, що вперше

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всєбічно охарактеризовано публікації П. Хавлюка, присвячені історії ремесел і технологій, виявлено основні напрямки його досліджень та ключові ідеї щодо розвитку давніх ремесел.

Висновки. П. Хавлюк постає як археолог та історик, який не боявся переглядати усталені теорії та прагнув всєбічно висвітлювати історію давніх ремесел і технологій з урахуванням результатів власних археологічних розвідок та розкопок, передусім на Південному Побужжі, з застосуванням комплексу дослідницьких підходів, включаючи експериментальну археологію, порівняльний аналіз та інтеграцію даних із різних наукових дисциплін. Увагу науковця привертали не лише суто технологічні, а й економічні та соціальні аспекти розвитку ремесел. Основні напрямки досліджень П. Хавлюка охоплюють гончарство, металургію, виробництво жорен і ювелірну справу різних культурних груп та періодів: зарубинецької та черняхівської культур, ранніх слов'ян і уличів, демонструючи. Ключовими теоретичними засадами праць П. Хавлюка є переосмислення ролі місцевих традицій у розвитку ремесел, зокрема наполягання на самостійному розвитку ювелірної справи уличів. Він також зробив важливий внесок у розуміння еволюції технологій виробництва жорен, кераміки та металевих речей. Дослідник робив на основі археологічних знахідок висновки щодо рівня розвитку ремесла, спеціалізації виробництва й торговельних зв'язків, розглядаючи розвиток ремесла в широкому економічному та соціальному контексті. Важливо відзначити еволюцію ідей П. Хавлюка протягом його наукової кар'єри. Його пізніші роботи демонструють більш критичний підхід до усталених теорій та глибше розуміння складності культурних взаємодій у розвитку ремесел. Хоча роботи П. Хавлюка містять глибокий аналіз багатьох аспектів давніх ремесел, він також указував на необхідність подальших досліджень, зокрема у сфері культурних впливів і технологічних обмінів між різними племенами та культурами.

Ключові слова: археолог, зарубинецька археологічна культура, історія ремесел і технологій, П. Хавлюк, пам'ятка археології, слов'янство, черняхівська археологічна культура.

The problem statement. By definition, archaeology is a mixed discipline with a unique epistemological status among the humanities, social sciences and natural sciences (Castillo, 2024, p. 1), particularly in view of a need for new historiographical narratives that connect recent developments in the field of archaeology with its disciplinary past (Abadía, 2024) requiring research into the connections between archaeology and the history of technology. After all, technology, which occupies an extremely important place among the diversity of social phenomena, has always aroused both practical and theoretical interest. Human thought has long tried to find an answer to the question: what is technology as a phenomenon that differs from other phenomena of nature and society. This takes into account not only the static but also the dynamic state of technology, its change over time, which is studied by the history of technology (Гріффен, 2013, с. 16). Despite its specificity and being a completely independent scientific discipline, history of science and technology is closely related to other social sciences, especially general history and social sciences (historical materialism, philosophy of history), which are part of the social sciences. As for the history of science and technology itself, today it is common to refer to historical sciences (Griffen, Ryzheva, Nefodov, Hryashchevskaya, 2022, p. 34). One way to trace these connections is to study the works of archaeologists related to the history of technology. In particular, a prominent Ukrainian archaeologist and historian, local historian and educator, who made a significant contribution to the study of antiquities of Podillia (Рудь, В., Косаківський, В., 2011; Рудь, В., Косаківський, В., 2011), Pavlo Khavliuk published a work in 1956 dedicated to materials for the archaeological map of the Sob River basin, in which he paid special attention to ceramic production, describing various decoration techniques, focusing on how the Trypillians processed stone, and regarding the bearers of the burial field culture, he noted technological progress in pottery and the development of metalworking. Mentioning Slavic settlements of the Rus times, he characterized in detail ceramic production, both molded and wheel-made (Хавлюк, 1956). With this article, the researcher demonstrated his particular attention to the history of ancient crafts and technologies, and subsequently devoted a series of publications to this direction (Рудь, В., Косаківський, В., 2011; Рудь, В., Косаківський, В., 2015), which require separate research as a contribution to the development of the history of technology in general.

The analysis of sources and publications. The source base of the study is P. Khavliuk's publications related to the topic: both individual (Хавлюк, 1965; Хавлюк, 1972; Хавлюк, 1973; Хавлюк, 1977; Хавлюк, 1980; Хавлюк, 1980а; Хавлюк, 1984; Хавлюк, 1988; Хавлюк, 1990; Хавлюк, 1992; Хавлюк, 1999), and in co-authorship with V. Hopak (Хавлюк, Гопак, 1972; Хавлюк, Гопак, 1973).

In addition to V. Rud and V. Kosakivsky, who devoted bio-bibliographic studies to P. Khavliuk and his legacy (Рудь, В., Косаківський, В., 2011; Рудь, В., Косаківський, В., 2015) with a list of P. Khavliuk's works, including those related to the history of crafts and technologies, D. Lenchuk paid considerable attention to the researcher's legacy. Thus, D. Lenchuk synthesized information about the

archaeological collection from P. Khavliuk's surveys and excavations, housed in the Vinnytsia Regional Museum of Local History and in particular characterized P. Khavliuk's findings in the early Slavic craftpersons' settlement of the 7th – 8th cent. near the village of Pariivka, in the Chernyakhiv settlements near the village of Chortoriya and the village of Harmaky, in the Zarubyntsi culture settlement near the village of Marianivka, in the Ulych hillfort near the village of Sazhky and summarized that P. Khavliuk's research allowed to obtain important archaeological materials that highlight the development of pottery, metallurgy and construction technologies in different historical periods in the Vinnytsia region (Ленчук, 2020). Another work by D. Lenchuk examines the contributions of P. Khavliuk to the study of Buh-Dnister and Trypillia cultures in the Vinnytsia region. The author emphasized that between 1951–2001, P. Khavliuk systematically investigated about 1000 archaeological sites in the area. The article examines such aspects of P. Khavliuk's contribution to the development of the history of crafts and technologies: research of Neolithic ceramics (on the example of Buh-Dnister culture pottery with the addition of crushed shells or grass to clay for strength, using a comb stamp for decoration); characteristics of Trypillian crafts: pottery, weaving, copper production, construction. Thus, D. Lenchuk concluded that P. Khavliuk, among other things, made significant conclusions about the topography, architecture, tools, pottery, and other aspects of material culture of Buh-Dnister and Trypillia settlements (Ленчук, 2024). D. Lenchuk also summarized and introduced into scientific circulation the anthropological material from P. Havlyuk's excavations at the Ulychian settlement near Sazhki and presents new insights into 42 10th-century human skeletons, drawing on unpublished materials from P. Havlyuk's personal archive and official reports (Ленчук, 2023). However, P. Khavliuk's publications entirely devoted to the history of crafts and technologies have not been the subject of separate research.

The purpose of the article: to characterize P. Khavliuk's scientific publications dedicated to the history of crafts and technologies in order to determine the main directions and key ideas of his research.

The results of the research. In his 1965 article on early Slavic pottery manufacturing technologies, based on extensive archaeological material collected in the Southern Buh region, P. Khavliuk characterized in detail the evolution of pottery manufacturing technologies and the establishment of pottery as a separate craft among Slavic tribes of the 5th – 10th cent. A key element of the study is the analysis of a special pottery manufacturing technology widespread among the Antes of the 5th – 7th cent., which P. Khavliuk called «ribbon horizontal circular molding» (building up vessel walls with clay strips using a primitive rotating stand). The scientist viewed this technology as transitional between hand molding and the use of a full-fledged potter's wheel. He noted that traces of joining these strips can be seen on archaeological finds. P. Khavliuk traced the gradual improvement of this technique from the 5th to the 8th – 10th cent., which facilitated the introduction of the potter's wheel, as well as the evolution of the potter's wheel from a primitive rotating stand to a heavy hand wheel, and finally to a foot-operated potter's wheel (Хавлюк, 1965). Thus, the researcher took a thorough approach to studying the technological development of pottery, which allowed for the identification and analysis of transitional technologies.

P. Khavliuk paid special attention to the regional peculiarities of pottery craft development. He emphasized that in different regions, the potter's wheel spread at different times, particularly among the Slavs of the Southern Bug region – earlier than in Volyn or Kyiv, possibly as early as the beginning of the 8th cent. (Хавлюк, 1965). Thus, using the comparative-historical method, geographical and temporal differences in the development of technologies were comprehensively taken into account.

The work also discusses the evolution of raw material use: from clay with additives to purified «fat» clay. According to P. Khavliuk, this innovation is associated with the overall progress in pottery production technology (Хавлюк, 1965). This demonstrates a systematic approach to analysing the development of the pottery craft.

Based on archaeological findings, P. Khavliuk made an important conclusion about the separation of pottery into a distinct craft as early as the beginning or first half of the 8th cent. One of the proofs in favour of this, the scientist identified the appearance of professional masters' stamps on the bottoms of vessels (Хавлюк, 1965). This shows P. Khavliuk's ability to make profound historical conclusions based on specific items of material culture, linking artefacts with broader socio-economic processes.

The researcher refuted the previously widespread historiographical idea of the «coarsening» of Slavic pottery, explaining this by the erroneous attribution of Chernyakhiv culture monuments to early Slavic culture (Хавлюк, 1965). This demonstrates his critical approach to established theories and ability to rethink archaeological data.

Before publishing in 1971 «some materials» on the characteristics of the Ulichian craft of the 10th – 11th cent., P. Khavliuk combined continuous archaeological exploration along rivers with stationary research of ancient settlements, which resulted in the discovery of numerous specialized dwelling-workshops, forges, iron-smelting and pottery kilns (Хавлюк, 1972). The researcher paid

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special attention to the development of metallurgy and blacksmithing based on numerous finds of metal products (tools, household items, and weapons). He emphasized that iron-smelting production, based on local raw materials, fully met the Uliches' needs for metal, and concluded that this indicates the tribe's self-sufficiency in this field. P. Khavliuk described in detail the technological level of Ulichian blacksmiths, who possessed various metal processing techniques, including free forging, steel cementation, hardening, and abrasive processing (Хавлюк, 1972). Regarding the pottery of the Uliches, according to P. Khavliuk, it was also at a high level. The scientist noted that the entire extremely diverse range of ceramics was made on a potter's wheel (Хавлюк, 1972). In addition, the researcher highlighted the advanced bone processing, from which various tools and household items were made (Хавлюк, 1972). P. Khavliuk paid special attention to the existence of a specialized centre for the production of millstones from volcanic tuff. According to the researcher, it indicated a developed division of labour in Ulichian society (Хавлюк, 1972). The extensive trade and exchange connections of the Uliches were also mentioned (Хавлюк, 1972). Thus, P. Khavliuk's approach is characterized by attention to the details of material culture and the desire to reconstruct the economic and social life of the studied peoples based on them.

The scientist emphasized the historical continuity of the Ulichian craft, noting that it was largely inherited from the craftpersons of the previous Antes period (Хавлюк, 1972). In summary, P. Khavliuk defined the level of development of Ulichian craftsmanship in the 10th – 11th cent. as high, but emphasized that this development suddenly ceased due to the invasion of nomads (Хавлюк, 1972). This indicates his adherence to the concept of continuous development of Slavic crafts, but taking into account sudden external interventions.

The research of P. Khavliuk and V. Hopak on the history of craft development and iron processing technology among the Zarubyntsi tribes of the Southern Bug region is based on a comprehensive analysis of iron tools found in Zarubyntsi settlements from the 1st cent. BC to the 2nd cent. AD, particularly at sites such as Marianivka, Nosivtsi, and Rakhny (Хавлюк, Гопак, 1972). So, it is possible to trace the researchers' focus on specific archaeological sites and their timeframe, showing a well-defined scope for their study.

The authors applied a multifaceted approach, which included macro- and microstructural analysis of tools, spectral analysis to detect impurities, metallographic and photocolometric analysis to determine carbon content, as well as measuring the microhardness of products (Хавлюк, Гопак, 1972). This highlights the advanced scientific methods used in the study, indicating a thorough and technologically sophisticated approach to archaeological analysis.

The study identified several technological groups of products. About 60% of them turned out to be simple products made of bloom iron or low-carbon steel (Хавлюк, Гопак, 1972). However, special attention was paid to more complex welded knives made from a combination of iron and steel plates. The researchers described in detail the technological scheme for manufacturing welded knives, from preparing thin blank plates, assembling «packages» of 2–3 plates, heating to 1300–1400°C for forge welding, to operations of actually shaping the knife. P. Khavliuk and V. Hopak noted that Zarubyntsi blacksmiths were familiar with such basic techniques of free forging as stretching, bending, chopping, etc. An important component of the work is the analysis of the evolution of iron processing technologies from simple bloom iron products to complex welded structures. The emergence of heat treatment of steel (hardening) at a later stage (1st – 2nd cent. AD) was particularly noted, indicating significant progress in metalworking (Хавлюк, Гопак, 1972). Therefore, the researchers deeply understood the ancient metalworking techniques and were able to trace technological evolution over time.

For a deeper understanding of the historical context, P. Khavliuk and V. Hopak compared Zarubyntsi technologies with those of Scythian (7th – 3rd cent. BC), Chernyakhiv (3rd – 5th cent. AD), and Antes (mid-1st millennium AD) cultures. It was emphasized that the Zarubyntsi technique of knife making was more advanced than the Scythian one, and also persisted among the Antes until the middle of the 1st millennium AD (Хавлюк, Гопак, 1972). This observation reinforced the authors' conclusions about the duration and stability of technological traditions in the region and demonstrated their ability to place all findings in a broader historical context, comparing technologies across different cultures and periods.

Raising in 1973 «the question of millstone production in Ancient Rus», P. Khavliuk thoroughly investigated the development of millstone production from the 3rd cent. AD to the 13th cent. (Хавлюк, 1973). First of all, he carefully analysed the materials from which millstones were made, noting the use of local resources such as granite, sandstone, and shell rock. The researcher paid special attention to the hypothesis of ceramic millstone production (Хавлюк, 1973), and provided a detailed characterization of the production of both stone and hypothetical ceramic millstones (Хавлюк, 1973), which demonstrates his interest in innovative technologies of the past and indicates a deep understanding of the technological aspects of the craft.

Referring to the archaeological findings of M. Bilyashivsky in 1891 and subsequent research in

Kyiv, at Raiky and Horodsk settlements, critically approaching the interpretations of various researchers, including H. Mezentsseva, M. Karger, and V. Goncharov regarding the material of some findings (Хавлюк, 1973), P. Khavliuk demonstrated a deep knowledge of the historiography of the problem, scientific objectivity, and critical thinking.

In considering the problem from the perspective of archaeology, history, and production technology (Хавлюк, 1973), P. Khavliuk's interdisciplinary approach is evident.

The researcher also drew attention to the socio-economic significance of millstone production, emphasizing their importance in the everyday life and economy of Rus. P. Khavliuk suggested that this craft was specialized (Хавлюк, 1973), which indicates a deep understanding of the economic structure of Rus society.

Another joint study by P. Khavliuk and V. Hopak in 1973, dedicated to the development of metallurgy and blacksmithing of the Uliches in the 10th – 11th cent., was based on findings of 42 iron tools, household items, and weapons, as well as remains of iron-smelting and pottery kilns. Like the authors' previous joint work, it was conducted using microstructural and spectral analysis, as well as measurements of metal microhardness (Хавлюк, Гопак, 1973). The application of these research methods allowed the authors to increase the reliability of data on the metallurgy and blacksmithing of the Uliches.

P. Khavliuk and V. Hopak determined the development of metallurgy among the Uliches, whose craft production was concentrated in settlements near fortified towns, as high. Regarding the sources of iron ore, the scientists emphasized that the Uliches used local sources (iron hydroxides, volcanic tuff, and bog ores), and thus were able to effectively use natural resources (Хавлюк, Гопак, 1973).

Regarding iron processing technology, the researchers concluded that it was largely inherited from the Antes. Overall, the Uliches were noted to produce both simple iron products for mass consumption and high-quality steel items on order, using cementation to obtain steel and hardening to increase its hardness (Хавлюк, Гопак, 1973). Thus, both technological and economic aspects of metallurgy were taken into account.

A particularly interesting find that P. Khavliuk and V. Hopak paid attention to was a sickle with an innovative design. This sickle had a groove in the centre of the blade, which allowed for localized hardening. The scientists noted that similar sickles had not been found in other Slavic territories (Хавлюк, Гопак, 1973), indicating a search for a broad comparative context.

In their work, the scientists disagreed with B. Kolchin's conclusion that some iron knives were «blacksmith's rejects» (Хавлюк, Гопак, 1973). This shows their willingness to revise established views based on new data and their own research.

P. Khavliuk and V. Hopak also considered the technological achievements of the Uliches in the context of their lives, mentioning the danger of nomadic attacks and the need to manufacture weapons (Хавлюк, Гопак, 1973), thus demonstrating a deep understanding of the connection between technological development and the socio-political conditions of that time.

P. Khavliuk began his work on the reconstruction of Chernyakhiv millstones by reviewing statistical data on the prevalence of different types of millstones and noted that these tools were extremely common, especially in the forest-steppe zone of Ukraine and Moldova (Хавлюк, 1977), thus demonstrating his systematic approach to the topic.

The researcher thoroughly studied the materials from which millstones were made, noting that local stone types were most often used – limestone, sandstone, and effusive rocks. P. Khavliuk even identified a specific source of material – the Luhivsky quarry in the Illintsi district of Vinnytsia region (Хавлюк, 1977), which indicates his deep knowledge of the area and regional geology.

An important aspect of the research is tracing the evolution of millstone construction from simple grain grinders to rotary millstones. P. Khavliuk emphasized that although Chernyakhiv millstones were simpler than late Roman examples, they were significantly more efficient than previous types. He also noted the absence of a hopper in Chernyakhiv millstones, which appeared much later, in the 10th cent. among the Drevlians (Хавлюк, 1977). Thus, the author revealed an evolutionary approach to studying technologies.

A detailed description of the technical characteristics of millstones is another important contribution by P. Khavliuk. He provides precise dimensions: diameter and thickness, describes the variety of central hole shapes in the upper stone (runner) (Хавлюк, 1977). Not limited to describing findings, P. Khavliuk proposed his own reconstruction of the millstone mechanism based on a critical analysis of previous reconstructions (including those by E. Simonovich, E. Rickman, I. Vynokur, and others), his own experimental data, and ethnographic parallels. According to his version, grain was poured through slots around the axis, and rotation was carried out using a handle or pole attached to the ceiling. The researcher considered several options for handle attachment, analysing their effectiveness (Хавлюк, 1977). Such an interdisciplinary approach indicates the author's broad outlook and high technical competence.

P. Khavliuk also examined in detail the changes that occur with millstones during use, such as

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the formation of a conical protrusion on the lower stone (Хавлюк, 1977), which indicates attention to the use of artefacts, not just their manufacture.

An important aspect of the research is the assessment of productivity and production organization. According to P. Khavliuk's calculations, one millstone could produce about 15 kg of flour per day (Хавлюк, 1977). The attempt to evaluate the economic aspects of millstone use indicates the researcher's interest in socio-economic history.

The researcher considered millstones not in isolation, but in the context of the entire settlement, analysing their location in buildings and the presence of special rooms for grinding. Findings of several millstone sets in one room gave the researcher grounds to hypothesize about the possible use of forced labour (Хавлюк, 1977). Thus, P. Khavliuk considered artefacts within the framework of a broader archaeological and social context.

In 1980, P. Khavliuk began his study of the development of crafts and technologies among the Slavs of the 6th – 7th cent. by examining the evolution of production. He emphasized the important transition from domestic production to specialized craft centres that served areas within a radius of 30–40 km, considering this process key to the economic and social development of the Slavs. According to the researcher, the emergence of separate craft settlements is a vivid evidence of this transformation (Хавлюк, 1980). This observation demonstrates his understanding of the formation of economic ties and trade networks in early medieval Slavic society.

P. Khavliuk described in detail various production facilities such as ovens, furnaces, and workshops, and emphasized the versatility of some ovens, which, in his opinion, testifies to the ingenuity and adaptability of Slavic craftpersons (Хавлюк, 1980). P. Khavliuk attached great importance to archaeological findings, using them as the main source of information. He described in detail specific objects and artefacts (Хавлюк, 1980), which demonstrates his belief in the importance of material evidence for historical research. At the same time, the researcher interpreted them in the context of economic and social development.

An important aspect of P. Khavliuk's research is his analysis of social changes caused by the development of crafts. He directly pointed out that these processes «accelerated the process of breaking tribal traditions» (Хавлюк, 1980). This demonstrates his vision of a close connection between economic development and the social structure of society.

P. Khavliuk emphasized that the craft of the 6th – 7th cent. became the basis for the further development of Old Russian craft (Хавлюк, 1980). This demonstrates his understanding of the historical process as a sequential development, where each stage is the foundation for the next.

P. Khavliuk took into account various factors: the geographical location of craft centres, availability of raw materials, technological features of production (Хавлюк, 1980). This demonstrates his desire for a comprehensive understanding of historical processes.

He considers the development of crafts as a key factor that influenced social and cultural changes in Slavic society (Хавлюк, 1980). This reflects his inclination towards economic determinism.

P. Khavliuk also applies a comparative method, comparing findings from different regions (Хавлюк, 1980). This allowed him to identify general trends in the development of crafts among the Slavs and avoid the limitations of local peculiarities.

In 1980, in his study of millstone production in the Chernyakhiv culture, P. Khavliuk emphasized that hand-operated rotary millstones were the main tool for initial grain processing and significantly more progressive compared to earlier methods of grain processing, such as grinding on grain rubbers, as this greatly increased the efficiency of milling (Хавлюк, 1980a).

The scientist criticized the approach of researchers who did not pay attention to the material used for making millstones, and emphasized that studying the material can provide important information about raw material sources, trade connections, stone processing technology, and local production features (Хавлюк, 1980a). This underscores the importance of an interdisciplinary approach in archaeology, including petrographic analysis.

P. Khavliuk also noted that millstone production required specialized skills and tools, indicating the existence of professional craftsmen or even craft centres. The assumption about millstone standardization allowed him to hypothesize about possible mass production. An important aspect of the research is the recording of millstone distribution in almost all settlements of the Chernyakhiv culture. This observation allowed the researcher to draw conclusions about the universality of this technology, the high level of agricultural production, a developed system of labour division, and the possible existence of grain surpluses that required efficient processing means. P. Khavliuk also suggested that this might indicate the existence of a developed system of technology exchange between settlements, high mobility of the population or craftsmen, or even centralized production and distribution of millstones. The use of millstones in households, according to P. Khavliuk, may indicate a certain level of family autonomy in food production. Overall, P. Khavliuk paid special attention to the historical significance of millstones as a notable achievement of ancient peoples (Хавлюк, 1980a), thus considering technological progress not only in an archaeological context but also in a broader

historical and socio-economic context.

P. Khavliuk's research (1984) on the history of the craftsmen centre for millstone production in the Southern Buh region mentions that the centre functioned from the 1st to the 11th cent. AD (Хавлюк, 1984). The scientist paid special attention to stone processing technology, noting that iron tools were used for millstone production (Хавлюк, 1984). This observation allowed him to draw important conclusions about the level of metalworking development in the region.

Tracing the evolution of millstones over the centuries, P. Khavliuk provided precise dimensions of artefacts (diameter and thickness) to demonstrate changes in their construction (Хавлюк, 1984). This demonstrated the author's attention to detail in recreating the picture of technological development in the craft.

P. Khavliuk noted the appearance of a new construction element in the 10th – 11th cent. – the hopper, which allowed for adjusting the quality of grinding (Хавлюк, 1984). Thus, an important aspect of the research is the analysis of technological innovations.

Emphasizing the scale of production and distribution of millstones throughout the Dnipro region, as well as conclusions about the existence of developed trade networks (Хавлюк, 1984), further indicate that P. Khavliuk did not limit himself to technical aspects of production, paying significant attention to the economic aspects of the craft.

The researcher also characterized specialized dwelling-workshops where millstones were made (Хавлюк, 1984), drawing attention to the specialization of production.

P. Khavliuk also mentioned related crafts, based on findings of ceramics and sandstone whetstones for sharpening tools (Хавлюк, 1984). This indicates an attempt to outline a more complete picture of craft production in the region, including the development of pottery and other crafts.

P. Khavliuk emphasized that the study of this craft centre can provide important information about the level of craft development among the Slavs in the 5th – 11th cent. (Хавлюк, 1984), demonstrating an understanding of the importance of this topic for a broader understanding of Slavic history.

In his 1988 work on the initial stages of early Slavic craft development, P. Khavliuk thoroughly examined the development of craft production in early Slavic settlements west of the Dnipro, primarily in the Southern Buh region, based on archaeological excavations that revealed a significant number of specialized production structures (Хавлюк, 1988).

According to P. Khavliuk, a complex of craft structures consisting of five semi-dugouts and six above-ground buildings exclusively for production purposes was excavated in Pariivka. The researcher emphasized that these were not just auxiliary premises, but full-fledged workshops for mass production. Particularly interesting, in P. Khavliuk's opinion, is workshop № 1, where two domed furnaces were discovered that had been repeatedly rebuilt, indicating constant improvement of production processes (Хавлюк, 1988).

P. Khavliuk noted that the furnaces in Pariivka were capable of reaching temperatures sufficient for melting metals and firing ceramics, as evidenced by findings of melted clay, bronze fragments, and slags. The researcher also found evidence of diverse craft activities: in addition to metalworking and ceramic production, bone and leather processing were carried out in the workshops (Хавлюк, 1988). Thus, the scientist paid close attention to the high technological level of these workshops.

P. Khavliuk concluded that at least two craftsmen could work simultaneously in one workshop, indicating a certain level of specialization and organization of production (Хавлюк, 1988). Therefore, an important aspect of the research is the analysis of labour organization.

According to the scientist, the workshops not only met the needs of the local population but were also part of broader trade and economic networks, contributing to the development of early feudal structures in the region. The researcher believed that findings of bronze encrustations, clay crucibles, and other items indicate the presence of technologically complex production processes that significantly influenced the economy and social development of Slavic settlements of that time (Хавлюк, 1988). Thus, the scientist particularly emphasized the socio-economic significance of these craft centres.

In 1990, P. Khavliuk dedicated his work to ceramic production of the Cherniakhiv culture in the territory of Middle Dnister region and the territory between Dnipro and Dnister from the 2nd to 4th cent. AD. The researcher noted that until the end of the 2nd cent. AD, the region was dominated by the Zarubyntsi culture, where ceramics were produced exclusively by hand. However, with the emergence of the Cherniakhiv culture, there was a sharp transition to the use of the potter's wheel. P. Khavliuk emphasized that this technological innovation, as well as kilns for firing, was borrowed, meaning they did not develop gradually (Хавлюк, 1990). This demonstrates both attention to technological aspects of production and the ability to analyse cultural changes.

P. Khavliuk paid special attention to the variety of kilns found in the region. He identified types with a support, with a supporting wall, and mixed, linking them to different cultural influences – Celtic and Roman. The author also emphasized the geographical distribution of technologies: west of

Kamianets-Podilsky, mixed type kilns prevailed, to the south – Roman type, and in the Southern Buh region – ancient Roman type kilns (Хавлюк, 1990). Thus, data was thoroughly systematized for understanding intercultural interactions.

The scientist noted that from the 3rd cent. AD, due to contacts with the northern Black Sea cities, the Cherniakhiv population gained access to new technologies and foreign craftsmen (Хавлюк, 1990), thereby emphasizing the importance of trade for craft development.

The researcher emphasized that from the late 3rd – early 4th cent. AD, mass production of grey pottery dominated in the region. He drew attention to the concentration of ceramic production in specialized settlements 15–20 km apart, which, in his opinion, indicates a high level of craft organization. P. Khavliuk also mentions the use of slave labour (Хавлюк, 1990), indicating his deep familiarity with the complex socio-economic structure of the studied society.

Analysing archaeological findings, the author noted inscriptions of Greek and Roman origin on Cherniakhiv ceramics – evidence of cultural connections and the influence of the ancient world on local production (Хавлюк, 1990). Attention to epigraphic monuments further demonstrates the scientist's interdisciplinary approach.

P. Khavliuk's research on the processing of non-ferrous metals in the Zarubyntsi culture in the Southern Bug region in 1992 contains observations that bronze metallurgy played a significant role in the lives of local tribes, despite the lack of their own raw material base (Хавлюк, 1992), which indicates an understanding of the complexity of economic processes in ancient societies.

P. Khavliuk paid special attention to the origin of the raw materials. He noted that bronze was imported in the form of ingots, and part of the metal was obtained by remelting imported items. The researcher emphasized that bronze artefacts were found in almost all settlements of the region, indicating mass production and high demand for such items (Хавлюк, 1992). Therefore, the author deeply considered the economic mechanisms of that time.

P. Khavliuk highlighted the use of various techniques, including mold casting, forging on wax models, stani, and basma techniques. He paid special attention to the smelting of bronze in crucibles, the use of domestic hearths, and blacksmith forges. P. Khavliuk also emphasized the diversity of the Zarubyntsi craftpersons' products. He described bracelets, neck torcs, beads, pendants, and fibulae, noting the high artistic quality of some items (Хавлюк, 1992). P. Khavliuk also focused on the craftpersons' tools, describing a specialized set that included punches, chisels, small hammers, drawplates, pliers, ladles, molds, abrasives, and scissors (Хавлюк, 1992). This indicates a systematic approach to research and attention to the details of the technological process.

The researcher also examined the specialization of craftsmen. According to his conclusions, non-ferrous metals were primarily processed by blacksmiths, but he did not rule out the existence of jewellery specialists, given the mass production and specificity of jewellery making (Хавлюк, 1992). Thus, attention was also paid to the socio-economic aspects of the craft.

Of particular importance in the work is the identification of production centres: Maryanivka, Raiok, Parkhomivka, and Haiok, where particularly skilled craftpersons lived (Хавлюк, 1992). This indicates the comprehensive work of the scientist with archaeological findings.

Overall, P. Khavliuk concluded that the level of non-ferrous metal processing in the Zarubyntsi culture of the Southern Buh region was quite high. This is confirmed, in his opinion, by the variety of techniques, the complexity of the products, and the mass production capable of meeting the wide demand for metal products that resembled and replaced gold (Хавлюк, 1992). Therefore, the work formed a holistic picture of the development of crafts and technologies in the Zarubyntsi culture based on the synthesis of the studied data.

In 1999, P. Khavliuk dedicated a separate article to the jewellery craftsmanship of the Uliches in the Southern Bug region and the Prut-Dnister interfluvium during the 9th – 13th cent. (Хавлюк, 1999).

The researcher strongly opposed the views of pre-revolutionary scholars such as N. Kondakov and V. Sedov, who considered the level of artistic craftsmanship among the Slavs to be low. He also criticized B. Rybakov for underestimating the ability of Slavic craftsmen to master complex jewellery techniques (Хавлюк, 1999). This criticism demonstrates P. Khavliuk's desire to reassess established historiographical views based on new archaeological data.

A key aspect of the study is the emphasis on the local origin of the Ulichian jewellery craftsmanship. P. Khavliuk categorically rejected the idea of a decisive influence from Arabs or Eastern peoples on the development of this craft. Instead, he insisted that the Ulichian jewellery craftsmanship developed independently, due to local socio-economic conditions (Хавлюк, 1999). This assertion is a significant contribution to understanding not only the economic development of the Slavic tribes but also their culture as a whole.

Based on his own archaeological research, during which many artefacts were found, P. Khavliuk provided a detailed description of the level of jewellery craftsmanship among the Uliches, who lacked their own raw material base. He emphasized that Uliches craftpersons mastered complex jewellery techniques, including filigree, granulation, fine forging, metal soldering, wire drawing, mold

casting, wax model making, and the creation of matrices and stamps (Хавлюк, 1999). The researcher noted that the craftsmen used specialized tools such as stamps for embossing shapes, drawplates for wire drawing, and miniature scales for weighing metal and finished products (Хавлюк, 1999). The detailed description of jewellery-making technology demonstrates P. Khavliuk's deep knowledge of jewellery technologies.

The scholar paid special attention to the production of earrings, which he considered the main product of Ulichian jewellers. He described two main types of earrings: hollow (openwork) and massive (solid). P. Khavliuk also noted other types of jewellery made by Ulichian craftpersons, such as lunulae, round and bipyramidal pendants, openwork beads, torcs, rings, and buttons. He emphasized that the craftsmen constantly improved their skills, as evidenced by the evolution of forms and techniques in their work (Хавлюк, 1999). Thus, the work systematically categorizes Ulichian jewellery items.

Importantly, P. Khavliuk insisted on revising the attribution of certain archaeological finds. In particular, he argued that earrings previously considered P. Khavliuk emerges as an archaeologist and historian who was not afraid to revise established theories and sought to comprehensively illuminate the history of ancient crafts and technologies, taking into account the results of his own archaeological surveys and excavations, primarily in the Southern Buh region, using a complex of research approaches, including experimental archaeology, comparative analysis, and integration of data from various scientific disciplines. The scientist's attention was drawn not only to purely technological aspects but also to economic and social aspects of craft development.

The main directions of P. Khavliuk's research encompass pottery, metallurgy, millstone production, and jewellery making of various cultural groups and periods: Zarubyntsi and Chernyakhiv cultures, early Slavs, and Uliches. Key theoretical foundations of P. Khavliuk's works include rethinking the role of local traditions in the development of crafts, particularly insisting on the independent development of Ulichian jewellery making. He also made an important contribution to understanding the evolution of millstone production technologies, ceramics, and metal items.

Based on archaeological findings, the researcher drew conclusions about the level of craft development, production specialization, and trade connections, considering the development of crafts in a broad economic and social context.

It is important to note the evolution of P. Khavliuk's ideas throughout his scientific career. His later works demonstrate a more critical approach to established theories and a deeper understanding of the complexity of cultural interactions in craft development.

Although P. Khavliuk's works contain a deep analysis of many aspects of ancient crafts, he also pointed out the need for further research, particularly in the field of cultural influences and technological exchanges between different tribes and cultures.

«Volynian» were actually Ulichian (Хавлюк, 1999). This effort to reassess historical facts demonstrates the researcher's critical approach to established scientific views.

Conclusions. P. Khavliuk emerges as an archaeologist and historian who was not afraid to revise established theories and sought to comprehensively illuminate the history of ancient crafts and technologies, taking into account the results of his own archaeological surveys and excavations, primarily in the Southern Buh region, using a complex of research approaches, including experimental archaeology, comparative analysis, and integration of data from various scientific disciplines. The scientist's attention was drawn not only to purely technological aspects but also to economic and social aspects of craft development. The main directions of P. Khavliuk's research encompass pottery, metallurgy, millstone production, and jewellery making of various cultural groups and periods: Zarubyntsi and Chernyakhiv cultures, early Slavs, and Uliches. Key theoretical foundations of P. Khavliuk's works include rethinking the role of local traditions in the development of crafts, particularly insisting on the independent development of Ulichian jewellery making. He also made an important contribution to understanding the evolution of millstone production technologies, ceramics, and metal items. Based on archaeological findings, the researcher drew conclusions about the level of craft development, production specialization, and trade connections, considering the development of crafts in a broad economic and social context. It is important to note the evolution of P. Khavliuk's ideas throughout his scientific career. His later works demonstrate a more critical approach to established theories and a deeper understanding of the complexity of cultural interactions in craft development. Although P. Khavliuk's works contain a deep analysis of many aspects of ancient crafts, he also pointed out the need for further research, particularly in the field of cultural influences and technological exchanges between different tribes and cultures.

Investigating the impact of P. Khavliuk's works on further study of ancient crafts and technologies is a promising direction for future research.

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