# Summary of professional accomplishments


## Dr. Barbara Wagner


The Sciences

**List of published scientific papers or professional creative works and information of teaching achievements, scientific collaborations and popularization of science**


**Faculty of Chemistry, University of Warsaw**


**Warsaw 2013**

# Contents

## 1. Personal data

Name (First, last): **Barbara Wagner** (maiden name **Bogusławska**)
Place of birth: Warsaw
Date of birth
Married, two children
Address of residence:

## 2. Diplomas and scientific degrees

| | |
|---|---|
| **1997-2002** | **University of Warsaw, Faculty of Chemistry, Laboratory of Basic Aspects of Analytical Chemistry**<br>- doctoral degree in Chemistry, dissertation title: *Physicochemical investigation of cellulose degradation caused by iron gall inks in historical manuscripts* (supervised by prof. Ewa Bulska, PhD.) |
| **2002**<br>(14.04–28.04) | **University College London Centre for Sustainable Heritage, London, UK**<br>– Course completion*: Science and technology of the environment for sustainable protection of cultural heritage* |
| **1998**<br>(9.11–11.12) | **ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property), Rome, Italy**<br>– Course completion*: Non-destructive and Micro-destructive Analytical Methods for the Conservation of Works of Art and Historic Buildings* |
| **1992-1997** | **University of Warsaw, Faculty of Chemistry, Laboratory of Basic Aspects of Analytical Chemistry**<br>- master's degree in chemistry, thesis title: *Direct analysis of trace amounts of Fe and Cu in manuscripts with slurry sampling graphite furnace AAS* |
| **1997**<br>(30.06–25.07) | **Central European University, Budapest, Hungary**<br>– *Class completion: Cultural Heritage in Danger* |
| **1988 - 1995** | **Academy of Fine Arts in Warsaw,** Faculty of Conservation and Restoration of Works of Art, Department of Conservation and Restoration of Old Prints and Graphics<br>- master's degree in arts, thesis title: *Conservation of the old print "Missale Fratrum Eremitarum ordinis Divi Pauli Primi Eremite", Venice, 1537 r. (published by Luceantonii Junte Fiorentini),* (cum laude: RECTOR'S DISTINCTION) |

## 3. History of employment:

| | |
|---|---|
| **From 1997** | **University of Warsaw, Faculty of Chemistry, Laboratory of Basic Aspects of Analytical Chemistry**<br>- adjunct professor (since 2003)<br>- doctoral student (1997-2002) |
| **1996-1997** | **National Library in Warsaw,** Laboratory of Conservation of the Department of Preservation and Conservation of Library Collections; Division of Old Prints<br>- conservator |
| **1995-1996** | **University Library in Warsaw,** Deparment of Preservation and Conservation,<br>- conservator |
| **1994-1995** | **Academy of Fine Arts in Warsaw,** Faculty of Conservation and Restoration of Works of Art, Department of Conservation and Restoration of Old Prints and Graphics<br>- intern-assistant |

## 4. List of publications comprising the scientific achievement referred to in Art. 16(2) of the Act of 14 March 2003 on scientific degrees and titles and the degrees and titles in arts (Journal of Laws no. 65, item 595, as amended) selected as the basis for the habilitation proceedings

### 4.A Title of scientific achievement

# Laser Ablation in the Analysis of Antiquities by Inductively Coupled Plasma Mass Spectrometry

### 4.B Publications comprising the scientific achievement:

| | Author(s), date of issue, title, journal or publishing house, volume, pages. | IF | Number of citations Web of Science/Scopus |
|---|---|---|---|
| H1 | **B.Wagner**, E.Bulska (2004) *On the use of Laser Ablation Inductively Coupled Plasma Mass Spectrometry for the investigation of the written heritage*, Journal of Analytical Atomic Spectrometry 19:1325-1329. | IF (2004) = 3.926 | 22/23 |

I planned and conducted the experimental works and LA-ICPMS measurements, interpreted the results, prepared the manuscript draft, charts as well as figures, and edited answers to the reviewers. My estimated percentage contribution is 85%.

| | | | |
|---|---|---|---|
| H2 | **B.Wagner**, E.Bulska, W.Sobucki (2008) *Magnesium distribution in paper subjected to deacidification investigated by means of Laser Ablation Inductively Coupled Plasma Mass Spectroscopy*, Journal of Cultural Heritage 1: 60-65. | IF (2008) = 0.854 | 7/11 |

I planned and performed the LA-ICPMS measurements and interpreted the results. I prepared the manuscript draft, charts as well as figures, corresponded with the editor and edited answers to the reviewers. My estimated percentage contribution is 85%.

| | | | |
|---|---|---|---|
| H3 | **B.Wagner**, E.Bulska, A.Drewniak, W.Sobucki, D.Rams (2009) *LA-ICPMS investigations of a long-term effect of indoor air pollution on paper*, Analytical Chemistry/ Warsaw 54: 1253-1264. | IF (2009) = 0.702 | 1/1 |

I planned and directly supervised ICP-MS measurements, designed the measurement methodology, conducted LA-ICPMS measurements, participated in discussions with co-authors on the interpretation of the results, prepared all charts and figures as well as the manuscript draft. My estimated percentage contribution is 75%.

| | | | |
|---|---|---|---|
| H4 | **B.Wagner**, A.Nowak, E.Bulska, J.Kunicki-Goldfinger, O.Schalm, K.Janssens (2008) *Complementary analysis of historical glass by SEM/EDS and LA-ICPMS,* Microchimica Acta 162: 415-424. | IF (2008) = 1.910 | 10/13 |

I planned and conducted LA-ICPMS measurements, participated in discussions with co-authors on the interpretation of the results, and prepared the manuscript draft. My estimated percentage contribution is 65%.

| | | | |
|---|---|---|---|
| H5 | V.Van Der Linden, P.Cosyns, O.Schalm, S.Cagno, K.Nys, K.Janssens, A.Nowak, **B.Wagner**, E.Bulska (2009) *Deeply coloured and black glass in the northern provinces of the Roman Empire: differences and similarities in chemical composition before and after 150 AD*, Archaeometry 51: 822-844. | IF (2009) = 1.355 | 9/13 |

I planned and supervised LA-ICPMS measurements of archaeological glass. I participated in the edition of LA-ICPMS measurements summary when preparing the publication. My estimated percentage contribution

is 10%.

| | | | |
|---|---|---|---|
| **H6** | T.Purowski, P.Dzierżanowski, E.Bulska, **B.Wagner**, A.Nowak (2012) *A study of glass beads from the Halstatt C-D from Southwestern Poland. Implications for glass technology and provenance*, Archaeometry 54: 144-166. | IF (2011) = 1.183 | 1/0 |

I planned and supervised LA-ICPMS measurements of archaeological glass beads. I participated in the edition of LA-ICPMS measurements summary when preparing the draft manuscript and in subsequent discussion on answers to the reviewers' questions regarding the results of chemical analyses. My estimated percentage contribution is 15%.

| | | | |
|---|---|---|---|
| **H7** | **B.Wagner**, A.Nowak, E.Bulska, K.Hametner, D.Günther (2012) *Critical assessment of the elemental composition of Corning Archaeological Reference Glasses by LA-ICPMS*, Analytical and Bioanalytical Chemistry 402:1667–1677. | IF (2011) = 3.778 | 1/1 |

I planned the LA-ICPMS measurements using different laser wavelengths in the ablation stage, conducted part of the measurements and supervised the remaining measurements. I also prepared the manuscript draft, charts as well as figures, corresponded with the editor and edited answers to the reviewers after discussing them with the co-authors. My estimated percentage contribution is 75%.

| | | | |
|---|---|---|---|
| **H8** | **B.Wagner**, W.Jędral (2011) *Open ablation cell for LA- ICP-MS investigations of historic objects*, Journal of Analytical Atomic Spectrometry 26: 2058-2063. | IF (2011) = 3.220 | 4/4 |

I prepared preliminary drafts of the open ablation chamber, planned and conducted LA-ICPMS studies using open ablation chamber in order to verify its potential uses in the analyses of historic objects and reference materials. I interpreted the results, prepared the manuscript, charts as well as figures, corresponded with the editor and edited answers to the reviewers. My estimated percentage contribution is 95%.

| | | | |
|---|---|---|---|
| **H1-H8** | **overall values for selected papers:** | **IF = 16.928** | **58/66** |

In all the aforementioned studies, I was the author of the concept of the LA-ICPMS analyses, and I supervised the experiments using this method while performing a significant part of these measurements by myself. Copies of papers comprising the monothematic series of publications are listed in Appendix 4, while co-authors' declarations defining the percentage contribution of each of the co-authors to individual publications are listed in Appendix 2c.

## 4.C ■ Summary of the scientific goals and major results of presented publications

My interest in chemistry began during the last years of my studies at the Faculty of Conservation and Restoration of Works of Art of the Academy of Fine Arts in Warsaw. While establishing a detailed schedule of conservation works on restored old prints and manuscripts, it became necessary to perform examinations to identify materials used when making the objects. Deeply convinced on the need to understand not only the relationship between the chemical composition of historical matter and its current conservation status, but also the mechanisms of reactions occurring over time after the object's creation, I took up studies at the Faculty of Chemistry of the Warsaw University while continuing my studies in conservation.

In 1995 I defended my master degree thesis at the Department of Conservation and Restoration of Old Prints and Graphics of the Faculty of Conservation and Restoration of Works of Art, Academy of Fine Arts in Warsaw, by carrying out practical conservation of two historical objects: an old print "Missale Fratrum Eremitarum ordinis Divi Pauli Primi Eremite" from a renowned Venetian publishing house Luceantonii Junte Fiorentini from 1537 and a 19th-century graphics by J.L.Benoist, titled "Christ by a pillar". My conservation works were supervised

by prof. Józef Charytoniuk and prof. Ewa Ważyńska. The topic of the theoretical annex, supervised by prof. Władysław Sobucki, was conservation chemistry. I studied, documented and described the effect of ammonium thioglycolate on the optical properties and strength of pater. My master degree thesis was awarded a Rector's Distinction.

Right after defense, I took up a half-time position of conservator assistant at the Department of Preservation and Conservation of the Warsaw University Library. After one year, I was proposed to transfer to the National Library in Warsaw, where I worked at Department of Preservation and Conservation of Library Collections, Division of Old Prints, until 1997.

Since 1996, I have been associated with the Laboratory of Basic Aspects of Analytical Chemistry at the Faculty of Chemistry of the Warsaw University, where I completed my master degree studies and lated defended my doctoral dissertation supervised by prof. Ewa Bulska. My interest in conservation and professional experience at the time met a warm welcome and resulted in interdisciplinary research combining analytical chemistry and preservation of antiquities My doctoral dissertation on physicochemical assessment of cellulose degradation caused by iron gall inks in historical manuscripts was defended in 2002 and awarded the Polish Academy of Sciences' Committee on Analytical Chemistry prize for the best doctoral dissertation in analytical chemistry in 2003. Publications I co-authored in years 1999-2004 present the results of my studies conducted at the Laboratory of Basic Aspects of Analytical Chemistry of the Faculty of Chemistry, Warsaw University as part of master-degree and doctoral dissertation research. The subject of conservation of historic manuscripts discussed in these papers reflects my approach to the topic as developed during my earlier art restoration studies and work on protecting library collections.

After my doctoral defense in 2002, I became interested in the capabilities of the new LA-ICPMS analytical system, which had been purchased by the Faculty of Chemistry (University of Warsaw) as the first system of that kind in Poland. Generally, my research focused on three leading subjects, including:

- restoration techniques, where I proposed the use of LA-ICPMS in the studies on effective methods for protection and conservation of library collections;
- archaeometry, where LA-ICPMS was used in determination of elemental composition of archaeological artifacts;
- methodology of LA-ICPMS application in microdestructive analyses of historical objects.

My studies made use of the LA-ICPMS technique and a precisely elaborated methodology of analysis of historical objects, characterized by their unique requirements in terms of chemical analyses. Historical objects are subject to legal protection and the requirements regarding analytical methods that can be used in the studies are very high. Selected publications comprising the presented scientific achievement are a series of monothematic articles on the applicability of LA-ICPMS in the analyses of historical objects, paying attention to both the unique character of the historical matter subject to analysis and to the requirements made on the state-of-the-art instrumental methods.

## 5. List of other (not included in the achievement mentioned in sect. 5) published research studies and scientific achievement indices

### 5.A ■ Scientific publications in journals included in the Journal Citation Reports (JRC) database

**List of scientific papers published before the doctorate:**

**1** B.Wagner, S.Garboś, E.Bulska, A.Hulanicki (1999) Determination of iron and copper in old manuscripts by slurry sampling graphite furnace atomic absorption spectrometry and laser ablation inductively coupled plasma mass spectrometry, Spectrochimica Acta, Part B 54:797-804. **IF** $_{(1999)}$ **= 1.758**

In this study, I formulated the study problem that emerged from my conservation practice, I conducted the GF-AAS analyses illustrating the results with appropriate graphs and figures, prepared the first draft and made final corrections to the manuscript. My estimated percentage contribution is 65%.

**2** E.Bulska, B.Wagner, M.G.Sawicki, Investigation of complexation and solid-liquid extraction of iron from paper by UV/VIS and atomic absorption spectrometry, Microchimica Acta (2001) 136: 61-66. **IF** $_{(2001)}$ **= 1.017**

In this study, I formulated the research problem, performed UV/VIS and GF-AAS measurements, prepared the first draft of the manuscript and edited answers to the reviewers. My estimated percentage contribution is 60%.

**3** B.Wagner, E.Bulska, T.Meisel, W.Wegscheider, Use of atomic spectrometry for the investigation of ancient manuscript, Journal of Analytical Atomic Spectrometry (2001) 16: 417-420. **IF** $_{(2001)}$ **= 3.017**

In this study, I formulated the research problem, I planned and performed ICP-MS and GF-AAS measurements, prepared the first draft of the manuscript and edited answers to the reviewers. My estimated percentage contribution is 60%.

**4** B.Wagner, E.Bulska, A.Hulanicki, M.Heck, H.M.Ortner, Topochemical investigations of ancient manuscripts, Fresenius Journal of Analytical Chemistry (2001) 369: 674-679. **IF** $_{(2001)}$ **= 1.649**

In this study, I formulated the research problem, participated in the processing and interpretation of results, prepared the first draft of the manuscript and edited answers to the reviewers. My estimated percentage contribution is 55%.

**5** A.Malon, **B.Wagner**, M.Maj-Żurawska, E.Bulska, *Comparison of the Potentiometric, 31P NMR, and Zero-Point Titration Methods of Determining Ionised Magnesium in Erythrocytes,* Analytical Biochemistry (2002) 302: 220-223. **IF**$_{(2002)}$ **= 2.370**

In this study, I conducted the F-AAS measurements and summarized the results obtained using this analytical method. My estimated percentage contribution is 10%.

■ **List of scientific papers published after the doctorate:**

**7** **B.Wagner**, E.Bulska, *Towards a new conservation method for ancient manuscripts by deactivation of iron via complexation and extraction,* Analytical and Bioanalytical Chemistry (2003) 375:1148-1153. **IF** $_{(2008)}$ **= 1.715**

In this study, I formulated the research problem, planned and performed the measurements, prepared the first draft of the manuscript and edited answers to the reviewers. My estimated percentage contribution is 90%.

**8** K.Proost, K.Janssens, **B.Wagner**, E.Bulska, M.Schreiner., *Determination of localized $Fe^{2+}/Fe^{3+}$ ratios in inks of historic documents by means ofXANES*, Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms (2004) 213: 723-728. **IF** $_{(2004)}$ **= 0.997**

In this study, I formulated the research problem and participated in the XANES measurements as well as in the discussion on the obtained results. My estimated percentage contribution is 25%.

**9** **B.Wagner**, E.Bulska, B.Stahl, M.Heck, H.M.Ortner, *Analysis of Fe valency states in iron-gall*

*inks from XVIth century manuscripts by $^{57}$Fe Mössbauer spectroscopy*, Analytica Chimica Acta (2004) 527:195-201. **IF** (2004) **= 2.588**

In this study, I formulated the research problem, collected and appropriately prepared samples of medieval manuscripts, prepared the first draft of the manuscript and edited answers to the reviewers. My estimated percentage contribution is 75%.

10 Ž.Šmit, K.Janssens, E.Bulska, **B.Wagner**, M.Kos, I.Lazar, *Trace element fingerprinting of façon-de-Venise glass*, Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms (2005) 239: 94-99. **IF** (2005) **= 1.181**

In this study, I designed the measurement procedure and conducted LA-ICPMS measurements. My estimated percentage contribution is 15%.

11 A. Michalska, M. Wojciechowski**, B. Wagner**, E. Bulska, K. Maksymiuk, *Laser-ablation inductively coupled plasma mass spectrometry (LA-ICPMS) assisted insight into ion-selective membranes*, Analytical Chemistry (2006) 78: 5584-5589. **IF** (2006) **= 5.646**

In this study, I participated in the development of the LA-ICPMS measurement procedure. My estimated percentage contribution is 5%.

12 **B.Wagner**, M.L.Donten, M.Donten, E.Bulska, A.Jackowska, W.Sobucki, *Analytical approach to the conservation of ancient Egyptian manuscript "Bakai Book of the Dead": a case study*, Mikrochimica Acta (2007) 159:101-108. **IF** (2007) **= 1.959**

In this study, I participated in the measurements and discussions on the obtained results, prepared the first draft of the manuscript, corresponded with the editor and edited answers to the reviewers. My estimated percentage contribution is 65%.

13 D.Baralkiewicz, A.Hanć, A.Piechalak, B.Tomaszewska, **B.Wagner**, E.Bulska, *An analysis of long-distance root-to-leaf transport of lead in Pisum sativum plants by Laser Ablation-ICP-MS*, Int. J. Environ. Anal. Chem., (2009) 89: 651-659. **IF** (2009) **= 1.703**

In this study, I developed the measurement procedure, supervised the LA-ICPMS measurements and participated in discussions on the obtained results. My estimated percentage contribution is 65%.

14 M.Pakieła, M.Wojciechowski, **B.Wagner**, E.Bulska, *A novel procedure of powdered samples immobilization and multi-point calibration of LA-ICPMS,* J. Anal. At. Spectrom. (2011) 26:1539-1543. **IF** (2011) **= 3.220**

In this study, I formulated the research problem, and took part in the preparation of final manuscript and answers to the reviewers. My estimated percentage contribution is 15%.

15 D.Walaszek, M.Senn, M.Faller, L.Philippe, **B.Wagner**, E.Bulska, A.Ulrich, *Metallurgical characterization of copper alloy reference materials towards LA-ICP MS method development for minimal invasive analysis of ancient bronze samples*, Spectrochimica Acta, Part B (2012). Accepted for publication. **IF** (2012) **= 2.876**

In this study, I formulated the research problem, supervised part of the research involving LA-ICPMS measurements, and participated in processing the results and editing the final version of the manuscript. My estimated percentage contribution is 10%.

16 T. Purowski, A. Nowak, E. Bulska, **B. Wagner**, *Chemical composition analysis of the glass of a Horned eye-bead from Lubień,* Archaeologia Polona (2013). Accepted for publication.

In this study, I participated in LA-ICPMS measurements and the discussion on the results. My estimated percentage contribution is 15%.

17 S. Cagno, P. Cosyns, V. Van der Linden, O. Schalm, A. Izmer, I. Deconinck, F. Vanhaecke, A. Nowak, **B. Wagner**, E. Bulska, K. Nys and K. Janssens "*Composition data of a large collection of black-appearing Roman glass*" , Open Journal of Archeometry (2013). Accepted for publication.

In this study, I participated in LA-ICPMS measurements and preparation of manuscript. My estimated percentage contribution is 5%.

## 5.B ■ Inventions and crafts/industrial patterns subject to protection and presented at international or national exhibitions or fairs

- None

**5.C ■ Monographs, scientific publications in international or national journals other than included in database referred to in sect. 5.A**

■ **List of chapters in books and monographs:**

| | |
|---|---|
| **1** | K. Janssens, K. Proost, I. Deraedt, E. Bulska, **B. Wagner**, M. Schreiner (**2003**) *The use of focussed X-ray beams for non-destructive characterisation of historical materials,* In: "Molecular and structural archaeology: cosmetic and therapeutic chemicals" (G.Tsoucaris and J.Lipkowski, Eds.) Kluwer Academic Pub., Dordrecht, pp. 193–200. |
| **2** | E.Bulska, **B.Wagner** (**2005**) *A study of ancient manuscripts exposed to iron-gall ink corrosion*, In: "Non-destructive microanalysis of cultural heritage materials" (K. K.Janssens, R.Van Griecken, Eds.) Elsevier Science BV, Antwerp, pp. 755–788. |
| **3** | E.Bulska, **B.Wagner** (**2005**) *Investigation of novel conservation procedure for historical documents*, In: "Non-Destructive Testing and Microanalysis for the Diagnostics and Conservation of Cultural Heritage" ( R.Van Grieken and K.Janssens, Eds.) Balkema, Leiden, Antwerp, pp. 101–116. |
| **4** | E.Bulska, E.Kopyść, **B.Wagner**, I.Wysocka (**2006**) *Nowoczesne metody instrumentalne w badaniu specjacji bezpośrednio w ciele stałym. Wybrane przykłady* [State of the art instrumental methods in the direct speciation analyses of solids. Selected examples] (M.Jarosz, Ed.) Oficyna Wydawnicza Politechniki Warszawskiej, pp. 292–318. |
| **5** | A.Kanecka, D.Barałkiewicz, A.Piechalak, B.Tomaszewska, **B.Wagner,** E.Bulska 8 (**2009**) *Zastosowanie techniki LA-ICPMS do określenia specjacji ołowiu w organach grochu (Pisum sativum L.)* [LA-ICPMS in speciation of lead in the organs of pea (Pisum sativum L.)], in: *"Specjacja chemiczna – możliwości i zastosowania* [Chemical speciation - capabilities and applications] D.Barałkiewicz, E.Bulska, Eds.) Wydawnictwo Malamut, pp. 266-274. |
| **6** | **B.Wagner,** E.Bulska (**2010**) *Wprowadzania i analiza próbek stałych* [Introduction and analysis of solid samples] In: *"Metody analitycznej spektrometrii atomowej"* [Methods of analytical atomic spectrometry] W.Żyrnicki et al., Eds.) Wydawnictwo Malamut, pp. 292-310. |
| **7** | A.Ruszczyńska, **B.Wagner,** E.Bulska (**2010**) *Spektrometria mas plazmy indukcyjnie sprzężonej* [Inductively coupled plasma mass spectrometry] In: *"Metody analitycznej spektrometrii atomowej"* [Methods of analytical atomic spectrometry] W.Żyrnicki et al., Eds.) Wydawnictwo Malamut, pp. 146-179. |

■ **List of revewed conference materials:**

| | |
|---|---|
| **8** | **B.Wagner**, E.Bulska, T.Meisel, W.Wegscheider (**2000**) *Analytical study of ancient manuscripts by ICP-MS and GF-AAS for purposes of diagnostics and conservation*, Proceedings of 4th European Furnace Symposium, pp. 209–212. |
| **9** | **B.Wagner**, M.L.Donten, E.Bulska, A.Jackowska, W.Sobucki (**2002**) *Identification of inks and pigments in ancient Egyptian Book of Dead by SEM-EDS,* Proceedings of 7th International Conference on Non-destructive Testing and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage, ART 2002, pp. P77: 1-7. |
| **10** | E.Bulska**, B.Wagner**, *Investigation of iron-gall ink corrosion of ancient manuscript by non-destructive and microanalytical methods* (**2002**) Proceedings of 7th International Conference on Non-destructive Testing and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage, ART 2002, pp. IL: 1-9. |

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|---|---|
| **11** | E.Bulska, **B.Wagner**, B.Stahl, M.Heck, H.Ortner (**2002**) *On the use of Moessbauer spectroscopy for the investigation of Fe(II)/Fe(III) in ancient manuscripts,* Proceedings of 7th International Conference on Non-destructive Testing and Microanalysis for the Diagnostics and Conservation of Cultural and Environmental Heritage, ART 2002, pp. P76: 1-8. |
| **12** | K.Janssens, K.Proost, I.Deraedt, E.Bulska**, B.Wagner**, M.Schreiner (**2003**) *The use of focused X-ray beams for non-destructive characterization of historical materials - from elemental trace analysis towards chemical state investigations*, (G. Tsoucaris and J. Lipkowski, Eds.), Proceedings on a NATO Advance Study Institute on "Molecular and Structural Archaeology", NATO Science Series, II. Mathematics, Physics and Chemistry, Vol. 117, Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 193–200. |
| **13** | K.Janssens, K.Proost, **B.Wagner**, E.Bulska, M.Schreiner (**2004**) *Determination of localized Fe2+/Fe3+ ratios in inks of historic documents by means ofXANES*, Proceedings of the ICOM-CC Graphic Documents Meeting, Slovenia, pp. 27–28 |
| **14** | A.Hanc, D.Barałkiewicz, **B.Wagner**, E.Bulska, A.Piechalak, B.Tomaszewska, J.Yao (**2007**) *Distributed lead in tissues of pea roots (Pisum sativum) determined by LA-ICPMS*, Y. Zhu, N. Leep, R. Naidu, Eds.), Biogeochemistry of trace elements: Environmental, protection, remediation and human health, Tsinghua University Press, ISBN 978-7-302-15627-7, Beijing, China, pp. 328-330. |

**5.D ■ Collective works, collection catalogs, documentation of research, expert analyses, artistic works**

■ **Reports from studies (research documentation) conducted for:**

■■ **The National Library in Warsaw:**
1. A. Drewniak, **B.Wagner** (2005) *Evaluation of a usefulness of paper as an indicator of air pollution in urban areas / Study documentation*, Warsaw.

■■ **The National Museum in Warsaw:**
2. M.Donten, **B.Wagner** (2009) *Final report from the LA-ICPMA and SEM-EDS examination of pigments*, Warsaw.
3. A.Żukowska, **B.Wagner** (2010) *A report on the LA-ICPMS examination of pigments from Jacek Malczewski's paintings / Study documentation*, Warsaw.
4. **B.Wagner**, B.Wrzosek, K.Malinowska, M.Donten (2011) *A report on the examination of pigments from Jan Matejko's "Battle of Grunwald" using SEM-EDS, LA-ICPMS and Raman spectroscopy techniques / Study documentation*, Warsaw.
5. **B.Wagner** (2012) *A report on the LA-ICPMS examination of pigments collected from a case sarcophagus (Egypt, Meir, 12th dynasty) / Study documentation*, Warsaw.

■■ **Wroclaw University of Technology:**
6. **B.Wagner** (2012) *A report of LA-ICPMS examination of archaeological ceramics / Study documentation*, Warsaw.

■■ **The Wilanow Palace Museum in Warsaw:**
7. **B.Wagner**, K.Malinowska, M.Donten (2012) *A report presenting the results of SEM_EDS and LA-ICPMS examinations of red and black stoneware clays and their imitations / Study documentation*, Warsaw.

**5.E ■ Overall Journal Citation Reports (JCR) impact factor per publication year**

■ IF= 48.624

**5.F ■ Number of citations according to the Web of Science (WoS)**

- Number of citations = 216 (182 without auto-citations) as of February 2013

**5.G ■ H-Index Hirscha according to the Web of Science (WoS)**

- H-index = 10 (February 2013)

**5.H ■ Leadership in international and national research projects and participation in such projects**

- I was engaged as an investigator or project leader in more than ten research projects.

| Years: | |
|---|---|
| **2000-2002** | Principal investigator in the KBN 3 T09A 09819 grant headed by prof. E.Bulska, titled "*Physicochemical investigations of cellulose degradation caused by iron gall inks in historical manuscripts*" |
| **2001-2005** | Investigator in the grant project GRD1-2001-400000 "*PRAXIS: A Portable Raman X-Ray Spectrometer*" led by prof. K.Janssens, University of Antwerp, Belgium, Polish coordinator: prof. E.Bulska |
| **2002-2006** | Investigator in the grant project "*Detailed micro-spectrochemical investigation of historic ferro-gallic inks before and after conservation treatment*", realized as part of bilateral Polish-Flemish collaboration, Polish coordinator: prof. E.Bulska |
| **2005-2007** | Principal investigator in the grant project KBN 1 H01E 018 29 "*Evaluation of the euse of DTPA in conservation of manuscripts affected by ink corrosion* ", headed by prof. W.Sobucki, The National Library in Warsaw, 31/10/2005 - 30/12/2007 (I was the originator and the main author of this grant project, which was collaboratively realized by three institutions: The National Library, The Central Archives of Historical Records and the Warsaw University). |
| **2006-2007** | Head of the grant prroject BW 120000 - 501/68-BW-172117 (Faculty of Chemistry, Warsaw University) " *Optimization of laser ablation procedures in determinations of elemental and isotopic composition using mass spectrometry*" |
| **2007-2009** | Head of the grant project BW 120000 - 501/68-BW-175613 (Faculty of Chemistry, Warsaw University) " *Design of a mobile laser ablation cell and optimization of microsampling conditions allowing application of the new cell in quantitative analyses* " |
| **2008-2011** | Principal investigator in grant project NN204 241734 "*High-resolution laser microsampling in the analyses of spatial distribution of elements in archaeological, biological and geological samples using inductively coupled plasma mass spectrometry*", headed by prof. E.Bulska |
| **2010-2013** | Participation in a Polish-Swiss program "*CorrLas: Minimal invasive investigations of corrosion products on ancient metal objects using LA-ICPMS*", realized in 2010-2013 (Polish coordinator: prof. E.Bulska). |
| **2011-2014** | Head of the grant project 2011/01/B/ST4/00478 "*Laser ablation with ICPMS detection in examination of unique artifacts"* , ongoing: 2011-2014. |
| **2011-2014** | Principal investigator in the grant project 2011/01/D/HS3/06119 "*Nubian painting technology: history, types and conservation*", headed by dr. Dobrochna Zielińska, ongoing: 2011-2014. |
| **Other projects:** | |
| **2008 – 2010** | An investigator in the "*Yemrehannä Krestos project – documenting cultural heritage in Ethiopia*" project of the "Cultural Heritage without Borders" organization, coordinated by dr. Ewa Balicka-Witakowska of Uppsala University (Sweden). The studies were conducted using the LA-ICPMS (Laser Ablation Inductively Coupled |

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| | Plasma Mass Spectrometry) technique. The results were submitted as a report to the project head and described in a master degree thesis supervised by me at the Laboratory of Basic Aspects of Analytical Chemistry of the Faculty of Chemistry, Warsaw University/ |
| | Since 2009, I participated in several projects realized in collaboration between the Warsaw University and the National Museum in Warsaw: |
| **2009-2010** | The objective of **Project no. 1** was identification of pigments used in the paintings by Jacek Malczewski being a part of the collection of the National Museum in Warsaw. The studies were conducted using the LA-ICPMS technique. The results were submitted as a report to the National Museum in Warsaw and described in a master degree thesis supervised by me at the Laboratory of Basic Aspects of Analytical Chemistry of the Faculty of Chemistry, Warsaw University/ |
| **2010-2011** | The objective of **Project no. 2** was identification of pigments used in Jan Matejko's "*Battle of Grunwald*" using the Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM-EDS), Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS) and Raman Spectrometry techniques. The pigments were collected during restoration of the painting held in the collection of the National Museum in Warsaw. The study report was submitted to the Museum in September 2011. |
| **2011-2012** | The objective of **Project no. 3** was the analysis of the elemental composition of Böttger clay from the collection of the Wilanow Museum using the SEM-EDS and LA-ICPMS techniques and development of elemental authenticity standard for this group of historic artifacts, possibly allowing to discriminate between original artifacts of this valuable group and forged imitations available in the antiquities' market. |

## 5.I ■ International and national awards for scientific or artistic achievements

■ **Awards and distinctions:**

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| **1995** | **A distinction from the Rector of the Academy of Fine Arts in Warsaw for a master's degree thesis defended at the Department of Conservation and Restoration of Old Prints, Graphics and Skins, Faculty of Conservation and Restoration of Works of Art, Warsaw** |
| **2000** | Fresenius' Journal of Analytical Chemistry prize awarded for the best poster of Euroanalysis XI conference , Lisbon, Portugal (presenting author) |
| **2003** | Royal Society of Chemistry prize awarded for the best poster of Colloquium Spectroscopicum Internationale XXXIII conference, Granada, Spain (presenting author) |
| **2003** | **The Award of the Committee of Analytical Chemistry of the Polish Academy of Sciences for the best doctoral dissertation in analytical chemistry defended in 2002, Warsaw** |
| **2006** | Scholarship of the Rector of the Warsaw University |
| **2007** | Analytical and Bioanalytical Chemistry prize awarded for the best poster of Euroanalysis XIV conference, Antwerp, Belgium (presenting author) |
| **2010** | Prized for the best posters in sessions: "Forensic analytics" and: "Analytical Methods in the Protection of Antiquities" at the 8th Polish Analytical Chemistry Conference, Krakow (poster co-author) |

## 5.J ■ Presentations at international and national conferences

### ■ National conferences:

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| **1** | **B.Wagner**, E.Bulska, "*Modern chemical methods in the analysis of manuscripts*"; Chemical Analysis in the Protection of Antiquities Conference (AChwOZ) I, Warsaw, October 1999 |
| **2** | **B.Wagner**, M.L.Donten, A.Jackowska, *"Application of SEM and EDS techniques in the analysis of inks from the "Bakai Book of the Dead";* Chemical Analysis in the Protection of Antiquities Conference (AChwOZ) II, Warsaw, December 2001. |
| **3** | **B.Wagner**, E.Bulska, *"Potential and limitations of LA-ICPMS in archaeometric studies"*, Chemical Analysis in the Protection of Antiquities Conference (AChwOZ) III, Warsaw, December 2003. |
| **4** | **B.Wagner**, A.Drewniak. A.Ruszczyńska, E.Bulska, "*ICPMS with laser vaporization in the examination of historical objects"*, 9th Atomic Absorption Seminar, Ustron near Wisla, September 2005. |
| **5** | **B.Wagner**, W.Gumiński, E.Bulska, "*Mass spectrometry in the analyses of archaeological objects"*, Chemical Analysis in the Protection of Antiquities Conference (AChwOZ) IV, Warsaw, December 2005. |
| **6** | **B.Wagner**, J.Kunicki-Goldfiner, "*Elemental composition analysis in the studies of historical glass origin and technology. Methodology and interpretation of results*", Chemical Analysis in the Protection of Antiquities Conference (AChwOZ) VI, Warsaw, December 2006. |
| **7** | **B.Wagner**, "*Criteria for selection of analytical methods in the analysis of historical objects*", Sympozjum GBC-Poland Symposium, Slesin near poznan, May 2007 |
| **8** | **B.Wagner**, W.Sobucki, "*Distribution of magnesium in paper sheets deacidified using C-900 (Neschen) or CSC Book Saver methods"*, Chemical Analysis in the Protection of Antiquities Conference (AChwOZ) VII, Warsaw, November 2007. |
| **9** | A.Szlasa-Byczek, B.Orłowska, **B.Wagner**, "*Dramatic consequences of chemical procedures on historical objects. Chemical analysis as an aid in selecting restoration methods"*; Chemical Analysis in the Protection of Antiquities Conference (AChwOZ) VIII, Warsaw, December 2008. |
| **10** | **B.Wagner**, "*Potential and limitations of LA-ICPMS in chemical analysis*", 11th Atomic Absorption Seminar, Ustron near Wisla, September 2009 |
| **11** | **B.Wagner**, "*Chemical analysis in Preservation of Antiquities*", 8th Polish Conference on Analytical Chemistry, Krakow, July 2010 |
| **12** | **B.Wagner**, E.Bulska, A.Nowak, D.Walaszek, "*Direct elemental analysis of solid samples using LA-ICPMS: potential and limitations"*, "Chemistry feeds, clothes and protects" Symposium, GBC-Poland, Slesin, May 2011. |

### ■ international conferences:

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| **13** | E.Bulska, **B.Wagner,** "*Spectrometry in the Field of Cultural Heritage*"; Colloquium Spectroscopicum Internationale XXXI, Ankara, Turkey, September 1999 (oral presentation) |
| **14** | E.Bulska, **B.Wagner**, "*Solid sampling techniques in the investigation of ancient objects*"; 9th International Solid Sampling Colloquium, Niemcy, Merseburg, September 2000 (oral presentation) |
| **15** | E.Bulska**, B.Wagner**, "*Investigation of iron-gall ink corrosion of ancient manuscript by non-destructive and microanalytical methods*", 7th International Conference on Non-destructive Testing and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage, ART 2002, Antwerp, Belgium, 2002 (oral presentation) |
| **16** | K.Janssens, K.Proost, **B.Wagner**, E.Bulska, M.Heck, H.Ortner, M.Schreiner, and G.Falkenberg, "*Investigation of the $Fe^{2+}/Fe^{3+}$ redox equilibrium in inks of historical documents and model samples by means of micro –XANES*", European Conference on Energy Dispersive X-Ray Spectrometry, EDXRS 2002, Berlin, Germany, Septamber 2002 (oral presentation) |

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| **17** | K.Janssens, K.Proost, **B.Wagner**, E.Bulska, M.Schreiner, "*Determination of localized Fe2+/Fe3+ ratios in inks of historic documents by means of XANES*", ICOM-CC (International Council of Museums - Committee for Conservation) Graphic Documents Meeting, Ljubljana, Slovenia, June 2004 (oral presentation) |
| **18** | E.Bulska, **B.Wagner**, H.M.Ortner, B.Stahl, W.Wegscheider, T.Meisel, K.Janssens, K.Proost, "*On the use of analytical methods for the investigation of ancient manuscripts*", MIP Colloquium (Metals in Paper - Thematic Network EVK4-2002-20010), La Rochelle, France, July 2004 (oral presentation) |
| **19** | E.Bulska, **B.Wagner**, I.Wysocka, "*On the use of laser ablation inductively coupled plasma mass spectrometry*", Colloquium Spectroscopicum Internationale XXXIV, Antwerp, Belgium, September 2005 (oral presentation) |
| **20** | E.Bulska, **B.Wagner**, "*On the use of XANES for the investigation of the iron-gall ink phenomena in ancient manuscripts*", Synchrotron radiation for Art, Berlin, Germany, September 2006 (oral presentation) |
| **21** | **B.Wagner**, A.Drewniak, E.Bulska, "*Investigation of metal distribution over the surface and sub-surface domain of paper by LA-ICPMS*", Colloquium Analytische Atomspektroskopie CANAS, Konstanz, Germany, March 2007 (oral presentation) |
| **22** | E.Bulska, A.Ruszczyńska, **B.Wagner**, M.Wojciechowski, "*Analytical Advantageous of Laser Ablation Inductively Coupled Plasma Mass Spectrometry*", Colloquium Analytische Atomspektroskopie CANAS, Konstanz, Germany, March 2007 (oral presentation) |
| **23** | **B.Wagner**, "*Analytical Advantageous of Laser Ablation ICP MS in Archaeometry*", Workshop on Science for Conservation & Preservation of Cultural Heritage. Research & Education, Wroclaw, Poland, June 2007 (oral presentation) |
| **24** | **B.Wagner**, A. Drewniak, E. Bulska, D. Rams, W. Sobucki "*Investigation of paper surface and sub-surface regions by LA-ICPMS*", European Symposium on Atomic Spectrometry, 8th Indoor Air Quality Conference 2008, Vienna, Austria, April 2008 (oral presentation) |
| **25** | **B.Wagner**, M.Biesaga, M.Donten, M.L.Donten, "*Chemical analysis for art conservation Scanning Electron Microscopy techniques, presentation and case study examples*", ICYS Plovdiv, Bulgaria, June 2009 (oral presentation) |
| **26** | **B.Wagner**, "*Spectroscopic methods in analysis of cultural heritage*", European Symposium on Atomic Spectrometry, Weimar, Germany, September 2008 (oral presentation) |
| **27** | **B.Wagner**, "*The use of LA-ICPMS in analysis of Works of Art*", Colloquium Spectroscopicum Internationale XXXVI, Budapest, Hungary, September 2009 (oral presentation) |
| **28** | H.Sadek Kotb, A.Nowak, **B.Wagner**, E.Bulska, "*Glazed ceramic analysis by means of LA-ICPMS*", Lasers in the conserwation of Artworks LACONA VIII, Bucarest, Romania, September 2009 (oral presentation) |
| **29** | D.Walaszek, **B.Wagner**, E.Bulska, I.Segal, L.Halicz, "*Determination of elemental composition of apatite crystals by LA-ICPMS*", Colloquium Spectroscopicum Internationale XXXVI, Budapest, Hungary, September 2009 (oral presentation) |
| **30** | **B.Wagner**, M.Donten, B.Wrzosek, A.Lewandowska, "*Identification of pigments from a painting "Battle of Grunwald". Possibilities and limitations of using LA-ICPMS for mapping of micro-samples*", Euroanalysis XVI, Belgrade, Serbia, September 2011 (oral presentation) |
| **31** | **B. Wagner**, "*Analytical strategy for multi-elemental laser ablation ICP MS investigations of pigments from unique, historical objects*", European Symposium on Atomic Spectrometry ESAS, Tatranska Lomnica, Slovakia, October 2012 (oral presentation) |
| **32** | **B. Wagner**, K. Malinowska, M. Donten, I. Fuks, B. Szelegejd, "*Red stoneware analysis towards authentification of historic objects by SEM-EDS and LA-ICPMS*", the European Winter Conference on Plasma Spectrochemistry, Kraków, February 2013 (oral presentation) |

- **Invited Lectures:**

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| **1** | **B.Wagner**, *Assessment of cellulose degradation caused by iron gall inks in historical manuscripts*, GBC Symposium Analytics-Accreditation-Union, Ślesin near Poznan, May 2003 |
| **2** | **B.Wagner**, *ICPMS with laser vaporization in examination of historical objects*, 7th Polish Analytical Chemistry Conference. "Analytics in civilizational progress", Toruń, July 2005. |
| **3** | **B.Wagner**, *State of the art analytical methods in protection and conservation of historical objects*, 10th International Fair of Analytics and Measurement Techniques EuroLab 2008, Warsaw, March 2008. |
| **4** | **B.Wagner**, *Potential and limitations of LA-ICPMS in examination of historic glass*, Plenary Session of the Polish National Committee of the Association Internationale pour l'Histoire du Verre, Warsaw, May 2008. |
| **5** | **B.Wagner**, *LA-ICPMS in the analysis of historical objects*, a lecture for the students of the post-graduate course "State of the art analytical methods in examination of historical objects", Faculty of Chemistry, Jagiellonian University, April 2010. |
| **6** | **B.Wagner**, *LA-ICPMS in examination of solid materials*; Department of Analytical Chemistry, Faculty of Chemistry of the Warsaw University of Technology, 18 November 2010. |
| **7** | **B.Wagner**, *Physicochemical analyses in conservatory diagnostics of historical paper-based objects*, Institute of Nuclear Chemistry and Technology in Warsaw, 14 March 2011. |

## 6. Teaching and popularization achievements and information on international collaborations of the applicant

### 6.A Participation in European, other international, and national programs

- *Detailed micro-spectrochemical investigation of historic ferro-gallic inks before and after conservation treatment*, bilateral Polish-Flemish collaboration over years 2002-2006, program co-author, principal investigator
- *Yemrehannä Krestos project – documenting cultural heritage in Ethiopia",* projekt organizacji *"Cultural Heritage without Borders"*, 2008-2010, investigator;
- *CorrLas: Minimal invasive investigations of corrosion products on ancient metal objects using LA-ICPMS*, Polish-Swiss program of doctoral studies in years 2010-2013 - co-author, , partner.
- European Social Fund,Human Capital Operational Programme: "Warsaw University of Technology Development Programme", Submeasure 4.1.1 - Enhancement of university's teching potential; my lecture about *Analytical instrumental methods in identification of historical object forgeries*, given to the students of the Center for Advanced Studies in 2010 and 2011 was a part of this program.

### 6.B Active participation in international and national scientific conferences

Besides presentations listed in section 5.J, I authored or co-authored the following posters presented at national and international conferences:

- **Prior to doctorate**

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| **1** | **B.Wagner**, GF AAS in direct determination of trace amounts of Fe and Cu in paper samples (1996) "Chemistry and the Environment", Jankowice, Poland |
| **3** | **B.Wagner**, S.Garboś, E.Bulska, A.Hulanicki (1997) Direct analysis of trace amounts of Fe and Cu in manuscripts by absorption spectrometry with slurry graphite furnace sampling, 6th Poznan Analytical Seminar, "Novel methods of sample preparation and determination of |

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| | trace elements", Poznan, Poland |
| **4** | **B.Wagner**, S.Garboś, E.Bulska, A.Hulanicki (1998) Analytical aspects of determination of trace amounts of metals by GFAAS with slurry graphite furnace sampling, 7th Poznan Analytical Seminar, "Novel methods of sample preparation and determination of trace elements", Poznan, Poland |
| **5** | **B.Wagner**, S.Garboś, E.Bulska, A.Hulanicki (1998) Determination of Fe and Cu in Old Manuscripts by Slurry Sampling Graphite Furnace Atomic Absorption Spectrometry, III European Furnace Symposium, Prague, Chech Republic |
| **6** | **B.Wagner**, M.G.Sawicki, E.Bulska (1999) Atomic Absorption and UV/VIS Spectrometry in investigation of kinetic of Iron Complexation in Ancient Manuscripts, Colloquium Spectroscopicum Internationale XXXI, Ankara, Turkey |
| 7 | **B.Wagner**, M.G.Sawicki, E.Bulska (1999) A study of cellulose degradation in the presence of iron and copper ions, "Spectroscopic and Electroanalytical Methods in Chemical Analysis Symposium], Warsaw, Poland |
| **8** | **B.Wagner**, M.G.Sawicki, E.Bulska (1999) Evaluation of the efficacy of complexation removal of iron ions by UV/VIS spectrophotometry], 8th Poznan Analytical Seminar, "Novel methods of sample preparation and determination of trace elements", Poznan, Poland |
| **9** | **B.Wagner**, E.Bulska, T.Meisel (2000) ICP-MS in examination of historical manuscript following microwave-assisted mineralization of samples, 9th Poznan Analytical Seminar, "Novel methods of sample preparation and determination of trace elements", Poznan, Poland |
| **10** | A.Malon, M.Maj-Żurawska, **B.Wagner**, E.Bulska (2000) Determination of ionized magnesium in erythrocytes, 6th Polish Conference on Analytical Chemistry, Gliwice, Poland |
| **11** | **B.Wagner**, E.Bulska, T.Meisel, W.Wegscheider (2000) Analytical study of ancient manuscripts by ICP-MS and GF-AAS for purposes of diagnostics and conservation, IV European Furnace Symposium, Podbanske, Slovakia |
| **12** | **B.Wagner**, E.Bulska, A.Hulanicki, H.Ortner (2000) Investigation of iron-gall ink corrosion in ancient manuscripts by spectroscopic techniques, Euroanalysis, Lisbon, Portugal (winner of the Best Conference Poster prize). |
| **13** | M.Piaścik, I.A.Wysocka, **B.Wagner**, E.Bulska (2002) Pd, Rh and Ir as modifiers in the the determination of the selenium content of garlic suspensions using GF AAS, 11th Poznan Analytical Symposium "Novel methods of sample preparation and determination of trace elements", Poznan, Poland |

- **After doctorate:**

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| **14** | E.Bulska, **B.Wagner**, M.Heck, H.Ortner, B.Stahl (2002) On the use of Moessbauer spectroscopy for the investigation of Fe(II)/Fe(III) in ancient manuscripts, International Conference on Non-destructive Testing and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage, ART 2002, Antwerp, Belgium |
| **15** | **B.Wagner**, M.L.Donten, E.Bulska, A.Jackowska, W.Sobucki (2002) Identification of inks and pigments in ancient Egyptian Book of Dead by SEM-EDS, International Conference on Non-destructive Testing and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage, ART 2002, Antwerp, Belgium |
| **16** | **B.Wagner**, E.Bulska (2003) On the use of laser ablation inductively coupled plasma mass spectrometry for the investigation of the written heritage, Colloquium Spectroscopicum Internationale XXXIII, Granada, Spain (winner of the Best Conference Poster prize). |

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| **17** | M.L.Donten, M.Donten, M.Biesaga, **B.Wagner** (2004) Scanning Electron Microscopy (SEM) and Energy Desperssive Spectroscopy (EDS) applied in the conservation of ancient papyrus and investigation of middle age fabrics, The XIIIth European Microscopy Congress, Antwerp, Belgium |
| **18** | **B.Wagner**, A.Drewniak, E.Bulska, D.Rams, D.Jarmińska (2005) ICP MS investigation of paper indicators of air pollution influence on special collection of National Library in Warsaw, Colloquium Spectroscopicum Internationale XXXIV, Antwerp, Belgium |
| **19** | **B.Wagner**, M.Pakieła, A.Ruszczyńska, M.Wojciechowski, E.Bulska (2006) LA-ICPMS analysis supporting cultural heritage preservation and biological research, Laser Ablation Workshop, Zurich, Switzerland |
| **20** | **B.Wagner**, E.Bulska, K.Janssens (2006) XANES and GF AAS investigations of a new conservation treatment for manuscripts endangered by iron – gall ink corrosion, konferencja "Synchrotron Radiation for Art Analysis", Berlin, Germany |
| **21** | A. Czajka, I.Kotala, H.Machaj, **B. Wagner**, E. Bulska, W. Sobucki, D.Jarmińska, D.Rams, F.Zerek (2006) The evaluation of DTPA usefulness for manuscripts conservation. Report of the project on iron gall ink corrosion in Polish Archives and Libraries, Euroanalysis XIV, Antwerp, Belgium, 2007 |
| **22** | **B.Wagner**, E.Bulska, W.Gumiński (2007) A mystery of Neolithic graves from the north part of Poland: investigation of archaeological objects with LA-ICPMS, Euroanalysis XIV, Antwerp, Belgium (winner of the Best Conference Poster prize). |
| **23** | K.Jabłonka, **B.Wagner**, E.Bulska (2007) Direct comparison of glass samples by LA-ICPMS multielemental analysis, Euroanalysis XIV, Antwerp, Belgium |
| **24** | A.Hanć, D.Barałkiewicz, **B.Wagner**, E.Bulska (2007) Determination of selected elements in sewage sludge using Laser Ablation Inductively Coupled Plasma Mass Spectrometry, Euroanalysis XIV, Antwerp, Belgium |
| **25** | A.Nowak, D.Walaszek, **B.Wagner**, E.Bulska (2008) Laser Ablation Inductively Coupled Plasma Mass Spectrometry for Analysis of Cultural Heritage Objects, 8th Indoor Air Quality Conference 2008, Vienna, Austria |
| **26** | **B.Wagner**, E.Bulska, E.Kurek, A.Ruszczyńska, M.Wojciechowski (2009) On the use of speciation studies for designing a functional food, Colloquium Spectroscopicum Internationale XXXVI, Budapest, Hungary |
| **27** | A. Nowak, D. Walaszek, **B. Wagner,** E. Bulska (2009) Laser Ablation Inductively Coupled Plasma Mass Spectrometry for Analysis of Culture Haritage Objects, The National Conference "Granice rekonstrukcji w konserwacji zabytków" [Limits of reconstruction in conservation of antiquities], Warsaw, Poland |
| **28** | D. Walaszek, **B. Wagner**, E. Bulska, K. Kisielewicz, M. Kisielewicz (2010) Analytical capabilities of SEM EDS and LA-ICPMS in archaeometric studies es exemplified by direct analysis of samples from antique sarcophagi from Lebanon; 8th Polish Conference on Analytical Chemistry; Krakow (awarded the prize for the best poster of the "Analytical Methods in the Protection of Antiquities" session) |
| **29** | K.Jabłonka-Salach, **B.Wagner**, E.Bulska (2010) Application of LA-ICPMS in examination of splintered glass as evidence material, 8th Polish Conference on Analytical Chemistry; Krakow (awarded the prize for the best poster of the "Forensic Analytics" session) |
| **30** | A. Nowak, **B. Wagner**, E. Bulska (2010) Depth profiling of archaeological glasses with the use of LA-ICPMS, European Symposium on Atomic Spectrometry ESAS, Wroclaw, Poland |

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| **31** | A. Nowak, **B. Wagner**, E. Bulska (2011) Archaeological glass analysis by means of LA-ICPMS, Meeting of the Students' Section of the Polish Chemical Society, Murzasichle, Poland |
| **32** | A. Nowak, **B.Wagner**, E.Bulska (2011) Archaeological glass beads decorated with metal foil – a challenge for analytical chemist, Euroanalysis XVI, Belgrade, Serbia |
| **33** | E. Bulska, **B.Wagner**, E.Müller, B.Bolibrzuch (2011) Direct calibration of Laser Ablation Inductively Coupled Plasma Mass Spectrometry with solid certified Reference Materials – Possibilities and limitations, Euroanalysis XVI, Belgrade, Serbia |
| **34** | A. Nowak, M. Wagner, **B. Wagner**, E. Bulska (2011) Interdyscyplinarne badania naczyń szklanych z Jiyeh [Interdisciplinary analyses of glassware from Jiyeh], Chemical Analysis in the Protection of Antiquities Conference (AChwOZ)'XI, Warsaw |
| **35** | **B.Wagner**, E.Bulska (2012) Micro-destructive analysis of works of art and historical objects by LA-ICPMS, 11th European Workshop on Laser Ablation, Gijon, Spain |
| **36** | O.Syta, T.Purowski, **B.Wagner** (2012) LA-ICPMS Analysis of Glass Beads from Hallstatt Period, 11th European Workshop on Laser Ablation, Gijon, Spain |
| **37** | W.Cegiełkowska, **B. Wagner**, E.Bulska, M.Wierzbicka (2012) Distribution of zinc in the leaves of Plantago lanceolata L. – LA-ICPMS mapping, 55th Polish Chemical Society Meeting, Bialystok, Poland |
| **38** | W.Cegiełkowska, **B. Wagner**, E.Bulska, M.Wierzbicka (2012) Chemical and biological studies of the distribution and speciation of zinc in Plantago lanceolata L., IV European Symposium on Atomic Spectrometry ESAS, Tatranská Lomnica, Slowakia |

### 6.C ■ Participation in organizational committees of international and national scientific conferences

■ Between 1999 and 2011 I was the vice-chairman of the Organizational and Scientific Committee of the *Analiza Chemiczna w Ochronie Zabytków* [Chemical Analysis in the Protection of Antiquities]; Starting from 2012, I am the chairman of the Organizational Committee of this conference (www.chem.uw.edu.pl/archeometria/)

■ Since 2009, I have been a member of the Organizational Committee of the Atomic Spectrometry Seminars, including the Atomic Absorption Seminar, Optical Emission Spectrometry Seminar and Mass Spectrometry Seminars in Ustron near Wisla, Poland. The conferences are held biannually.

■ In 2010, I was a member of the Organizational Committee of the *European Symposium on Atomic Spectrometry* **ESAS'10**, Wroclaw, Poland, September **2010** r. (http://www.esas2010.pwr.wroc.pl/information.html)

■ I am the member of the Organizational Committee of the EUROANALYSIS XVII Conference, Warsaw 2013 (http://www.euroanalysis2013.pl/)

### 6.D ■ Other awards and distinctions

■ Second degree teaching award for a monographic lecture titled " Analiza instrumentalna w ochronie zabytków" [Instrumental analysis in the protection of antiquities] (Faculty of Chemistry, University of Warsaw, November 2012)

### 6.E ■ Participation in research networks and consortia

■ None

**6.F ■ Leadership in projects realized in collaboration with researchers from other Polish and international sites as well as in collaboration with private entrepreneurs, other than listed in Sect. 5.1H**

■ None

**6.G ■ Participation in editorial committees and scientific committees of journals**

■ Since 2007, I have been a member of the editorial staff of the journal *Nauka i Zabytki. Nauki ścisłe w służbie archaeologii, ochronie zabytków oraz historii [Science and Antiquities. The Sciences in the Service of Archaeology, Relics Protection and History*

**6.H ■ Participation in international and national scientific organizations and societies**

■ In 2003, I was appointed secretary of the Analytical Atomic Spectrometry Commission of the Committee on Analytical Chemistry, Polish Academy of Sciences, currently the Analytical Atomic Spectrometry Team of the Committee on Analytical Chemistry, Polish Academy of Sciences

**6.I ■ Teaching achievements and achievements in popularization of science or arts**

■ I started my teaching duties as an intern assistant at the Academy of Fine Arts in Warsaw, where I was asked to teach practical classes on paper conservation for students of the first, second and third years of the Faculty of Conservation and Restoration of Works of Art at the w Department of Conservation and Restoration of Old Prints and Graphics in the academic year 1994/1995

■ From 1997 I have been an associate of the Warsaw University, where I hold classes for the students of the Faculty of Chemistry and the Interdepartmental Studies in Environment Protection:

in years 1997-2001, I taught calculation and lab classes in the Analytical Chemistry Lab for the second-year students of the Faculty of Chemistry.

■ ■ since 2003, I am teaching the following lab classes:

(1) Determination of mercury by CVAAS atomic absorption spectrometry as part of the "Environmental Analytics" Lab for the first-year master-level students of the Faculty of Chemistry (winter semester);

(2) Determination of levels of selected elements by flame photometry as part of the "Analytical Chemistry in Environmental Studies" for the third-year bachelor-level students of the Interdepartmental Studies in Environment Protection (winter semester);

■ ■ Since 2010, I have developed and taught new classes on:

(3) LA-ICPMS assessment of distribution of selected elements in dietary supplements for the first year master-level students of the Faculty of Chemistry as part of the "Instrumental Analysis" class (winter semester);

(4) Mapping of silver nanoparticle distribution on the surface of photographic materials for the second-year students of the Nanostructure Engineering programme as part of the "Instrumental Analysis" class (summer semester).

■ In 2010, I held lectures and classes on the use of LA-ICPMS in the analysis of historical objects for the students of the post-graduate course “State of the art analytical methods in examination of historical objects” at the Faculty of Chemistry of Jagiellonian University.

■ ■ Starting from academic year 2005/2006, I have held a monographic lecture titled „Instrumental methods in the analysis of historical objects” in the summer semester. It is a lecture for the first-year master level students (formerly fourth-year students)

of the Faculty of Chemistry of the Warsaw University, which is a pass-grade lecture.

- Each year starting from academic year 2010/2011, I hold 4 lectures to the students of the post-gradual course of "Evidence Law, Criminal Science and Related Sciences" of the Warsaw University as part of the session titled " Analytical methods in identification of forgeries".
- Each year starting from academic year 2010/2011, I hold 1 lecture in the cycle on "Physicochemical examination of matter in Criminal Science" at the Center for Advanced Studies of the Warsaw University of Technology.

- **Summary of popularization activities:**

I am the originator and co-organizer of the conference "Analiza Chemiczna w Ochronie Zabytków" [Chemical Analysis in the Protection of Antiquities - AChwOZ, which has been held since1999 (www.chem.uw.edu.pl/archeometria/). It is a cyclic all-national conference. The objective of the conference is to exchange experience between researchers in the field of analytical chemistry and individuals interested in application of state-of-the-art instrumental analysis methods in examination of historical objects. The interdisciplinary nature of meetings is to promote integration of different groups, such as chemists, archaeologists, art historians and conservators engaged in examination and preservation of antiquities. The main objective of the conference is to promote research within areas on the border of several disciplines.

Besides annual organization of the conference, I try to actively and widely promote archaeometry and conservatory chemistry by writing popular science articles on this topic:

1. E.Bulska, **B.Wagner**, *Ratujemy zabytkowe rękopisy, czyli badanie procesów degradacji celulozy w laboratorium chemicznym* [Saving historical manuscripts, or studying the cellulose degradation processes in chemical laboratory], Analityka (**2000**) 1: 4-6.
2. E.Bulska, **B.Wagner**, *Ratujemy zabytkowe rękopisy, czyli badanie procesów degradacji celulozy część II* [Saving historical manuscripts, or studying the cellulose degradation processes in chemical laboratory/ part II.] Analityka (**2000**) 2: 12-15.
3. **B.Wagner**, E.Bulska, *Zastosowanie nowoczesnych metod instrumentalnych w badaniach zabytków rękopiśmiennych* [Modern instrumental methods in examination of historical manuscripts] Notes Konserwatorski (**2001**) 5: 68-77.
4. **B.Wagner**, M.L.Donten, A.Jackowska, E.Bulska, W.Sobucki, *Ratujemy zabytkowe papirusy, czyli w jaki sposób analiza chemiczna może wpłynąć na działania konserwatorskie* [Saving historical papyruses, or how chemical analysis might change the conservatory efforts] , Analityka **(2002)** 3: 4-8.
5. **B.Wagner**, *Ochrona dziedzictwa kulturowego w Unii Europejskiej* [Protection of cultural heritage within European Union], Analityka (**2003**) 2: 45-49.
6. **B.Wagner,** E.Bulska, D.Rams, D.Jarmińska, W.Sobucki, *Ocena przydatności procedury ekstrakcji żelaza roztworem DTPA do celów konserwatorskich [The assessment of the usefulness of the extraction of iron into DTPA solution for restoration purposes]*, Biuletyn Informacyjny Konserwatorów Dzieł Sztuki (**2004**) 15: 39-43.
7. **B.Wagner**, E.Bulska, W.Sobucki, *Analiza rozmieszczenia magnezu w arkuszach papieru odkwaszonych metodami C-900 (Neschen) lub CSC Book Saver*, [Analysis of magnesium distribution in paper sheets deacidified using C-900 (Neschen) or CSC Book Saver methods], Notes Konserwatorski **(2006)** 10: 268-277.
8. W.Gumiński, **B.Wagner**, D.Walaszek, E.Bulska, *Zastosowanie spektometrii mas w analizie szczątków kostnych ze stanowiska archaeologicznego Dudka na Mazurach* [Mass spectrometry in the analysis of bone relics from the archaeological site Dudka in Mazury], Analityka **(2008)** 2: 29-35.

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| **9.** | **B.Wagner**, E.Bulska, A.Drewniak, W.Sobucki, D.Rams, *Ochrona zbiorów bibliotecznych: papier jako wskaźnik zanieczyszczenia powietrza* [Preservation of library antiquities: paper as an indicator of air pollution], Analityka **(2008)** 3: 42-48. |
| **10.** | **B. Wagner,** A. Nowak, E. Bulska, J. Kunicki-Goldfinger, O. Schalm, K. Janssens, *Analiza pierwiastkowa zabytkowych obiektów szklanych* [Elemental analysis of historic glass objects], Nauka i Zabytki. Nauki ścisłe w służbie archaeologii, ochronie zabytków oraz historii **(2008)** 1: |
| **11.** | W.Sobucki, A.Czajka, I.Kotala, H.Machaj, **B.Wagner**, *Wżery atramentowe w kolekcjach archiwalnych – badania zasobu Archiwum Głównego Akt Dawnych w Warszawie* [Ink corrosion pits in archival collection – studies of the collection of the Central Archives of Historical Records in Warsaw], Notes Konserwatorski **(2009)** 12: 171-184. |
| **12.** | **B.Wagner**, W.Sobucki, D.Jarmińska, D.Rams, W.Jędral, E.Bulska, *Porównanie zmian wywołanych w papierze przez zastosowanie roztworów fitynianów i DTPA w konserwacji obiektów rękopiśmiennych dotkniętych korozją atramentową* [Comparison of changes caused in paper by the use of phytate and DTPA solutions in conservation of manuscripts affected by ink corrosion], Notes Konserwatorski **(2009)** 12: 292-306. |
| **13.** | A.Nowak, **B.Wagner**, E.Bulska, *Szkło, jako obiekt zainteresowania chemików analityków Cz.1.: "Szkło i metody badania jego składu"*, [Glass as an object of interest of analytical chemists. Part 1. Glass and glass composition analysis methods] Analityka (**2009**) 3: 42-48. |
| **14.** | A.Nowak, **B.Wagner**, E.Bulska, J.Kunicki- Goldfinger, *Szkło, jako obiekt zainteresowania chemików analityków Cz.2. "Analiza pierwiastkowa szkieł historycznych metodą LA-ICPMS"*, [Glass as an object of interest of analytical chemists. Part 2. Elemental analysis of historic glass using the LA-ICMPS technique] Analityka (**2009**) 4: 28-33. |
| **15.** | K.Jędrysik, M. Ciechańska, W. Sobucki, **B. Wagner**, *Konserwacja XVIII-wiecznej mapy sądowej z wżerami grynszpanowymi*, [Conservation of an 18th century court map with verdigris corrosion pits] Notes Konserwatorski (**2009**) 13: 188-200. |
| **16.** | **B.Wagner**, *Badania obiektów zabytkowych* [Examinations of historic objects], Chemia w Szkole (**2009**) 6: 6-12. |
| **17.** | D.Walaszek, **B.Wagner**, E.Bulska, L.Halicz, *Naturalne apatyty – prosty model materiałów kostnych w analizie wielopierowastkowej obiektów wykopaliskowych metodą LA-ICPMS* [Natural apatites – a simple model of bone materials for multielemental analysis of excavation findings using LA-ICPMS], Analityka (**2010**) 1: 44-48. |
| **18.** | A.Nowak, **B.Wagner**, E.Bulska, T.Purowski, *Szkło, jako obiekt zainteresowania chemików analityków Cz.3. "Zastosowanie LA-ICPMS w bezpośredniej analizie szklanych obiektów archaeologicznych*" [Glass as an object of interest of analytical chemists. Part 3. LA-ICPMS in direct analysis of glass archaeological objects], Analityka (**2010**) 1: 49-55. |
| **19.** | K.Jabłonka-Salach, **B.Wagner**, E.Bulska, *"Szkło, jako obiekt zainteresowania chemików analityków Cz.4. Analiza pierwiastkowa mikrośladów kryminalistycznych",* [Glass as an object of interest of analytical chemists. Part 4. Elemental analysis of forensic microtraces] Analityka (**2010**) 2: 42-49. |

### 6.J ■ Scientific advice to students and specializing physicians

**Bachelor degree theses**: in years 2010-2012, I was a supervisor of 5 bachelor degree theses at the Laboratory of Basic Aspects of Analytical Chemistry of the Faculty of Chemistry, Warsaw University.

**Master degree theses**: in years 2000-2012, I participated in realization of 15 master degree theses at the Laboratory of Basic Aspects of Analytical Chemistry of the Faculty of Chemistry, Warsaw University:

- I was a scientific advisor of 10 master degree theses defended in 2000, 2002, 2005, 2006,

2007 (three theses), 2008, 2009 and 2010.

- I was a supervisor of 5 master degree theses defended in 2007, 2008, 2009, 2011 and 2012.

Currently, I am a supervisor of another (16th) master degree thesis and scientific advisor of yet another (17th) master degree thesis, both of which are conducted from the beginning of academic year 2012/2013 at the wanych od początku roku akademickiego 2012/2013 at the Laboratory of Basic Aspects of Analytical Chemistry of the Faculty of Chemistry, Warsaw University.

### 6.K ■ Scientific assistance to doctoral students as scientific advisor or assistant supervisor

■ I am the assistant supervisor of the doctoral dissertation of Ms. Anna Nowak, MSc, who conducts her research titled "*Nierutynowymi procedurami analitycznymi bezpośredniego oznaczania składu pierwiastkowego szkieł zabytkowych z wykorzystaniem mikropróbkowania laserowego z detekcją ICP-MS*" [Non-routine analytical procedures for direct determination of elemental composition of historical glass using laser microsampling and ICP-MS detection] at the Laboratory of Basic Aspects of Analytical Chemistry of the Faculty of Chemistry, Warsaw University. Earlier, in 2005-2007, I was also the scientific advisor of her master degree thesis titled "*Badania składu elementarnego szkieł zabytkowych z wykorzystaniem mikropróbkowania laserowego*" [Laser microsampling studies of elemental composition of historical glass], supervised by prof. Stanisław Głąb.

### 6.L ■ Internships in foreign or national research or academic centers

| **Year**: | |
|---|---|
| **2010** | **Laboratory of Inorganic Chemistry, Department of Chemistry and Applied Biosciences, ETH,** Zurich, Switzerland (March 2010)<br>– scholarship |
| **2003** | **Perkin-Elmer Laboratories,** Monza, Italy (16-23.05.2003)<br>– scholarship |
| **2002** | **Centre for Sustainable Heritage, University College London**, Londyn, Anglia (14.04–28.04.2002)<br>– scholarship |
| **2001** | **HASYLAB Laboratories,** DESY Synchrotron, Hamburg, Germany (7–13.12.2001)<br>– scholarship |
| **2000 and 1999** | **Institut für Allgemeine und Analytische Chemie Montanauniversität**, Leoben, Austria (06.2000 and 07.1999)<br>– scholarship |
| **1998** | **ICCROM** (International Centre for the Study of the Preservation and Restoration of Cultural Property), Rome, Italy (9.11–11.12.1998)<br>– scholarship |
| **1997** | **Central European University,** Budapest, Hungary (30.06–25.07.1997)<br>– scholarship |
| **1992** | **Stadt- und Universitätsbibliothek** Bern, Switzerland (July-September 1992)<br>– conservator of library collection |

**1991** **Central Laboratory for the Conservation of Archival Records, The Central Archives of Historical Records, Warsaw** (June 1991)
- summer internship as part of curricular student practices / intern-conservator

## 6.M ■ Expert opinions or other contracted studies

■ Comparison of changes caused in paper by the use of phytate and DTPA solutions in conservation of manuscripts affected by ink corrosion, conducted for the National Library in Warsaw (2005) **B. Wagner**, W. Sobucki, D. Jarmińska, D. Rams, W. Jędral, E. Bulska

■ Analysis of the causes of damage and the methods for restoration of an incunabulum, conducted for ad'art B. Orłowska, A Szlasa-Byczek sp. j. company from Nowy Dwór Mazowiecki (2008) **B.Wagner**

■ Analysis of chemical composition of glass beads from early iron age discovered in the Vistula and Odra interfluvial region, conducted for the Institute of Archaeology and Ethnology of the Polish Academy of Sciences (2010-2012) O.Syta, **B.Wagner**

■ Analysis of chemical composition of beads from early-medieval burial ground in Lubień, conducted for the Institute of Archaeology and Ethnology of the Polish Academy of Sciences (2011); A. Nowak, **B. Wagner**, E. Bulska; results published as Annex 11 to the monograph: "Wczesnośredniowieczne cmentarzysko szkieletowe w Lubieniu, pow. piotrkowski" [Early-medieval skeletal burial ground in Lubien, Piotrkow District] T. Kurasiński, K. Skóra; publisher: Instytut Archaeologii i Etnologii PAN, Ośrodek badań nad dawnymi technologiami; ISBN 978-83-89

## 6.N ■ Participation in expert panels and juries

■ In 2012 I was appointed an expert of the National Science Centre Experts Team, panel ST4 (Analytical and physical chemistry – analytical chemistry, theoretical methods in chemistry, physical chemistry/chemical physics) to evaluate applications filed as part of the OPUS, PRELUDIUM and SONATA contests of the 5$^{th}$ edition of NSC contest series

## 6.O ■ Reviews of international and national grant projects

■ I was the reviewer of research applications in the following Foundation for Polish Science programs: Ventures (5/2010), Homing PLUS (4/2011) and Pomost (4/2011).

## 6.P ■ Reviews of publications in international and national journals

■ Since 2004, I have reviewed articles for publication in such journals as:

1. Chemia Analityczna/Warsaw: three article manuscripts, one in each of the years 2004, 2006 and 2007;

2. Polish Journal of Chemistry: two article manuscripts in 2008;

3. Analytical Chemistry: one article manuscript in 2009;

4. Periodico di Mineralogia: one article manuscript in 2009;

5. X-Ray Spectrometry: two article manuscripts, one in each of the years 2010 and 2012;

6. Analityka: numerous reviews as a part of regular collaboration since 2002.

7. Monograph: Recent Advances in Laser Ablation ICP-MS for Archaeology; Dussubieux, L., Gratuze, B., Golitko, M. (Eds.): a manuscript of a chapter on LA-ICPMS analysis of archaeological glass (2012).

## 6.Q ■ Other achievements, not listed in 5.2 A–5.2 P

Invitation to lecture on the conducted studies to the students of Professor Rick Russo's Laser Spectroscopy and Applied Materials Group at the Lawrence Berkeley National Laboratory (November 2012, Berkeley, California, USA.)

The article “Open ablation cell for LA-ICP-MS investigations of historic objects” (Manuscript ID: c1ja10137d) was among the 10 most frequently accessed publications at the Journal of Analytical Atomic Spectrometry website in two consecutive months of August and September 2011.

Invitation to write a review article on the use of LA-ICPMS in the analysis of antiquities for the Journal of Analytical Atomic Spectrometry.

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