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# Issues of archaeological and architectural research conducted during the reconstruction of the Royal Castle in Warsaw

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**Abstract:** The decision to rebuild the Royal Castle in Warsaw entailed many activities beyond strict construction work. An opportunity was seen to conduct thorough scientific research on an object that until then had been inaccessible to architectural researchers or archaeologists. Paradoxically, the complete destruction of the Castle became the only unique opportunity to undertake this field research. The article summarises the activities undertaken in the research field before and during the restoration of the Royal Castle, emphasising the complexity and difficulties of the research process. The study covers various aspects, from decision-making through the implementation of research tasks to the complexity of methodological issues. The most important discoveries resulting in the creation of theories about the origins of Warsaw Castle and Warsaw itself are presented. This was when the so-called modern archaeology was born, and the research at the Warsaw Castle can be considered pioneering.

It should be noted that the presented study does not exhaust the entire subject. It is only an attempt to summarise the work undertaken in a social act to save cultural heritage and to show how heroic and admirable the work of a committed scientific community was.

**Keywords:** archaeological excavations; architectural research; cultural heritage; methodology; reconstruction

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## 1. Introduction

Cultural heritage plays a significant role in shaping national and social identity. On the one hand, it serves as evidence of the past, which contemporary societies strive to preserve to pass on values, traditions, and memories to future generations. On the other hand, it also acts as a factor shaping successive generations. This influences modern societies' socioeconomic and cultural development, and preserving tangible and intangible cultural heritage strengthens interpersonal bonds and education and promotes cultural diversity. It should also be emphasised that protected and safeguarded monuments inspire creators, attract tourists, and form the foundation of scientific research, enabling a better understanding of human history and its evolution.



When discussing protecting and safeguarding tangible heritage, particularly historic buildings, it is crucial to consider that environmental and human factors threaten them. For many years, efforts have been underway to preserve, conserve, or restore damaged cultural heritage sites [1]. It is crucial to highlight that invaluable sources include archival photographs, plans, maps, and vector drawings [2–6] and documentation derived from them using modern measurement methods based on Structure-from-Motion and Multi-View Stereo algorithms.

The use of archival images to generate lost documentation from archival images acquired from various heights at different altitudes has been employed, among other things, for the reconstruction of the shape of the Bamiyan Buddha statue in Afghanistan [7] (Gruen et al., 2004), destroyed during World War II, the Palazzo di Cosimo de' Medici in the Fortezza Vecchia site (Livorno, Italy) [4], the reconstruction of the shape of Dresden Zwinger damaged during World War II [8], and the partially lost architectural-archaeological documentation obtained between 1934 and 1939 in Lusatian Brought in Biskupin (Poland) [2].

## **2. The Beginnings of the Reconstruction of the Royal Castle in Warsaw**

The reconstruction of the Royal Castle in Warsaw has been taken up many times in the literature. Various aspects of the decision to rebuild the castle walls have been presented. The most common theme is the significance of the rebuilt monument as a symbol of a reborn nation after the devastating years of war [9]. This information breaks through to the forefront in almost all accounts, reinforced by a message about the unfavourable political climate. The rightness of this message is undeniable, but against the backdrop of the political disputes and the tremendous social uprising arose the conviction that a unique and unrepeatable opportunity for thorough historical, archaeological and architectural research of the Castle had arrived.

The decision to prepare and conduct this kind of research was made possible by the Sejm's Resolution of July 2, 1949, on the necessity of rebuilding the Castle to be used as a Museum of Polish Culture. The response from the scientific community was impressive. Teams from all scientific units participated in the research, supported by the capital's conservator's office.

The complete destruction of the castle paradoxically provided the opportunity for large-scale excavations. The plan was to survey the entire area covered by the earthworks. This was the first time in the history of archaeology that a challenge of this type, with no analogue in this scientific discipline, was undertaken. Surveys in an urban environment were not standard, even less so on a site with such complex stratigraphy.

## **3. Preliminary Work Before the Start of the Reconstruction**

During the work at the Castle site, virtually all methods known at the time were used, from wide-area surveys through survey research to observations limited only to the supervision of construction work. For the first time in Poland, wide-hole drilling was used to diagnose stratigraphic layers [10,11]. It should be noted that modern archaeology has been practised only since the 1950s, that is, since the research conducted in Warsaw. In the first phase, comparative material was lacking for the monuments acquired and the research methods used [12]. There was also a lack of legal regulations concerning the conservation protection of zones where archaeological monuments occur, especially in urban areas. This often gave rise to conflicts between archaeologists and builders. It was a constant battle against time and construction deadlines. Archaeological teams repeatedly worked two shifts, staying in the field for up to 11 months a year. Only in 1971 was it possible to conduct



systematic excavations. In 1948-49, it was only thanks to the interventions of Prof. Jerzy Antoniewicz and Ludwik Sawicki and the Minister of Culture and Art that archaeological supervision was introduced during the construction of the W-Z route [13]. Eng Tadeusz Żurowski undertook the lone battle on the construction site. Thanks to his observations, we have information about relics of a timber and earth embankment with a box structure on the southern slope of the castle. Unfortunately, at that time, examining and documenting the discovered relics from laconic references was impossible. T. Żurowski, we know that he dated the structure back to the end of the 13th or early 14th century [14].

Three phases can be distinguished in the post-war study of the castle. The first falls between 1949 and 1952. The second is the time of tidying up the castle grounds in the 1960s. The last, the third, was related to the reconstruction of the Castle, begun in 1971 [15].

In the first period, work began as early as December 1949 and was carried out as part of the "Research work at the Warsaw Castle" project financed by the PMA (State Archaeological Museum). Art historian and archaeologist Aleksandra Świechowska and architect Zdzisław Tomaszewski headed the project. In 1951, the Commission for the Study of Old Warsaw [16], a particular purpose of bringing together representatives of various scientific fields whose task was to organise and undertake interdisciplinary research, began its activities. At the southwest corner of the Castle, a semicircular tower of the outer city wall was uncovered, and in the Main Courtyard, the first traces of a castle moat were found. The time of its functioning was determined based on pottery fragments found in its fill in the 14th century [17]. Soon, in 1952, all research work in the Castle area was abruptly halted for political reasons. In 1963-67, research activity was limited to rescue work, which involved supervising and observing excavations during construction. Bogusław Gierlach led the archaeological engineer's team and carried out architectural supervision. Alexander Król. Only in 1969 was it possible to establish regular research excavations at the eastern elevation of the Great House (Curia Maior). Jacek Strupiechowski conducted the archaeological work, while the architectural analysis was carried out by Eng Przemysław Gartkiewicz [18].

In 1960 - 62, a detailed inventory and analysis of the cellars of the three parts of the east wing of the Royal Castle was made by Antoni Kaśinowski [19]. Using Skórewicz's drawings and the findings of the work from 1949 to 1953, he identified several phases of construction, reconstruction, or adaptation of this part of the castle's foundation [20]. Unfortunately, work in areas where the oldest relics could or did occur was carried out without the participation of an archaeologist; only P. Gartkiewicz worked closely with archaeologist J. Strupiechowski. The lack of cooperation with the archaeological team undoubtedly affected the conclusions' quality, although Kaśinowski's findings were, in many cases, groundbreaking. For future researchers of the castle's past, his findings became the basis and starting point for considering the origins of today's residence. In the context of previous archaeological discoveries, the most interesting facts concerning the oldest Warsaw Castle assumptions are related to the Justice Court Tower and the castle moat. It was then found that the Ducal House was larger than previously thought because it connected directly with the Justice Court Tower. The inner space consisted of three rooms, of which only the northern one had a basement at the time of construction. The absolute chronology of the Justice Court Tower was established in the 2nd quarter of the 14th century, and the complex of the Duke's House Curia Maior dates to the early 15th century [20].

In 1962, during the work on securing and reconstructing a single-post Renaissance cellar, traces were encountered that could be linked to the remains of the foundation of some buildings earlier than the cellar walls. At that time, a cluster of boulders was registered,



which, it was inferred, formed the last, lower part of the foundation, laid on clay-sand mortar. The structure was considered a relic of the so-called Crane Tower (Szoraw) mentioned in written sources in a 1379 privilege of Prince Janusz I, through which the original entrance to the castle grounds was to lead.

In 1965, the Historic Preservation Company began its activities at the castle, initiating the reconstruction of the so-called "Royal Kitchens" and the former sculpture-painting studio, now known as "Bacciarell's". From an analysis of the sources, it appeared that the Minor Court (Curia Minor), a building erected in the mid-15th century, should be located in this area. It was a one-story building serving residential functions intended for the expanding Ducal Court. The technical condition of the uncovered relics of the Gothic walls did not allow their preservation [21].

#### **4. The work undertaken in the reconstruction of the Royal Castle in Warsaw**

The 1971 decision to rebuild the castle allowed the continuation of field research work. The Civic Committee for Reconstruction of the Castle entrusted the coordination of archaeological work to Aleksandra Swiechowska, while Antoni Kašinowski directed architectural research.

Since 1971, work on the castle has been carried out simultaneously in several areas. In the northern part of the pre-castle, the research was carried out by the team of the Archaeological and Conservation Workshop of the PKZ o/Warszawa under the direction of MA Barbara Buczek-Płachtowa, commissioned by the Conservator of Monuments of the City of Warsaw. The result of this stage of research was the uncovering of all preserved relics of the basement walls of the so-called "shed", i.e. the building of the Land Courts Chancellery mentioned in sources for the first time in 1432 [22], and traces of which were encountered as early as 1949-1952 [23]. The uncovered fragments of walls were identified with relics of medieval walls visible on the plan published by K. Skórewicz [24]. However, the cellars were preserved by re-plastering them, which indicates the intention to continue using this room. This was also evidenced by the portal connecting the basement with the interior of the west wing and the preserved level of the 17th-century floor. Based on finds excavated from the cellar's backfill, it can be concluded that its use was discontinued only in the 20th century. This is evidenced, among other things, by numerous tiles dating to the 19th/20th centuries [25].

In the area of the Wladyslaw Tower, the work was conducted by a team from the Institute of Fundamentals of Architecture Development at the Warsaw University of Technology under the direction of Dr Jerzy Widawski, with archaeological cooperation from the team of the Historical Museum of the City of Warsaw, led by Lidia Eberle. No Gothic threads were found in the uncovered foundations, which finally cut off the discussion about its early metric. However, in the wall of the Great House, the outline of a portal was discovered, testifying to the existence of a direct exit to the courtyard from the north basement of the Court [25].

Some information was also obtained about buildings outside the castle's fortifications. The remains of a farm oven were encountered during the reconstruction of the foundation of the castle's northern wing in April 1973. Vasa buildings had destroyed its north part. The structure was completely sunk into the ground, entirely built of bricks and laid in a diagonal Polish thread. At the bottom of the kiln was a layer of heavily parched calcic clay about 5 cm thick. Based on the ceramic material from the layers of the kiln fill, it was determined that the period between its use and backfilling could not have been extended and was within the first half of the 14th century [26].



Among the most critical architectural discoveries is the registration in the foundation of the south wing of four fragments of a brick wall built in the Vendian thread. The dimensions of the bricks make it possible to date it to the 4th quarter of the 14th century. This wall connected the Justice Court Tower with the Krakow Gate, which rose in the southern part of the present Castle Square. Simultaneously with the wall, a building 14 meters wide and unknown length was erected. These discoveries changed previous theories about the ducal castle's layout and successive construction phases. It was essential to establish that at the end of the 14th century, that is, before the erection of the Great House, there was already a residential building in the southern area of the Castle [27, 28].

Reconstruction was a very complex process, not only in terms of construction or conceptual design. It was also a great challenge for the research teams. The conditions under which the work was carried out were far from comfortable. Unfortunately, the opportunity to thoroughly study the castle area was not fully seized. Despite the efforts of many specialists, time pressure and the priority of construction work meant that researchers had to step aside. Given the conditions under which the decision to rebuild the Royal Castle in Warsaw and the general political atmosphere, the haste was understandable. Reconstruction has risen to the status of a symbol - a symbol not only of political change, but above all of the phenomenon of the great social movement of Poles at home and abroad, who united in rebuilding Warsaw's royal residence.

However, the results of the research work carried out during the restoration of the Castle were reflected in the design process. It should be considered an unqualified success, as should the inclusion in the design of several elements found in the early stages of archaeological and architectural research. One of these was the exposed outline of a well adjacent to the Justice Court Tower, which it was decided to make visible. Similarly, a relic of the northern wall of the Great House stuck in the walls of the Renaissance basement, witnessing another phase of expansion of the ducal residence, was treated similarly. Another relic decided to be preserved is the canal, which runs from the royal kitchens through the central risalit to the Saxon staterooms [29]. An exposed tower of the second line of the defensive wall located at the southwest corner of the castle was also secured [30]. It is still possible to expose this reli.

In subsequent phases of research strictly related to the restoration, once elements that were not included in the project were uncovered, their fate was decided by the Architectural and Conservation Commission.

In one case, the importance of the object was recognised, and complete restoration was carried out. The case in question is the basement mentioned above of the Land Courts building or the so-called court shed. The entire preserved walls were uncovered in 1971, and a year later, the relic was conserved, supplemented and covered with concrete vaults, respecting the original shape. It was connected by a spiral staircase to the adjacent first-floor room [29].

In three cases, the importance of the objects was recognised, secured and left underground. Such a step was taken in the cases of the escarpment of the Great House, which supports the northeast corner of the building, the sewage sump at the east wall of the Great House, one of eight such objects built between 1778 and 1815 [31], and the foundations of the Central Risalit, which were backfilled with sand and their crowns poured with concrete screed [29].

There were also cases when the importance of the object was recognised, but preservation was impossible. Doomed was the foundation of the 16th-century building



discovered in the northeast wing, on the north side of the Renaissance basement. A similar fate befell the relics of Sigismund Augustus' so-called curled east: the staircase added to the Great House during its reconstruction during the reign of the last of the Jagiellons—predecessors of the Wladyslaw Tower [29].

## **5. Methods of Architectural Documentation**

The development of design documentation and execution was entrusted to the State Company Pracownie Konserwacji Zabytków. The design team, headed by Prof. Jan Boguslawski, was responsible for recreating the massing and spatial arrangement of the interiors in the pre-1939 outline and dimensions and incorporating all the surviving details into their former place. The principal architectural designers on Prof. Boguslawski's team were Irena Oborska and Mieczyslaw Samborski.

The design process used historical iconography in engravings, paintings, and drawings and preserved expansion projects from particular eras, inventory sketches, and pre-war photographs. In the reconstruction of the interiors, the collection of drawings and plans for the wall decoration of the Castle's various rooms and the collection of inventories and accounts relating to the Castle's historical furnishings and decoration proved very useful.

The inventory and design work proceeded almost in unison, which was no small challenge for the designers. Many aspects had to be taken into account during the architectural inventory. The surviving architectural details in the ruins were sorted out regarding functional affiliation, location, and technical condition. The object's state of preservation and the possibility of its reuse had to be evaluated continuously.

A thorough inventory of architectural relics showed that the castle interiors were highly irregular, often deviating from the outline of the walls. There were practically no right angles in the original castle, making it very difficult to reconstruct them and put the surviving original elements in their place. Due to the great irregularity of the castle interiors, the shape of the halls was determined photogrammetrically using plotted geometry.

Some decor designs had to be drawn at a scale of 1:1 due to the irregularity and complexity of the elements from which they were initially made. One example is the floor in the Old Audience Room. Its area is 126m<sup>2</sup>. Solving the technical problem of creating such a large drawing in the design studio was necessary. For this purpose, an unconventional method was used. The help of the Gdynia Shipyard was requested. The designers produced a small drawing on a scale of 1:20, then projected from an 18-meter-high tower for routing ship hulls. In a community deed, shipyard workers reproduced this 1:1 scale drawing on specialised plastic tracing paper stretched below, which was then processed over for several months in the design studios.

The castle was rebuilt using the same technology and materials used in historical times. Thanks to the fact that historical credibility was preserved during the reconstruction, and thanks to due diligence in the reconstruction, the Old Town and the Royal Castle in Warsaw have been inscribed on the UNESCO World Heritage List.

## **6. Summary**

The archaeological and architectural research accompanying the castle reconstruction was an unprecedented event. It should be acknowledged that this was pioneering research in historical archaeology. International convention defining the principles of conservation and restoration of architectural monuments, the so-called Venice Charter, was adopted only in 1964 [32], long after the activities in Warsaw began. Despite unfavourable conditions, in a situation where the priority was to rebuild the destroyed city, several significant discoveries



were made due to such an extensive campaign. New research methods were developed, both archaeological and architectural. Until then, fieldwork had not been practised in architectural research. Methods were introduced based on the cooperation of an archaeologist and an architect in the study of architecture using the archaeological process. This methodology was successfully used in studying the Old Town in Warsaw, castles in Liwa and Ciechanow and the Abbey of the Virgin Mary in Tum near Leczyca [27]. Many scientific studies have been produced, providing a basis for analysing historical material. Undoubtedly worthy of mention are the studies of Jerzy Kruppe on Warsaw's late medieval ceramics [33, 34, 35, 36] and the study of the table of historical bricks for the Castle and Old Town in Warsaw by Zdzisław Tomaszewski [37, 38], which to this day is used as a research criterion to help date the walls.

Despite the lack of a comprehensive summary of research results, despite some attempts, the research work at the Warsaw Castle should be considered an enormous success.

**Conflicts of Interest:** "The author declare no conflict of interest".

## References

1. Stylianidis, E. CIPA - Heritage Documentation: 50 Years: Looking Backwards. *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci.* **2019**, XLII-2/W14, 1–130, doi:10.5194/isprs-archives-XLII-2-W14-1-2019.
2. Zawieska, D.; Markiewicz, J.; Kopiasz, J. Development of True Orthophotomaps of the Fortified Settlement at Biskupin, Site 4, Based on Archival Data. *Archaeol. Prospect.* **2019**, 26, 333–360, doi:10.1002/arp.1748.
3. Bevilacqua, M.G.; Caroti, G.; Piemonte, A.; Ruschi, P.; Tenchini, L. 3D Survey Techniques For The Architectural Restoration : The Case Of St . Agata In Pisa. **2017**, XLII, 22–24, doi:10.5194/isprs-archives-XLII-5-W1-441-2017.
4. Bevilacqua, M.G.; Caroti, G.; Piemonte, A.; Olivieri, 3D. Reconstruction Of Lost Architectural Volumes By Integration Of Photogrammetry From Archive Imagery With 3-D Models Of The Status Quo. **2019**, XLII, 6–8.
5. Kazhdan, M.; Bolitho, M.; Hoppe, H. Poisson Surface Reconstruction. In Proceedings of the Eurographics Symposium on Geometry Processing (2006); 2006.
6. Girelli, G.B.V.A.; Zanutta, M.M.A. Use Of Historical Images For The Documentation And The Metrical Study Of Cultural Heritage By Means Of Digital Photogrammetric Techniques. **2007**, 1–6.
7. Gruen, A.; Remondino, F.; Zhang, L. Image-Based Reconstruction of the Great Buddha of Bamiyan , Afghanistan.
8. Maiwald, F.; Henze, F.; Niebling, F. Photogrammetric Analysis Of Historical Image Repositories For Virtual Reconstruction In The Field Of Digital Humanities Photogrammetric Analysis Of Historical Image Repositories For Virtual Reconstruction In The Field Of Digital Humanities. **2017**, doi:10.5194/isprs-archives-XLII-2-W3-447-2017.
9. Klekot, E. Constructing a 'monument of national history and culture' in Poland: the case of the Royal Castle in Warsaw, *International Journal of Heritage Studies*, 18:5, 459-478, 2012, DOI: 10.1080/13527258.2011.637944.



10. Świechowska, A. O najdawniejszej Warszawie w świetle dotychczasowych badań archeologicznych. *Wiadomości Archeologiczne* 1954, 20, 221–233.
11. Strupiechowski, J. Wiercenia badawcze na Zamku królewskim w Warszawie i Gnojnej Górze w latach 1964-1965. *Warszawskie Materiały Archeologiczne* 1969-1971, 6.
12. Canti, M.; Meddens, F.M. Mechanical Coring as an Aid to Archaeological Projects. *J. Field Archaeol.* 1998, 25, 97–105.
13. Rozwałka, A. Archaeology in a town, a town in archaeology. Selected issues of archaeological research of historical towns. *Analecta Archaeologica Ressoiviensia* 2012, 7, 13–24.
14. Meyza, K. Badania archeologiczne na Placu Zamkowym w latach 1977-1983. *Almanach muzealny* 2003, 8–9.
15. Żurowski, T. Badania archeologiczne na trasie W-Z w roku 1948 w Warszawie. *Ochrona Zabytków* 1949, 2/6, 87–93.
16. Garus, J. Archeologia na Zamku królewskim. Cześć pierwsza. *Kronika Zamkowa* 1991, 1 (23), 58–59.
17. Szwankowska, H. Komisja Badań Dawnej Warszawy, prace architektoniczne i historyczne, 3–21; Szczypińska, W. Komisja Badań Dawnej Warszawy, prace archeologiczne. *Kronika Zamkowa* 1991, 1 (23), 22–26.
18. Dobkowski, M. Ceramika z fosy grodowej na Dziedzińcu Wielkim Zamku Królewskiego. *Kronika Zamkowa* 1991, 1, 95–118.
19. Garus, J. Archeologia na Zamku królewskim. Część druga. *Kronika Zamkowa* 1991-1992, 2 (24), 3–31.
20. Kąsinowski, A. Warszawa – Zamek Królewski. Badania architektoniczne środkowej części skrzydła wschodniego wraz z podsumowaniem badań architektonicznych z lat 1960-62; Szczecin, 1962; manuscript in the archives of the Royal Castle in Warsaw.
21. Kąsinowski, A. Warszawa - Zamek Królewski. Zespół piwnic gotyckich skrzydła wschodniego; Szczecin, 1960; manuscript in the archives of the Royal Castle in Warsaw; Świechowska, A. Dyskusja o najdawniejszym grodzie warszawskim. *Warszawskie Materiały Archeologiczne* 1969-1970, 4-5, 218–219.
22. Król, A. O odkryciu i znaczeniu relikwii architektonicznych na terenie Zamku Królewskiego. *Warszawskie Materiały Archeologiczne* 1967, 2, 41–44.
23. Wolff, A. Źródła do dziejów Warszawy z lat 1313-1549. *Rocznik Warszawski* 1979, 15, 13.
24. Kąsinowski, A. Sprawozdanie z badań architektonicznych Zamku Królewskiego w Warszawie przeprowadzonych w okresie od czerwca do listopada 1971 r. In *Siedem wieków Zamku Królewskiego w Warszawie*; Warszawa, 1972; 38.
25. Skórewicz, K. Zamek Królewski w Warszawie na tle badań architektonicznych i archiwalnych 1915-1924. *Architekt* 1924, 1–7.
26. Świechowska, A. Sprawozdanie z badań archeologicznych na Zamku Królewskim. In *Siedem wieków Zamku Królewskiego w Warszawie*; Warszawa, 1971; 43.
27. Ciuk, K. Piec gospodarczy z pierwszej połowy XIV wieku na Dziedzińcu Wielkim Zamku Królewskiego w Warszawie. *Rocznik Warszawski* 1979, 15, 105–112.
28. Kąsinowski, A. Badania architektoniczne jako materiał do projektu odbudowy Zamku Królewskiego. *Ochrona Zabytków* 1987, 1-2, 31.
29. Wrede, M. Domus - curia - domus ducalis - domus regalis - curia murata - domus magna lapidea - lapidea regia - stary dom murowany - kamienica. Budynek południowy Zamku Królewskiego w Warszawie (XIV-XVII w.). *Rekapitulacja. Kronika Zamkowa* 2009, 1/2 (57/58), 9–52.





30. Świechowska, A. Badania archeologiczne a odbudowa Zamku Królewskiego i jego otoczenia. *Ochrona Zabytków* 1987, 1-2, 37.
31. Widawski, J. Baszta przy Zamku – Warszawa Średniowieczna; Warszawa, 1975; 251–160.
32. Gartkiewicz, P. Badania architektoniczne na Zamku Królewskim w Warszawie w sezonie 1969. *Warszawskie Materiały Archeologiczne 1969-1970*, 4-5, 57–64; Świechowska, A. Nowe materiały do historii budowy Zamku Królewskiego w Warszawie. *Rocznik Warszawski* 1979, 15, 102.
33. Venice Charter. Available online: <http://www.international.icomos.org/venicecharter2004/index.html>.
34. Kruppe, J. *Studia nad ceramiką XIV wieku ze Starego Miasta w Warszawie*; Wrocław, 1961.
35. Kruppe, J. *Garncarstwo warszawskie w wiekach XIV i XV*; Wrocław, 1967.
36. Kruppe, J. *Badania fizykochemiczne ceramiki warszawskiej XIV-XVIII w.*; Wrocław, 1973.
37. Kruppe, J. W sprawie rzemiosła garncarskiego. *Warszawa Średniowieczna* 1975, 2, 145–149; Kruppe, J. *Garncarstwa późnośredniowieczne w Polsce*; Wrocław, 1981.
38. Tomaszewski, Z. Badania cegły jako metoda pomocnicza przy datowaniu obiektów architektonicznych. *Zeszyty Naukowe Politechniki Warszawskiej, Budownictwo* 1955, 4, 31–52.
39. Levandauskas, V.; Taluntytė, N. Lithuanian old brick size variations over time. *Meno istorija ir kritika [MIK]* 2012, 8, 131–149.