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INTERDISCIPLINARY EXAMINATION OF DOCUMENTS OF HISTORICAL SIGNIFICANCE

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Abstract

Implementation of forensic sciences in historical research has had a long tradition. Forensic sciences are applied in establishing whether historical objects, including documents, and works of art are genuine. The documents may have survived in various conditions and therefore their identification may pose numerous difficulties. Their examination commences with a decision what techniques should be employed to avoid damage to or destruction of a document. Complex nature of information included in a document calls for handwriting examination on the one hand, but on the other – for physico-chemical examination; in practice the range of implemented techniques varies from case to case, depending on their particular character. Currently the need to retrieve unreadable or invisible content of documents at various stages of degradation is of paramount importance. The research problem consists in effective implementation of scientific examination methods for revealing the content of unreadable documents.

Keywords*: Forensic sciences; Archaeology; Historical examination; Document examination; Unreadable document; Non-destructive examination; Destructive examination*

Introduction

Implementation of judicial sciences in historical research has had a long tradition. Forensic expert examination has been applied in, e.g. reconstruction of Nicolaus Copernicus's outward appearance [1]; anthropometric examination has also been implemented during the exhumation of royal tombs in the Wawel cathedral. Judicial sciences, including forensic sciences, are also implemented in determining authenticity of historical objects and works of art, which is paramount in determining their age and origin as well as in revealing forgery or fraud. Due to diversified nature of the material which such objects are made of (ceramics, wood, metal, paper, leather, etc.) their examination assumes an interdisciplinary character [2].

Historical documents attract special attention, e.g. the notorious case of Adolf Hitler's diaries or Chopin's letters to Delfina Potocka, when the documents in question were subject to identification examination several times [3]. Disputed authenticity of documents attributed to famous people is a matter of great interest for historians and collectors. The documents sometimes include the information which sheds new, and not necessarily favourable, light on their authors, and thus may cause controversy in biographical research [4].

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Historical documents have survived in various conditions. Those deposited in professional archives, where they are properly looked after, are usually best preserved. Paper especially requires appropriate conditions of storing (temperature, humidity, and exposure to light). Old documents infected with various micro-organisms may also constitute a threat to potential readers.

Examination of historical documents involves numerous problems. The essential issue is their condition, which necessitates a decision as to what type of examination may be carried out without a risk of causing damage or destruction. Complex nature of information "coded" in the document calls not only for identification handwriting examination but also for complex physical-optical and physical-chemical examination to determine, e.g. the type and homogeneity of ink, the document's age as well as the type and age of paper [5-10].

Determining the author of a document and revealing its content may essentially contribute to the verification of currently adopted hypotheses and formulation of new ones as to the circumstances, causes and effects of historical events.

One of the most obvious examples here would be the documents retrieved during the exhumation of the victims of the Katyn massacre; the documents were subject to forensic examination and some of them were quoted in a scientific conferences discussing the results [11-13]. As in accordance with the standards of international law crimes against peace and humanity as well as war crimes are not subject to statute of limitations, the documents and other objects discovered on the victims may constitute important evidence in the ongoing legal proceedings. Therefore, it is paramount that they are retrieved, restored and stored professionally. The documents found on the bodies of victims of war crimes are of varying nature: they may be official (military commissions, IDs) and private documents, such as letters, diaries, notes, etc. Their effective analysis may constitute a valuable source of information and help to reconstruct the facts of the crime. The above is the premise for the activity carried out by the Bureau of Search and Identification of the Institute of National Remembrance in Poland and abroad. Forensic archeology is also developing in Poland in the process of searching and identifying victims of homicide crimes [14-19].

For nearly a decade after the end of World War II there was very strong resistance against the communist rule in Poland imposed by the Soviet Union, manifesting itself as an anti-communist armed underground movement; until 1963, when the last partisan was killed in combat, from 120 to 180 thousand people may have served in various capacities and for various periods of time in the independence underground movement. Over a dozen thousand people were killed in uneven combat, were executed or murdered; several dozen thousand others were sentenced for many years of imprisonment and until the end of the communist rule in Poland were regarded second-class citizens.

One of the hundreds of armed resistance groups was a National Armed Forces (NSZ – Narodowe Siły Zbrojne) unit commanded by Henryk Flame, nom de guerre Bartek, numbering at the peak of its activity in summer 1946 more than 300 partisans supported by a network of intelligence and supply groups. Active in the mountainous areas of the Beskids in southern Poland, they defied the communist repressive system, while the area remained beyond the control of the new authorities. Confronted with this situation the government security forces initiated a repressive action, which ultimately resulted in the annihilation of the unit. The action's pivotal element was the operation "Avalanche", which resulted in one of the greatest mass murders in the history of communist Poland.

In the summer of 1946 the Ministry of Public Security in Warsaw made a decision to go ahead with the operation "Avalanche". The key role was played by an officer from the III Department of the Ministry, an ex-soldier of the wartime underground Home Army Henryk Wendrowski, who had adopted the pseudonym of "captain Avalanche". In the complex

operation he was aided by another officer from the same department Czesław Krupowies, a.k.a. "Korzeń" or "Kossowski". They posed as representatives of the Silesian District of the NSZ – at that time already fictitious organisation, totally under control of the government security forces. In a relatively short time "Capt. Avalanche" won the trust of the initially distrustful "Bartek", who believed an alleged order to redeploy the unit to the west, where they were to join general Anders's army. "Bartek" agreed to redeploy three groups of his men, each numbering from 95 to 150 soldiers, according to varying estimates. The destination of the first stage of redeployment was the Opole region, where they were supposed to spend the last night before crossing the border to the west. In reality they were transported to three, previously designated places where they were murdered in September 1946. In each instance the scenario was the same. The partisans were transported in lorries driven by the Ministry's operatives to remote locations, where they were greeted by other security men posing as the local NSZ people. The partisans were served supper and alcohol doped with soporific drugs. In the early morning, when the tired and dazed NSZ men were unable to put up any resistance, they were attacked by 40 Soviet NKVD soldiers and 70 Polish security officers. The men from the first group were murdered with shots in the back of their heads in an isolated house near Łambinowice; subsequently their bodies were buried in two mass graves. Approximately a week later the second group were transported to the former German airfield in Stary Grodków near Grodków, where they died in an explosion when a wooden barrack in which they slept was blown up. The last group were murdered in the same way – in an explosion of the blown up forester's lodge "Hubertus" situated near the village of Baruty on the border between the Opole and Silesian provinces [20].

Despite extensive effort, until today the search commenced in 1990 has failed to locate all the graves of the victims of the murder from September 1946. A relative breakthrough in the search carried out by the Institute of National Remembrance took place in March and April 2016 in the airfield in Stary Grodków [21-22], where the remains of nearly thirty partisans were found (Fig. 1).

Fig. 1. Photograph of the place where the partisans' bodies were found.

Aim and methodology of research

During the exhumation of the body of one of the victims a considerably degraded, unreadable fragment of a document – a piece of folded newspaper – was found (Figs. 2 and 3). It was assumed that the documents inside pages may include important handwritten information. Occasionally, revealing such information may result in determining important circumstances of an event (farewell letters, victim's last words).

Fig. 2. Fragment of the garment where the folded document was found

Fig. 3. Overall view of the document – the newspaper found on inspection of the clothes

The document was subject to physico-optical and physico-chemical identification examination, aiming at revealing the handwritten content.

The document was examined in the Document Examination Laboratory at the Department of Forensic Sciences, University of Wrocław, and the Restoration Department of the National Ossoliński Institute in Wrocław.

The piece of newspaper, which obviously must have come from the early 1940s, had been folded many times (Fig. 3). The paper was considerably discoloured, broken along the lines where it was folded and exceptionally brittle. Under the influence of dampness and micro-organisms the layers of the paper formed one compact mass. Acidity of the paper and the conditions in which it remained adversely affected its condition.

Acidity primarily concerns the mass-produced paper from the mid-19th until the 1990s, rendering it exceptionally impermanent and prone to quick disintegration. The innovations introduced in paper production at the beginning of the 19th century, such as wood pulp, use of soda pulping, sulphite process, sulphate process to produce cellulose mass and adding rosin [23] to paper mass considerably lowered paper's quality and strength. The acidic environment of paper production resulted in disintegration of cellulose fibres and even at the stage of sheet forming on the screen paper's strength considerably decreased (Gluing paper in acidic environment (pH 4–5) following Mortiz Friedrich Illig's invention of 1806/1807).

The ultimate purpose of any identification examination, including restoration and conservation, is preserving and strengthening the historical matter, interrupting the degradation processes and removing the resulting harmful products. The ultimate aim of the examination was to reveal the possible content of the document, which would enable further investigation. Apart from destructive physical-chemical methods, non-destructive methods, which do not cause any damage to the structure of the analysed object/document, are implemented. The latter are primarily physical-optical methods; additionally, the X-ray based methods are sometimes used [24]. Physical-chemical methods are implemented when non-destructive methods are ineffective or for some reason can not be applied [25].

Physico-optical examination

This type of examination involves observation of a document in visible, infrared and ultraviolet light. A frequent research problem is how to combine various non-damaging techniques to read unreadable documents; the issue is also extensively discussed in the literature [26-30].

Optical examination also includes the methods employing electromagnetic waves of a particular length. The resulting optical signal is received directly visually or with the use of the equipment amplifying the signal, processing it and recording.

Direct visual observation entails numerous limitations resulting from the very nature of sight and therefore visual assessment of an object is subjective and as such may lead to error because in each case the decisive factor is the examiner's personal preference. An examiner, just like every other person, may variously interpret the results of observation made without appropriate specialist equipment.

In the analysed case the first stage of examination aimed at testing the quality of ink and homogeneity of paper forming the lump, which was made with the use of a Video Spectral Comparator VSC 2000/HR, a SuperMacroPhotographic set and a microscope MiScope. The equipment enables the analysis of a document in various lighting conditions (NIR-VIS-UV) with the use of appropriate filtration of images, observed at various angles and different magnifications (Equipment of this type is commonly used in document examination laboratories all over the world). The equipment's full potential was used; the document in question was observed from near infrared across the complete range of visible light to ultraviolet. It was also analysed in monochromatic light spot using selected cut filters (630nm/740nm monochromatic light observed through the 780nm cut filter), which may reveal possible luminescence of ink (or its remains on the document). Spectroscopic methods failed to find anything inside the lump of paper delivered for the analysis (Fig. 4 and 5).

Fig. 4. Fragment of the document seen in 850nm infrared light

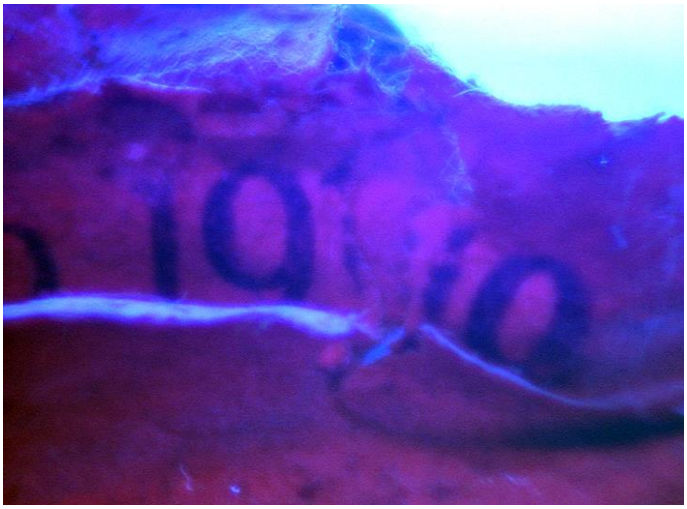

Fig. 5. Fragment of the document simultaneously seen in 365nm ultraviolet light and in transparent light

Physico-chemical examination

In view of the above the next step consisted in implementing physical-chemical methods in the examination of the document. The object was first disinfected (Chemical disinfection with Rotanox gas - mixture of ethylene oxide and carbon dioxide - in a fumigation chamber) and then photographed.

A number of tests were carried out to select the most effective way of conservation and a series of consecutive steps of examination was designed to unfold the document, which minimised the risk of mechanical destruction and damage of print and possible handwritten notes on the paper. The tests proved that the document can be unfolded after it is properly moistened – if moistening was not sufficient, the layers of paper could not be separated and were not elastic; if it was excessive, the paper became spongy and fell apart. Finally, 70% water solution of ethyl alcohol was used, which did not cause disintegration of paper due to a relatively short time of evaporation. A small chamber was constructed to ensure even and controlled moistening.

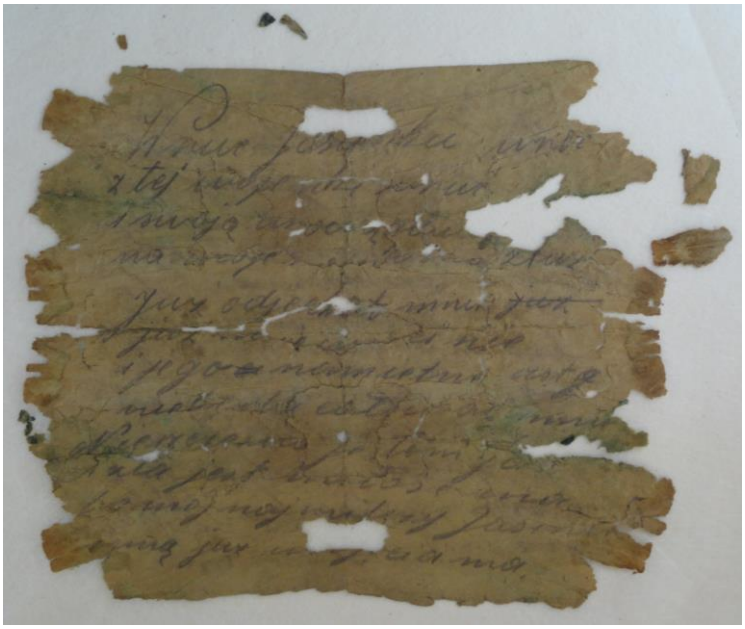

Fig. 6. Professional conservation of the document was carried out by the specialists from the Restoration Department of the National Ossoliński Institute in Wrocław. The displayed fragment carries legible handwritten lyrics of the song „Rozkwitały pąki białych róż". The document is stored at the Institute of National Remembrance. It was found on the body of one of the soldiers from Capt. Flame's (nom de guerre Bartek) NSZ unit. The soldiers were murdered in 1946; their mass grave was discovered in 2016 in Stary Grodków, Province of Opole, Poland.

Additionally, when the paper was unfolded the solution of alcohol was applied locally with a brush. Because the paper was in a very bad condition, no further chemical treatment was implemented. To strengthen, protect and prepare the document for further examination, the missing bits of paper were filled in with paper mass and margins were added. For this purpose a mixture of cotton fibres matching in colour was used. The margins of the width of ca. 1.5cm were added to avoid direct touching of the document. In the next step the document was strengthened with 1.5% water solution of methyl cellulose, placed on 4g/m^2 Japanese Kozu Natur paper and dried in a bookbinding press. All these steps required exceptional patience, caution and dexterity. Moisturising sessions lasting several hours allowed several minutes of work on the object. Because it could include valuable information, utmost care was taken to avoid disintegration of the paper, which is not always possible in the case of objects/documents of such a degree of degradation. The physical-chemical analysis yielded very good results, which enabled revealing the full content of the document (Fig. 6).

Conclusions

In the discussed case application of non-damaging physical-optical methods proved insufficient and only the implementation of physical-chemical methods yielded satisfactory results, effectively revealing the handwritten notes. However, even these methods would have proven ineffective if the layers of the compact lump of paper had not been successfully unfolded. The documents recovered in similar circumstances are often considerably damaged, requiring very cautious, individual and experimental approach; therefore, their processing requires co-operation of experts from various fields in order to select appropriate methods. Due to their condition historical documents must in each case be examined with greatest care and

caution. All available non-destructive methods should be implemented first and only when they prove ineffective should physical-chemical methods be applied.

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