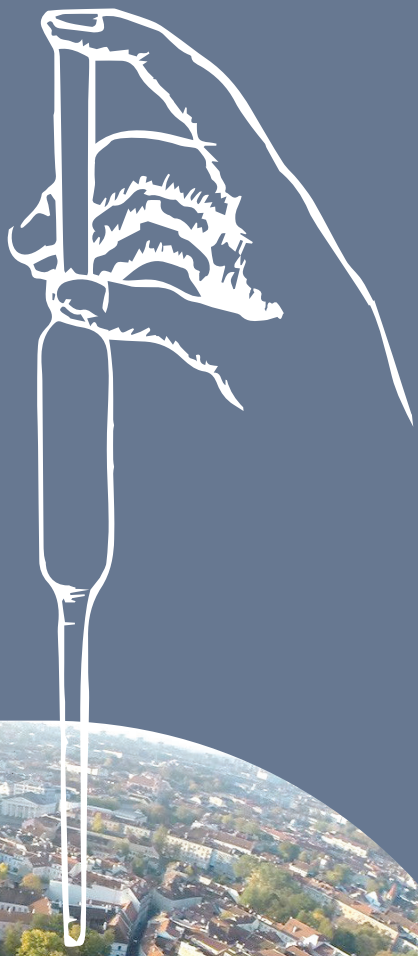
13TH INTERNATIONAL
CONFERENCE
ON THE HISTORY
OF CHEMISTRY

13 ICHC 2023

Vilnius – Lithuania



BOOK OF ABSTRACTS

Vilnius 700

Dedicated to
the 700th anniversary
of the city of Vilnius

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OF CHEMISTRY

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BOOK OF ABSTRACTS

VILNIUS, 2023

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ICHC 13 Vilnius – Lithuania 2023

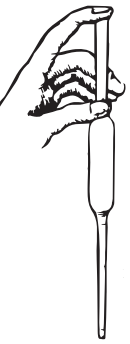
CONFERENCE ORGANIZED BY

Working Party on History of Chemistry (WPHC)
of the European Chemical Society (EuChemS)

Lithuanian Chemical Society

Lithuanian Biochemical Society

Vilnius University, Faculty of Chemistry and Geosciences



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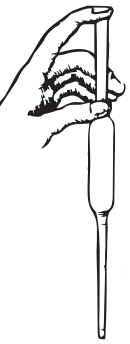
The Steering Organising Committee gratefully acknowledges the continuous support received from the members of the International Advisory Committee in preparing and organising the conference.



Contents

Welcome Address on Behalf of the Local Organizing Committee

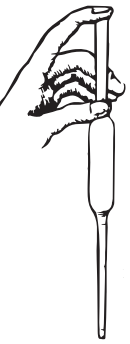
Dear Participants,

Lithuania's involvement with the Working Party on History of Chemistry of the European Chemical Society dates to the 1990s, when Dr Mudis Šalkauskas, then an employee of the Institute of Chemistry, joined the ESF Programme 1993–1997, on the topic *The Evolution of Chemistry in Europe 1789–1939*, which was organized by Christoph Meinel. Dr Šalkauskas represented Lithuanian chemists at numerous international events and authored surveys on chemistry in Lithuania. It was Dr Šalkauskas who invited me to join the Working Party and become Lithuania's second representative. He also encouraged me to apply to host ICHC in Vilnius. Our first application, submitted in 2008, marked the Lithuanian Chemical Society's our first-time hosting ICHC, which took place in partnership with the Lithuanian Biochemical Society (LBS). This collaboration remains fruitful, as Society's members currently serve on the Local Organizing Committee for this conference and have provided valuable support in organizing it.

As you may know, ICHC2023 is being held in conjunction with the Second Lithuanian-Polish Jędrzej Śniadecki Memorial Conference on 'Frontiers in Molecular Life Sciences', organized by the LBS. We had initially planned to host both conferences in 2021, but the pandemic forced us to reschedule.

After participating in the Working Party on History of Chemistry for seventeen years (2006–2023) and attending several biennial ICHC conferences, I am delighted to welcome you to Vilnius, my home city and country.

On behalf of the Local Organizing Committee, I extend our heartfelt gratitude to the Institute of Chemistry of the Faculty of Chemistry and Geosciences at Vilnius University for their comprehensive support in organizing the conference, managing registration and setting up the website. The efforts of the Institute's dedicated administrative staff have been indispensable in making this event possible.



The Lithuanian Chemical Society has also been instrumental in dealing with urgent conference tasks and helping with the Jędrzej Śniadecki memorial project. In addition, the European Chemical Society has recognized this 13th ICHC as an official activity, which has facilitated sponsorship opportunities.

The Wroblewski Library of the Lithuanian Academy of Sciences has also played a central role in coordinating conference preparations. The Academy helped create a map illustrating the history of chemistry in Vilnius, which will be displayed as a poster during the conference.

We are immensely grateful to our numerous sponsors, both within Lithuania and abroad. National financial support was received from our primary patron, Thermo Fisher Scientific, also Rūta Baranauskienė and Rimvydas Baranauskas. It was a good practice to organize this conference with a partner GoVilnius. The Ministry of Education, Science, and Sport of Lithuania generously provided access to the historic chemistry hall for this event. More about this historic hall will be featured in one of the keynote lectures.

International sponsors include the Society for the History of Alchemy and Chemistry in the UK, the Science History Institute in the USA, Commission on History of Chemistry and Molecular Sciences and the French Institute in Vilnius. We extend our sincere appreciation to all sponsors, as their contributions have made this conference possible. We also express our gratitude to the International Advisory and Steering Organizing Committees, particularly Ignacio Suay-Matallana and Ernst Homburg, for their invaluable advices, also assistance in disseminating the call for papers, selecting conference contributions, designing the program, and compiling the Book of Abstracts.

We are pleased that 88 participants from over 20 countries from the whole world are attending the conference. We wish you all an enjoyable and inspiring time in Vilnius, filled with fruitful discussions and opportunities to forge new connections that will significantly benefit the future of our field, I hope, influence, new generations' attitude to the heritage of chemistry in the world.

Dr Birutė Railienė
Bibliographer and historian of chemistry
Chair of the Local Organizing Committee

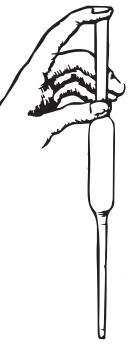
Greetings from the Ministry of Education, Science and Sport of Lithuania

Congratulations to all participants and organisers of the 13th International Conference on History of Chemistry and the 2nd Jędrzej Śniadecki Memorial Conference. This is an extraordinary opportunity to celebrate science and share knowledge together.

I am pleased that both of these conferences of international importance are being organised in Vilnius. Lithuania is proud of the achievements of its scientists, which contribute to the well-being of society not only in our country but also worldwide. We want as many young people as possible to become interested in natural sciences while still at school and to see how meaningful the research career is. We hope that the modern STEAM Centres in various regions of Lithuania will help pupils get involved in this field, since they open up a wide range of opportunities to experience the beauty of science and the joy of creativity.

I wish both experienced scientists and those interested in the possibilities of science new discoveries that will help them learn even more about the world around us. I believe that this joint event will also be a source of new inspiration, growth, and development.

Prof. Ramūnas Skaudžius
Vice-Minister of Education, Science and Sport



Greetings from the Rector of Vilnius University

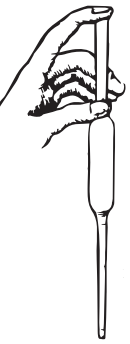
Every institution cares about fostering its own identity, including historical memory. Science and studies do not just appear out of thin air; they are the result of consistent work and deep traditions. The fact that today, we can be justifiably proud of Vilnius University's achievements in chemistry, biochemistry, and other natural sciences is, to a great degree, due to the success of our predecessors. The second half of the 18th century and the beginning of the 19th century were exceptional periods in the history of Vilnius University. The ideas of the Enlightenment period and the willingness of statesmen to invest in the development of science led to a real breakthrough in science and the modernisation of universities. This was probably the most intensive stage in the development of Vilnius University as it reached the level of the most advanced European centres of science; moreover, its development was not initially halted, even by the destruction of the state – the division of the Polish-Lithuanian Commonwealth.

A long-time rector of the University who was an astronomer and a member of the Royal Society of London, as well as the French Academy of Sciences, Marcin Poczobutt, was the embodiment of ongoing reforms. He placed Vilnius on the map of European astronomical science. Professors of this level were rare; therefore, the University had systematically sought specialists abroad. The Frenchman Jean-Emmanuel Gilibert developed botanical science at the University and established the first botanical garden. He was replaced by Georg Forster, a world-renowned German scientist who took part in James Cook's expedition. The Frenchmen Michel Renier and Jacques-Antoine Briôtet initiated medical education and training at the University.During this period, Vilnius University invited Jędrzej Śniadecki from Poland to pioneer the studies of chemistry and physiology; he was not only a lecturer and scientist but also worked on the organisation and popularisation of science. He was involved in founding a scientific body and a journal. His articles encouraged society to change its attitudes towards various aspects of everyday life, such as the

education of children. His activities were not limited to the University. In the face of the Tsarist occupation, he used satirical texts to criticise the ills of society. Śniadecki was systematically concerned about scientific resources, and it was he who, in 1818, appealed to his colleagues by rhetorically pointing out the scientific 'lameness of the library', encouraging it to subscribe to and compile the most important continuing European scientific publications. During his academic journey, he furthered his knowledge in Padua, Vienna, Edinburgh, and Paris. He brought back a collection of books, which he donated to the University library

Śniadecki's state-of-the-art knowledge of medicine, chemistry, and other natural sciences acquired at the best European universities and his talent as a scientist and lecturer enabled him to write the first chemistry textbook in Polish – 'The Terminology of Chemistry'. His work culminated in the most important publication of his life, 'The Theory of Organic Beings', one of the first works on biochemistry in the world. It was this book that brought the author recognition and gave prominence to the School of Chemistry at Vilnius University, laying the foundations for the science of biochemistry, the achievements of which are now famous worldwide and still felt to this day.

Prof. Rimvydas Petrauskas
Vilnius University Rector



Greetings from the Chair of the Lithuanian Chemical Society

Dear attendees of the 13th International Conference on the History of Chemistry and the 2nd Jędrzej Śniadecki Memorial Conference,

As chair of the Lithuanian Chemical Society, it is my pleasure to welcome you to Vilnius, the capital of Lithuania and express my gratitude for accepting the invitation and taking time out of your packed schedule for the joint ICHC2023 conference. We are immensely grateful to present Lithuania and Vilnius to the international scientific community as a centre of science and culture, as a place suitable for strengthening scientific cooperation and establishing new contacts. We are delighted to welcome ICHC2023 speakers from Europe, Asia and America. We hope that this conference will attract young people from Lithuania and worldwide and encourage their interest in the history of chemistry.

The Lithuanian Chemical Society was originally founded in 1959 and re-established in 2017 and aims to promote interest in chemistry, publicize and present chemistry and chemical technology to the public, develop relations with scientists from other countries, and organize conferences and seminars. Currently, the Lithuanian Chemical Society unites 103 members from different Lithuanian scientific and educational institutions and associations as well as representing different areas of chemistry. From 2023, the Lithuanian Chemical Society is a member of the European Chemical Society.

The Lithuanian Chemical Society wishes you all a very pleasant and inspiring time in Vilnius. May it bring many opportunities to engage in fruitful and insightful discussions and allow you to forge valuable connections that will shape the future of our field.

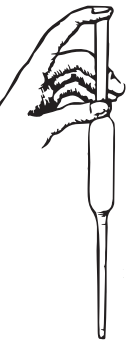
Almira Ramanavičienė
Chair of Lithuanian Chemical Society

Greetings from the Chair of the Working Party

Four years have passed since we last met in person for a history of chemistry conference. Like all our International Conferences on the History of Chemistry (ICHC), the successful 12ICHC meeting in Maastricht in 2019 provided ample opportunity to discuss research, build networks, nurture relationships, socialize and experience an exciting place in Europe together. Ever since I participated in my first ICHC in Budapest in 2003, I have felt that the history of chemistry community is my professional home and a welcoming and inclusive family that has provided me with fruitful relationships and arenas in which I could develop and present my research.

During the pandemic, we all learnt that some meetings can be more efficient on online platforms, saving time and costs and reducing environmental impacts. Since then, the scientific community at large has benefitted from the experiences gained. For example, the Working Party was able to host an online one-day event on 'Heritage and History of Chemistry' in May 2021, since the in-person meeting originally scheduled to be held in Vilnius had to be postponed. However, I am convinced that to nurture good relations within our international family, we still need to meet in person from time to time. Some of us have also experienced 'Zoom fatigue' and have realized that it is not only the scientific presentations we give and comment on that matter in conferences; equally important is the social interaction that takes place after the scientific discussions in the auditorium, when we meet over lunch or a cup of coffee. Indeed, we have learnt that cordial collegiality does not grow if we do not also meet in informal settings. Good relationships are key to future collaboration in research and the organization of communities like ours.

When I ran for the chairmanship of the Working Party in 2021, I emphasized that the welcoming and family-like atmosphere in our conferences is something we should strive to maintain. Like other academic conferences, we offer an arena where good research can be developed through critical discussion, but at the same time, we respect and are curious in our encounters with the different disciplinary



traditions represented in our meetings. We provide unique meeting places for chemists, historians, philosophers, sociologists, educators and others interested in the history of chemistry. In my view, having such an inclusive and safe haven is gold for academic life.

This year, 60 participants from 20 countries will present their research in Vilnius. This is the first time an ICHC will be hosted in a Baltic country. We are grateful to Birutė Railienė and her team for taking on the demanding task of organizing this conference. As the local organizer of the 11ICHC in Trondheim in 2017, I am fully aware of the hard work involved. I very much look forward to spending four days together, catching up with people I have known for one or two decades and getting acquainted with people participating in an ICHC for the first or second time.

Annette Lykknes
Chair of the Working Party on History of Chemistry

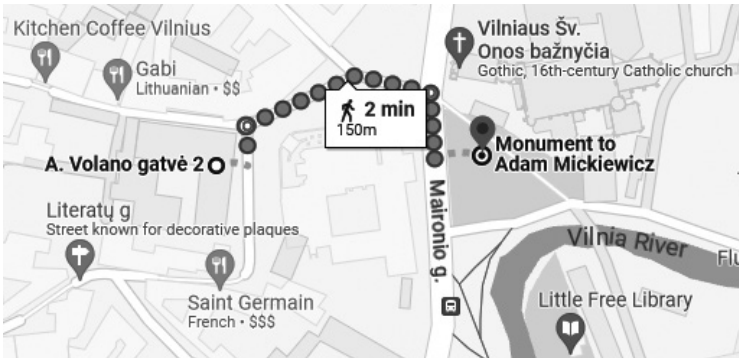
Practical information and site map

Emergency (only during 23–27 May) *WhatsApp* and *Viber*: +370 626 27855
For questions by email: ichc2023vilnius@gmail.com

Venue

Registration at the Arkangelo Conference and Art Centre, Maironio St. 11 on May 23, 2023

The conference will start in the heart of the old city. Before the conference all participants are invited to register at the Arkangelo Conference and Art Centre (Maironio St. 11). After registering, take a 2 minutes trail along the Šv. Mykolo St. To reach the former premises of Chemistry department of Vilnius university. Now the Ministry of Science, Education and Sport of Lithuania (A. Volano St. 2) is situated here.



For the rest days **the conference will be continued in** the premises of the new city – Saulėtekis district, at the Centre of Physical Sciences and Technology (FTMC). The participants are welcome to visit our conference in conjunction – it will take place in the same place, a neighbour building Centre for Life Sciences (GMC). All information will be available at the registration desk.

Registration and Conference at Center for Physical Sciences and Technology (FTMC), Saulėtekio al. 3 on 24–26 May, 2023

VIEW IN GOOGLE MAPS: https://goo.gl/maps/yqfk8FmLiENGafvn6

Excursions

Tuesday, 23 May, 12:30–15:00.
The excursion is limited to a small group. Departure is planned at 12:30 from the conference registration place (Maironio St. 11). Bus will bring back the group to the same place of departure (Maironio St. 11) at 15:00, where registration to the conference is organized.

Sponsor: Thermo Fisher Scientific

Meeting place: Maironio St. 11 (next to the *Arkangelo Conference and Art Centre*) at 12:30.

(1) Thursday, 25 May, 18:00–19:30.
Tour at the Vilnius University (VU) courtyards and visiting an exhibition 'History of Chemistry in Lithuania'. Tour by VU guide.

For conference participants departure by a bus from FTMC (Saulėtekio al. 3) at 17:30.

Meeting place: Universiteto St. 3, at the central entrance to the Vilnius University at 18:00.

(2) Thursday, 25 May, 18:00–19:30.
Registration needed. Tour at Vilnius city centre. Tour by City guide.

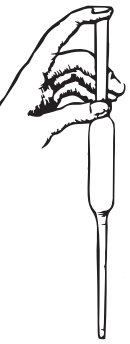
For conference participants departure by a bus from FTMC (Saulėtekio al. 3) parking lot at 17:30.

Meeting place: Cathedral Square, at the Bell Tower at 18:00.

Saturday, 27 May, 09:00–20:00.
All day excursion to the first pagan capital of Lithuania Kernavė (40 km outside Vilnius) visiting Kernavė archaeological museum will be followed (organizers idea to give a rest to your mind) by a short (2,5 km) trail on a wonderful place Dūkštos, followed by a visit to Trakai, a residence town of great dukes of medieval Lithuania (30 km outside Vilnius), a place, where a community of Karaim ethnic group lives since medieval times. Here an education on making traditional Karaim dish 'kibinai' and tasting will be organized. Then a visit to the famous Trakai castle will follow. You will have some free time in Trakai. Back to Vilnius before 20:00.

Lunch will be included.

Meeting place: Maironio St. 11 (next to the *Arkangelo Conference and Art Centre*) at 9:00.



Scientific and Social Program

Ministry of Science, Education and Sport of Lithuania. A. Volano St. 2, Registration at Maironio St. 11		*Center for Physical Sciences and Technology* (FTMC). Saulėtekio al. 3	
Time	May 23 (TUE)	May 24 (WED)	
08:30–09:30		Registration	
09:30–10:30		Plenary lecture / A 101 Science History Institute lecture: 20 Years of Scientific Heritage in Europe: Trends and Perspectives *Marta C. Lourenço* (Sponsored by SHI)	
10:30–11:00	12:30–15:00		
11:00–12:30	Excursion to *Thermo Fisher Scientific* (registration is over) Meeting point Maironio St. 11 (at registration)	Panel 1A / A 101 **New Approaches to the History of Chemistry** (Sponsored by SHAC) The Role of Modern Experiment (...). Meagan Allen	Session 1B / D401 **Natural and Artificial Materials** The Innovation Process of Technical Textiles (...). Stefanie van de Kerkhof Looking for Materials and Finding Stories (...). Artur Neves, etc.

ICHC – International Conference on the History of Chemistry

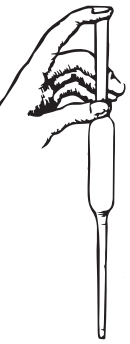
JSMC – Jędrzej Sniadecki Memorial Conference 'Frontiers in Molecular Life Sciences'

ICHC only
ICHC+JSMC

Center for Physical Sciences and Technology (FTMC). Saulėtekio al. 3		*Center for Physical Sciences and Technology* (FTMC). Saulėtekio al. 3	Meeting point Maironio St. 11
May 25 (THU)		May 26 (FRI)	May 27 (SAT)
Registration		8.30–9.00 Registration	09:00–20:00
Plenary lecture / A 101 Industrial Heritage and the Environment: the Challenges of Conservation and Transmission. *Florence Hachez-Leroy* (Sponsored by French Institute, Vilnius)		9.00–10.30 Business meeting EuChemS WPHC / A 101	All day excursion to the first pagan capital of Lithuania Kernavė (40 km outside Vilnius) followed by Trakai, a residence town of great
Coffee			
Panel 5A / A 101 **Teaching Chemistry through History of Chemistry** Learning Nature of Science (NOS) (...). Annette Lykknes Chemistry in the Deutsches	Session 5B / D401 **Early Chemical Industries and Practices** Making Chemistry Industrial. Ernst Homburg Eisen Mountains – The Century of Bohemian Fuming	11.00–12.00 Plenary lecture / A 101 Historiography and Discipline Formation. *Christoph Meinel* (Sponsored by SHAC) 12:00–12:30 **Poster session** / Lobby	

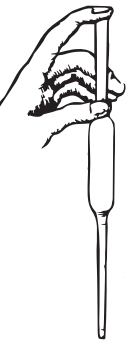
		Unveiling alchemical secrets (...). Sarah Lang A preliminary exploration of the origin of the 'Chemical Revolution' (...). Adrian Wilson The Disappearing Act of William Thomas Brande (...) Frank James, Anna Simmons	Moon Rock Analysis in West Germany (...). Christopher Halm Indigo – the history of its synthesis. Michaela Kröppl
12:30–14:00			
14:00–15:30		Panel 2A / A101 **Material Culture, Texts, and Theories: an Interdisciplinary Approach to the History of Chemical Arts** A chemical approach to the ancient alchemical theory (...). Lucia Maini and Matteo Martelli	Session 2B **/** D401 **Politics and Chemistry in the Long Run** Contributions to the History of Chemistry (...). Sérgio P. J. Rodrigues and Marília Peres The Responsibility of Scientists (...). Marabel Riesmeier

Museum. Susanne Rehn-Taube History of Chemistry in German School textbooks. Gisela Boeck History of chemistry through its practices and entities. José Antonio Chamizo Commentary. Brigitte Van Tiggelen	Sulfuric Acid. Petr Holzhauser History of Chemistry Meets Art History and Heritage Science (…). Hartmut Kutzke and Lasse Hermansen Bjørnland Dynamite and Crops (…). Carlo Bovolo	A Map of Chemical Heritage Places in Vilnius City. Birutė Railienė Emil Fischer's Estate – Museum Archeology at its Best. Susanne Rehn-Taube Psychedelics – Story from Shamanic Rituals to Psychotherapy. Martin Kuchař	dukes of medieval Lithuania (30 km outside Vilnius), visiting Trakai castle. Lunch will be included.
Lunch			
Panel 6A / A101 **Face to Face for Science: Chemistry Conferences** Chemists Before the Lens (…). Georgiana Kotsou Convening for Chemistry in	Session 6B / D401 **Female Chemists and Their Narratives** About the First Female Chemists at the German University in Prague. Gisela Boeck and Eva Herrmann-Dresel	Session 8A / A 101 **Redefining Chemistry in Revolutionary Times** Georg Ernst Stahl's Chemical Ideas (…). Carmen Schmechel Artificial Laboratory vs. God's Nature: Rousseau's Politics of Science. Mi Gyung Kim	



		Cosmetic, poison, and a paradigm of whiteness (…). Daniele Morrone Instant Ice in the Middle Ages (…). Marianna Marchini and Lucia Raggetti A Jewish alchemist reads a classic of Arabic chemistry in Early Modern Italy (…). Gabriele Ferrario Alchemy and public health (…). Stefano Mulas	The Establishment of the Independent University of Chemistry and Technology Prague (…). Věra Dvořáčková
15:30–16:00	Registration		
16:00–17:30	15:30–18:30 Registration. Maironio St. 11 16:30–16:45 Unveiling of the memorial plaque to Jędzej Sniadecki. A. Volano St. 2 17:00–17:15 All participants' photo. A. Volano St. 2	Session 3A / A 101 **Chemistry in Lithuania and Latvia** Early Bell Casting Technology in Vilnius. Marytė Kuodytė In Memory of Professor Kazys Daukšas. Aivaras Kareiva and Rolandas Kazlauskas	Session 3B / D 401 **Crossing Disciplines and Spaces: Chemical Frontiers in the Twentieth Century** The Operationalization of Porosity Between Petroleum Geology and Reticular

Brussels (…). Alessio Rocci Spaces, Forms and Functions of Face-to-Face Interaction (…). Thomas Mougey 'The Goddess that We Serve' (…). Geert Somsen	Pioneer Women Scientists in Japan. Yona Siderer Beyond the Surface: Agnes Pockels and the Gendering of Scientific Narratives. Brigitte Van Tiggelen The First Female Chemists in the Ottoman Empire. İlknur Şahin	Between Chemistry and Administration (…). Francesca Antonelli Exerting Control. Antoine-Laurent Lavoisier and Scientific Instruments. Marco Beretta The Development and Legacy of the term 'Rare Earth'. Charlotte A. Abney Salomon	
Coffee			
16:00–17:30 Session 7A / A101 **Laboratory Spaces, Communities and Methods** About Those Red Bandanas… A Work-in-Progress on History in the	16:00–17:30 Session 7B / D401 **Known and Unknown Risks and Hazards** Agnotology and Public Health Debates at the Lead Mines of Linares (Spain), 1880–1920. Ignacio Suay-Matallana	16:00–17:00 **Round table** / A101 17:00–17:30 **Closing Session** / A101	



	17:15–17:30 Opening of the conference, welcome. A. Volano St. 2	The Development of Electrochemistry in Lithuania. Rimantas Ramanauskas Solid State Ionics in Latvia. Guntars Vaivars	Chemistry. Ana Luiza Nicolae From Solid to Liquid: The Global Chemical Industry (…). Óscar Moisés Torres Montúfar About Maria Skłodowska-Curie (…). Ewa Bulska Computational History of Chemistry. Guillermo Restrepo and Jürgen Jost
17:30–18:30	17:30–18:15 Keynote lecture The History of Chemistry in Lithuania. *Rimantas Vaitkus*.	17:30–18:45 Session 4A / A 101 **Constructing Naturalness** The Naturalization of Chemical Substances (…). Paulina S. Gennermann Activating Skincare (…). Gina Maria Klein Producing the 'natural cycle' (…). Sophia Wagemann	17:30–18:45 Session 4B / D401 **Alchemy: Its Tools, Images and Dreams** The Archaeology of Alchemy and Chemistry (…). Umberto Veronesi History of Polysulfides and their Role in the Evolution of Chemical Knowledge (…). Alexey Kamyshny
		19:00 Bus to the Conference dinner.	
18:30–22:00	18:30–22:00 Welcome party	19:30–22:00 Conference dinner	

Chemistry Lab. Sarah Lowengard Co-Authorship in Early-20th Century Chemistry (…). K. Brad Wray Modernizing School Subjects: The Case of Radiation and Radioactivity (1930–1970). Isabel Malaquias, João Oliveira	The Making of Ignorance in the Regulation of DDT in Franco Spain. Silvia Pérez-Criado On the Trail of Ignorance: Tracing Neglected Connections Between Toxicology and Nanotechnology. Candida F. Sánchez Burmester and Marianne Noël		
17:30 the bus takes all ICHC participants to the city. Excursions by registration only 18:00 –19:30 Tour at the Vilnius University courtyards and visiting an exhibition 'History of Chemistry in Lithuania' **OR** 18:00 – 19:30 Excursion at Vilnius city			

Plenary Lectures

History of Chemistry in Lithuania

Chair: Birutė Railienė

Rimantas Vaitkus

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Chemistry was studied already in the end of XVIII century in Vilnius University. Jędrzej Śniadecki (1768–1838), author of first text book of chemistry in Polish (1800), has started new school of chemistry research. J. Śniadecki has published a book of life sciences, a 'Theory of Organic Beings' Vol. 1 (1804), Vol. 2 (1811) which may have been one of the first textbooks of biochemistry in the world. At the same time Theodor von Grotthuss (1775–1822) has performed his investigations of electro-chemistry and photochemistry in Lithuania. Closure of Vilnius University by Russian occupational authorities (1832) and ban to use public Lithuanian language affected the development of chemistry in the country. Research and studies of chemistry started again after independence in 1918. New directions of chemistry research have been introduced.

Science History Institute lecture: 20 Years of Scientific Heritage in Europe: Trends and Perspectives

(Sponsored by SHI)

Chair: Ernst Homburg

Marta C. Lourenço

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In the past 20 years, European scientific museums have become more relevant public spaces of engagement and open debate about contemporary scientific, political, economic, and social issues.

Largely driven by social movements such as 'decolonization' and inclusion, coupled with increased interest from historians of science, exhibitions are also presenting more complex, innovative, and non- traditional narratives about the past, including the presentation of discomfort stories, controversies, citizen science and interdisciplinary perspectives. The heritage of chemistry has also largely benefitted from this growing awareness and recognition, with increased literature and public access to recently restored historic spaces of chemistry in schools and universities.

As new and renovated scientific museums open everywhere in Europe – particularly in universities – I will briefly revise the last two decades of the sector with the aim of identifying main driving forces and actors. I will focus on the material culture and heritage of chemistry, discussing future perspectives and challenges.

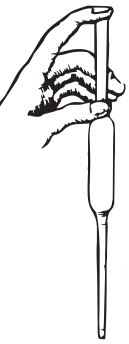
Industrial Heritage and the Environment: the Challenges of Conservation and Transmission

Chair: Ignacio Suay-Matallana

Florence Hachez-Leroy

Université d'Artois, GRHEN, Florence.Hachez-Leroy@ehess.fr

Industrial heritage has been built as an interdisciplinary disciplinary field since the 1960s and has gradually developed internationally. Its recognition by the World Heritage List has greatly assisted in its protection. Its chronological scope has also evolved: initially focused on the English 'Industrial Revolution', it quickly encompassed all human production activity from prehistoric flint deposits to the most recent and obsolete technical objects – our smartphones are an example. The nature of industrial heritage was the subject of a rapid consensus: its tangible and intangible dimensions were immediately affirmed, and all technical heritage is taken into account, including communication networks and infrastructures, the tertiary sector or trade. In themselves, these tangible and intangible elements are valuable sources for historians, in addition to 'paper' archives. If we now consider the thematic dimension, i.e. the industrial sectors concerned by protection measures or simple heritage considerations, the situation is more ambiguous. Indeed, the analysis of industrial heritage by sector, at the national and international levels, offers contrasting situations. While there is generally unanimity in recognizing the coal mining or textile heritage, the situation is quite different for a sector such as chemistry. What is the nature of this heritage today? What are the obstacles to the heritage process in this field? How to apprehend, for heritage, cultural and educational purposes, an industry with very negative perceived environmental effects? How to address the question of the authenticity of the technical object, which arises in a very sensitive way in a context of rapid technical change, which leads to incessant modifications to industrial production devices, to successive replacements that make lose the value of authenticity dear to the curators of cultural heritage. Keeping a worn element is not in the habits of industrial management, unless the part has a particular history, linked to a major innovation for example. But even then, the initiative to preserve remains individual… Are all questions that we will raise.



Historiography and Discipline Formation

Chair: Ernst Homburg

Christoph Meinel

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Towards the end of the eighteenth century the evolution of the modern system of scientific disciplines gave birth to a new kind of disciplinary historiography. The paper will argue that, by defining territory and by shaping identity, historical narratives played a crucial part in creating chemistry as a discipline. Once the pattern of scientific disciplines had been institutionalised in the early twentieth century, historical arguments lost their former functions and chemical historiography declined. In the last decades, however, the disintegration of the classical disciplines triggered the need for new answers to the issue of identity and subject area of chemistry, a new kind of historiography has emerged.

Abstracts of Panels and Sessions

(in chronological order)

1 A PANEL:
New approaches to the history of chemistry

(Sponsored by SHAC)
Chair: Bruce Moran

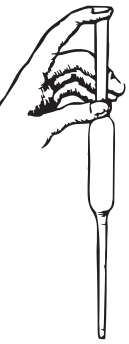
This session highlights both the range of work fostered by SHAC in subject, temporal and geographical terms, but also the effect of new approaches to studying the history of alchemy and chemistry. In their different ways each paper engages with developing new historiographical approaches. Allen and Lang discuss the benefits and drawbacks of using modern scientific knowledge to gain much deeper insights into the practice of alchemy and alchemical medicine in the late middle ages and early modern period. Wilson starts the project of deconstructing one of the key ideas of the history of alchemy and chemistry and the supposed transition between them by examining how the concept of the 'chemical revolution' came about and how that led to a specific idea of what constituted chemistry. This is exemplified by James and Simmons who, by examining the life of a once prominent chemist, William Brande (1788–1866), illustrate how by his not conforming to the historical construction of what a chemist should be, has largely disappeared from history.

The Role of Modern Experiment in Understanding the Alchemical Medicines of the Late Middle Ages

Meagan Allen

Science History Institute, Philadelphia, mallen@sciencehistory.org

Chemical experimentation can provide valuable insights into the practice of pre- and early modern alchemy. Such replications can answer numerous questions, including identifying substances previously only known by their *Decknamen*, and determining to what extent alchemists were engaged in practice, rather than theoretical speculation. More recently, such practices have been used in the history of medicine as well – in 2015, researchers discovered that a 10th century recipe for styes was effective at treating methicillin-resistant *Staphylococcus aureus* (MRSA). It is apparent that both histories of transmutational alchemy and medicine can benefit greatly from reproductions. But can the study of medical alchemy benefit from such trials? Many medical alchemists from the Medieval period focused on remedies that would either cure the whole body of all afflictions, rather than a specific disease, or even prolong life. Such remedies are much harder to test using modern replications. Indeed, are such replications even necessary? In this talk, I will discuss the benefits and drawbacks of incorporating modern experiment into the study of Medieval alchemical medicine. Ultimately, I will argue that while experimentation deserves a place, the absolute reduction of medieval alchemical medicine to modern chemistry can obscure the beliefs of those who practiced it.



Unveiling Alchemical Secrets with the Help of Digital Humanities

Sarah Lang

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The Digital Humanities have become established as an inescapable part of Humanities research nowadays. This talk will illustrate a range of ways of using Digital Humanities methods to advance scholarship in the history of alchemy, introducing the wide range of technologies apt for the analysis of sources from the history of alchemy. It will focus on two case studies: decrypting an alchemical cipher and using state-of-the-art computer vision technology to identify laboratory apparatus in metallurgical tracts.

With ongoing digitization, many alchemical texts become available online as digital facsimiles or transcriptions. Flagship projects such as *The Chymistry of Isaac Newton* (2006), *Furnace and Fugue* (2020) or *Making and Knowing* (2020) have illustrated the potential of digital editions in the historiography of alchemical texts. But digital approaches can go much further: Especially Neo- Latin printed works are promising subjects for computational analyses. Statistical methods were successfully used to decrypt an alchemical cipher in Sloane MS 1902 (Bean, Lang & Piorko 2022). But alchemical books can also be mined using their imagery: Computer Vision methods can detect different types of alchemical apparatus in scientific illustrations in technical treatises on metallurgy, helping to trace their development from the Italian Renaissance to the flourishing German mining industry. While the experimental history of science and archaeometric analysis offer promising insights into the functioning of historical laboratory tools, technical treatises are a fairly understudied book genre. Examples for such technical tracts are Georgius Agricola, *De re metallica* (Basel 1556) or Lazarus Ercker, *Aula subterranea* (Frankfurt 1703). We can use text and image mining on such treatises to further advance our understanding of chymical laboratory processes and the cultural practices of depicting them in technological tracts.

A Preliminary Exploration of the Origin of the 'Chemical Revolution' Concept

Adrian Wilson

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In the historiography of chemistry, the concept of the 'Chemical Revolution' has long been both pivotal and problematic. I propose that the status of that concept might be elucidated if we ask how it came into being, and how it came to prominence in historians' collective conception of late- eighteenth-century chemistry. The first of these questions turns out to be much easier to answer than the second.

Although, as is well known, revolution-talk was initiated by Lavoisier himself, and was very much furthered by Fourcroy around 1800, the concept as we know it – that is, with the definite article, with capital letters, and with the connotation of once-for-all singularity – dates from very much later: specifically, from 1890, when Berthelot used it as the title of a book whose proximate origin was the then-recent centenary of the French Revolution. Only then were Lavoisier's innovations dignified with the special halo with which we now find them surrounded. But the path from Berthelot's move to the historiography of the mid-twentieth century was by no means a simple one. On the one hand, a thread can be traced that seemingly established a simple continuity from Berthelot through Meldrum to Guerlac and beyond. On the other hand, counter-examples are supplied by, for instance, Clow and Clow (who in 1952 used the title *The Chemical Revolution* with a completely different meaning), and by J R Partington (whose *History of Chemistry* of 1961–64 avoided the phrase altogether). Tracing out the process by which the concept became dominant is a task for the future.

The Disappearing Act of William Thomas Brande: How History of Science Marginalises some but not Others

Frank James, Anna Simmons

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Described as 'London's leading chemist' and author of 'one of the most important text-books of the day', William Thomas Brande (1788–1866) tended to be strongly linked with his contemporaries and colleagues, Humphry Davy and Michael Faraday. Born to a wealthy Anglo- Hanoverian family of apothecaries, he went on to hold a large number of paid positions simultaneously in London institutions including The Royal Institution, The Society of Apothecaries, The London Institution, The Royal Society of London and The Royal Mint. In addition, Brande provided chemical advice to water and gas companies and to the East India Company and well as publishing numerous textbooks, mostly based on his lecture courses. However, never having received a 'life and letters' Brande is now seen as a somewhat marginal figure, something this paper seeks to rectify. We argue that his initial disappearance from the historical record can be attributed to the historiography of science that, until recent decades, focussed on scientific research as the primary object of study in the history of science. This meant that those areas of science to which Brande devoted most of his time and effort – lecturing, administration, publishing and consulting – have been relatively neglected. (This argument is pleasingly symmetrical since until recently these aspects of Davy's and Faraday's careers have been largely overlooked). By examining Brande's career in all its multifarious aspects, we hope to justify the view of his contemporaries that he was in the same class as Davy and Faraday and make him re-appear.

1 B SESSION:
Natural and Artificial Materials

Chair: Ewa Bulska

The Innovation Process of Technical Textiles in the Rhenish Textile Industry: Invention, Adoption and Diffusion of Kevlar, PVC and PTFE in Times of Crisis (1950s–2020)

Stefanie van de Kerkhof

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What do the Olympic Stadiums in Montreal, Munich, Berlin and Kiev, the iconic 'La Grande Arche' building in Paris, the curved sail of the famous Burj al Arab hotel in Dubai, and various stadiums built for the football World Cup competitions in South Africa, Brazil and Qatar have in common? They all were designed by renowned international architects using PTFE-coated membrane facades or roofing from the Rhenish textile industry! Thus, the paper uses rich archival material to analyze the crisis period and the change to new technical textiles at one of the most prominent exponents of the industry, the Verseidag corporation at Krefeld (Lower Rhine area). The ongoing shift to technical textiles as a profitable niche market stemmed principally from the decline in the West German textile industry that had commenced at the close of the 1950s. It was a sea change that affected numerous manufacturers in West Germany. But through innovative processes and the early adoption of aramid fibers, fiberglass weaving, PVC and PTFE coating, Verseidag succeeded in opening up new markets. Based on inventions of the US- and West German chemical industry (DuPont and Hoechst), the textile producer established a successful range of industrial applications.

Looking for Materials and Finding Stories: Celluloid as a Starting Point

Artur Neves[1], Robert Friedel[2], Maria João Melo[3], Maria Elvira Callapez[4]

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Teaching history using objects is one of the most important services to society that a museum provides. Objects, central figures in any museum, must be interpreted, exhibited, and conserved. Understanding their materiality is crucial in each step. The materials that compose the objects impart messages about their role in culture and define their physical-chemical experiences over time. However, in museums and other smaller cultural institutions, materials identification can be found incomplete, unexplored, or inadequate, for example, by misidentification. It is urgent to create more procedures that allow cultural institutions to assess the materiality of their collections in a simple, economical, and efficient way. In this work, we show how the use of a single handheld Raman spectrometer, used in the USA and Portugal for the search of celluloid objects in several cultural institutions, allowed building new stories about the chemical history of billiard balls, dentures, and combs, based on object material identification. Revolving around sustainability, a key topic for a better future, the history of celluloid, and the objects made with it are relevant in all educational programs that, in turn, aim to make us think about the consequences of our material choices.

Moon Rock Analysis in West Germany: Tensions Between Involvement, Self-Assertion, Escaping the Past and Dreading the Future

Christopher Halm

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On July 24, 1969, for the first time in history, a human mission brought selected rock samples from a celestial body to planet Earth. Sampling the moon-initiated research programs and museum exhibitions that are still running today but whose history has yet to be told. Moon rocks are of multiple research interests and reflect vivid political and cultural stakes. As objects in museums and labs, they offer a fascinating global history of the 20th and early 21st centuries. This paper traces the history of a particular moon rock sample from when it was taken off the lunar ground until nothing was left except its atoms in mass spectrometry. I provide insight into the work, staff, and correspondence of NASA's Principal Investigators in West Germany. I argue that these chemically trained scientists were seeking an exit from the tragedies and crimes of World War II by entering the billions of years of cosmic age deriving from radiometric dating. What have they precisely done in and outside their labs? In what politics did they believe? And what future did they hope to accomplish?

Indigo – The History of its Synthesis

Michaela Kröppl

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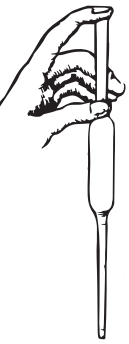
The dye indigo is nowadays especially popular as it is widely used for the colouring of blue jeans trousers. Its intensive use started in the last quarter of the 19th century as Levi Strauss invented the jeans fabric for very hardwearing clothes – using the blue indigo colour for their coloration. At this time also first chemical synthesis ways for the blue colour originally derived in Europe from dyer´s woad (a very time-consuming and long during process) and later imported from Asia – have been developed. The work will give an historic overview of the traditional blue colouring with the dyer´s woad (the 'European indigo' Isatis tinctoria) and the Indian indigo Indigofera tinctoria. Then it will present the experimental ways for the determination of the chemical structure of the indigo molecule and the first steps to reproduce indigo from its parts. An overview of different approaches for chemical synthesis will be described. Important researchers and companies in this synthesis process will be presented, chemical reaction equations will give explanations for the development of finally the best synthesis way at the beginning of the 20th century.

2A PANEL:
Material Culture, Texts, and Theories: an Interdisciplinary Approach to the History of Chemical Arts

Chair: Giacomo Montanari

From the second millennium BCE, through Antiquity and the Middle Ages, an uninterrupted flow of texts and artifacts witnesses to the interest that many different societies had in the manipulation and transformation of matter. Dyeing techniques, metalworking, perfume making, and imitation of natural substances were some of the main goals of the practitioners, who operated between textual traditions and practical experiences. In late antique Egypt, this lore took the form of a unique discipline, that is alchemy, whose practice was crucial to both the Latin and the Islamic Middle Ages. This knowledge was shared by erudite scholars and craftsmen alike, and permeated many different aspects of social life. This panel will discuss critical case-studies from this tradition (from the Graeco-Roman Antiquity to the Islamic Middle Ages and the Italian Renaissance), which will be investigated by adopting a new approach to the textual and material sources. Indeed, a fresh interest has arisen among chemists in the possibility of exploring the material reality behind premodern texts, which, once studied inside a chemical laboratory, can provide new insights into the earliest phases in the history of chemistry. Combined with a rigorous historical and textual analysis of the sources, this approach leads to an interdisciplinary research that sees historians of science and chemists working hand in hand to open new perspectives on chemistry before chemistry.



A Chemical Approach to the Ancient Alchemical Theory: 'All Metals are Mercury'

Lucia Maini, Matteo Martelli

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This paper explores the ancient chemistry of mercury, the natural element that held the greatest fascination among alchemists. The study combines a philological investigation of Greek and Syriac alchemical texts that describe the hot extraction processes from cinnabar with laboratory-based interpretations of the sources, which have been tested by means of modern experiments and replications. This study will lead to a better understanding of how ancient practitioners conceptualized and processed mercury as one of the main constituents of the mineral word. At the same time, by following the ancient procedures, we will be able to rectify some explanations that have been commonly proposed for ancient alchemical knowhow and identify reactions that never found their way into modern chemistry laboratories and the literature.

Cosmetic, Poison, and a Paradigm of Whiteness. A *TheSu* – Assisted Overview of Lead White (Psimúthion/Cerussa) in Graeco- Roman Sources and Contemporary Replications

Daniele Morrone

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A comparative overview of ancient Graeco-Roman testimonies on the use, production and cultural value of lead white (psimúthion or cerussa), assisted by the *TheSu* XML digital annotation scheme, is presented. The sources varyingly mention lead white as a mineral of cosmetic, medical, alchemical and even metaphysical significance, and *TheSu* facilitates its comprehensive historical reconstruction. *TheSu* may also assist historians in designing replications of its attested production techniques.

Instant Ice in the Middle Ages: An Interdisciplinary Study of a Chemical Wonder

Marianna Marchini, Lucia Raggetti

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The great scholar al-Kindī (d. 873) composed a treatise on the preparation of artificial food ('Preparation of foods without their basic ingredients', *Risāla fī ṣinʿat al-aṭʿima min ġayr ʿanāṣirihā*), now preserved only the quotations of other authors. Among such preparations, we find a procedure generically featuring a white salt to prepare instant ice. A similar recipe is attributed to the ingenuity of Galen by Ibn Abī Uṣaybiʿa (d. 1270) in his history of physicians, along with a North African vegetal preparation supposedly meant to imitate the result. Moving from the textual tradition to the laboratory, replication shed light on the identification of the salt and its chemical behaviour under the conditions described in the recipe. Moreover, the replication of the chemical reality behind the text helped discerning the role played in the procedure by the relative perception of heat and the striking visual effect produced by a phase transition.

A Jewish Alchemist Reads a Classic of Arabic Chemistry in Early Modern Italy: Translation and Practice in the Hebrew *On Alums and Salts*

Gabriele Ferrario

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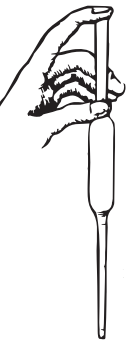
How was a 12th century Arabic alchemical treatise read (and practiced) by an Italian Jew living in Early Modern Northern Italy? This paper looks at one of the most recent incarnations of the very influential Arabic alchemical treatise known as the *Book on Alums and Salts*, i.e. its Hebrew translation. The Hebrew version of the *On Alums and Salts* was produced between the 16th and the 17th century by a Jewish alchemist living in Northern Italy. Although no information about this Jewish practitioner has been preserved, much can be inferred from the traces he left on his version of the work. His annotations, drawings, comments, and corrections to the treatise allow a rare insight into the reading techniques of Early Modern alchemists and show a clear commitment to laboratory practice as an epistemological tool. The analysis of his notes on and corrections to the treatise through the lens of modern chemical replications is therefore a very effective and historically grounded tool for approaching the Hebrew *On Alums and Salts*.



Alchemy and Public Health: A Case-Study from the Official Pharmacopoeia of Florence

Stefano Mulas

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During the 16th century, at the time of Cosimo I and his sons, Francesco I and Ferdinando I, Florence became the scene of a renewed interest in alchemical practices. In this context, where Hermeticism, Neoplatonism, and natural philosophy were strongly intertwined, the study of the ancient traditions combined with empirical research provided a new perspective on nature, outlining a cultural context in which the foundry of Duke Cosimo I acquired a leading role for experimentation. This paper aims to show the range of the Medicis' alchemical interests and especially the importance of alchemy in matters of public health. Indeed, an examination of the various editions of the official pharmacopoeia of Florence (i.e., *Ricettario Fiorentino*) from 1550 onwards reveals a progressive expansion in the section dedicated to the distillation of natural substances and an increasing number of remedies based on minerals and metals. In this sense, these recipes represent an important clue to reconstruct the relationship between the Medicis' laboratory activities and the sanitary measures issued by the Guild of Physicians and Apothecaries.

2 B SESSION:
Politics and Chemistry in the Long Run

Chair: Anders Lundgren

Contributions to the History of Chemistry During the First Romantic Period in Portugal

Sérgio P. J. Rodrigues[1], Marília Peres[2]

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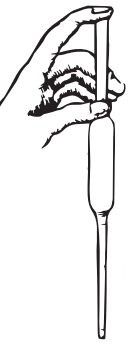
[2]Universidade de Lisboa, Centro de Química Estrutural, Institute of Molecular Sciences, Escola Secundária José Saramago-Mafra, imperes@ciencias.ulisboa.pt

In Portugal, the Romantic movement is intrinsically connected to Liberalism and was made with personalities forged in the peculiar illuminism one had in the Country. Though the Enlightenment assumed in Portugal a special character, where the freedom of public speech, was never taken into account, Portugal had an earlier Liberal Revolution in 1820. In fact, due to the Napoleonic invasions (1807–1813), the fleeing of the Royal Family to Brazil (1807–1821), the civil war that started circa 1832 and lasted till 1834, and also due to exiles, the intellectuals had the opportunity to think of the real state of the country and develop a romantic attitude towards science. This work is anchored in personalities connected to chemistry or natural philosophy that fought, or have been affected by the revolutions, as viscount of Vilarinho de São Romão (1785–1863), Luís Mouzinho de Albuquerque (1792–1846), Marquis de Sá da Bandeira (1795–1876), and Viscount of Vila Maior (1809–1884), but take also into account the local and international scenarios. The relations with the Academy of Sciences of Lisbon, University of Coimbra, the Polytechnic Academies of Lisbon and Porto, and other institutions, are explored in this paper. (Acknowledgments: CQC is supported by FCT, Portugal, through contract UIDB/00313/2020).



'The Responsibility of Scientists' – History of Chemistry Writing in German Student Associations

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In remembrance of the various atrocities committed with the help of chemistry in the 20th century, there is a tradition of lay historical work in German chemistry student associations, which has not received any historical attention to date. This paper focuses on the reader '… *von Anilin bis Zwangsarbeit*' (transl. '… from Aniline to forced labour'), which was first published by the National Convention of Chemistry and Chemistry-Adjacent Students' Associations in German-Speaking Regions (BuFa-TaChemie) in 1994, following ownership debates in the German chemical industry after reunification. Across almost 200 pages, it provides a detailed and opinionated account of the history of the German chemical industry and its entanglements in the world wars, focusing on its role in the Third Reich. What motivated a group of largely unnamed chemistry students to publish a detailed historiography? What was their purpose and self-image? The text reveals a deeply political vision of the project, collecting and curating information as an expressly political statement against war and profit. Chemistry students used history writing to take a stance against the perceived neutrality of science.

The Establishment of the Independent University of Chemistry and Technology Prague in the Conditions of Communist Czechoslovakia

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The independent University of Chemistry and Technology in Prague was established as of 1 September 1952 as the successor of the Faculty of Chemistry of the Czech Technical University after the extensive de-centralization of the Czechoslovak university system under the instructions from Soviet advisors. The university was to be newly built following the example of the Moscow D.I. Mendeleev Institute of Chemical Technology which, however, was not up to the standards of its Czechoslovak counterpart as regards the quality of academic research. This was in direct conflict with the efforts to reform the university and its curricula, which had been most actively improved by František Šorm, Rudolf Lukeš and Otto Wichterle, the leading lights of the Czech chemical sciences, after the war. In the new system, the pedagogical work and academic research became controlled by the state plan that determined the research topics and focus and defined the scope of cooperation with industrial enterprises, as well as the numbers of enrolled students. The university's involvement in international research networks was strongly limited by the Iron Curtain, and politics also had an adverse impact on the university's staff policy, most prominently during the class origin and political loyalty checks in 1958.

3 A SESSION:
Chemistry in Lithuania and Latvia

Chair: Gisela Boeck

Early Bell Casting Technology in Vilnius

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In fourteenth century cannon and bell foundries were already operating in Vilnius and Kaunas. It is known that the Grand Duke of Lithuania and King of Poland Zygmunt II August (1520–1572), especially while living in Vilnius, was very interested in casting process. Under his order a book by German doctor, metallurgist and mineralogist G. Agricola (1494–1555) *De re metallica libri XII* (XII books on mining and metallurgy) was obtained to the royal library. It was the first book on the European continent to describe the casting process and the preparation of raw materials for that process in great detail.

In 1924 the history of bell casting in Vilnius was described by Michał Eustachy Brensztejn (1874–1938), researcher of a history and culture of Samogitia (Western part of Lithuania), archaeologist, ethnographer, librarian, in the Polish language *Zarys dziejów ludwisarstwa na ziemiach b. Wielkiego Księstwa Litewskiego* (An outline of the history of bell founding in the lands of the former Grand Duchy of Lithuania), in which he provided a very detailed description of the history of bell casting throughout the Grand Duchy of Lithuania. The report will present several historical relics that have reached our times in the city of Vilnius.

In Memory of Professor Kazys Daukšas

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The 2025 year will mark the 120th anniversary of Professor of Vilnius University Kazys Daukšas. His PhD dissertation *Osmates of alkaline metals* in 1936 has been presented for public criticism. This PhD thesis is first doctoral thesis in the field of Inorganic Chemistry in Lithuania. The current report is based on the original work of K. Daukšas and briefly describes the main trends reported in the dissertation. Moreover, the aim of this study also is to introduce the most famous Lithuanian chemist of the twentieth century to the global scientific community.

Vilnius University was founded in 1579. The Department of Chemistry was established only in 1797 when famous chemist Professor Jedrzej Sniadecki was then appointed as a new Head of the Department. After Lithuania was annexed by Russia, the University was closed down in 1832. First Department of Inorganic Chemistry was established at Vilnius University in 1919. When in 1919 Lithuania lost its historical capital Vilnius, the second-largest city Kaunas served as the provisional capital for the next twenty years. In 1922 a new school was founded under the name of the University of Lithuania, which was renamed to Vytautas Magnus University in 1930.

The Development of Electrochemistry in Lithuania

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Lithuania may be reasonably proud that origin of electrochemistry science in the country is associated with name of Theodor Grotthuss, the world- famous founder of the theory of electrolysis. It was proposed in 1806 and some think it, could have been worthy of a Nobel Prize, if such had existed at that time. However, 100 years had to pass till next serious electrochemical investigations in Lithuania began and they are related to the name of professor V. Čepinskis. To be fair, it should be acknowledged that before the World War II, only the foundations for development of electrochemical science were laid. In the post-war period prof. J. Matulis, initiated research related with electrolytic deposition of metal coatings. The main achievement in electrochemistry in the XX century in Lithuania were attained exactly in this field. After Lithuania had regained its independence new research directions were identified with a focus on an integration into global chemistry science. The qualitative changes took place in the field of research objects and scientific production during the last decade of the century. Fundamental and applied research initiated by J. Matulis spread out into such areas as autocatalytic metal reduction, bioelectrochemistry, spectro-electrochemistry and electrochemical materials science.

Solid State Ionics in Latvia

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In 1970-ties the development of electronics attracted interest to solid devices with ion conductivity – batteries, fuel cells, displays, sensors etc. The Semiconductor Material Department in the Laboratory of Semiconductor Physics Problems (University of Latvia) was established on June 30, 1968. Andrejs Lūsis (1937–2017) was appointed as the head of the department. His doctoral thesis *Electrophysical properties of copper phosphate glasses* (1975) was related to studies of the conductivity switching effect. It will define the future of the main research direction – electrochromic devices. The laboratory became part of the Institute of Solid State Physics, which was established in 1978. The cooperation was initialized with electrochemist Dr Chem Gunārs Slaidiņš (1934–1980) from Department of Physical Chemistry of the Faculty of Chemistry (University of Latvia) on solid electrolytes and hydrogen diffusion in palladium and metal oxides. It led to the rapid development and the institute was recognized as a leading in Solid State Ionics in the whole of the former Soviet Union. The annual All-Union international conferences 'Solid State Ionics—SSI' in Riga (1979–1989) invited scientists from all over the country. The international recognition will be achieved by number of research publications and doctoral thesis.

3 B SESSION:
Crossing Disciplines: Chemical Frontiers in the Nineteenth and Twentieth Centuries

Chair: Marcus Carrier

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The Operationalization of Porosity between Petroleum Geology and Reticular Chemistry

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The adsorption of fluids within porous materials has been a concept long observed within different material sciences. From ancient medicinal practices employing pumice and other porous stones to absorb human ailments to modern reticular chemistry, the concept of porosity has been theorized and operationalized at different historical junctions. This paper argues that the rise of petroleum geology at the turn of the 20th century influenced the study of porosity in chemistry by providing a capitalistic incentive for determining the amount and shape of void space within rocks. From measurements of specific gravity, or density, to spectroscopy, the void channels and permeability of rocks and soils became increasingly related to their productive abilities. Higher effective porosity in certain sedimentary rocks correlates with oil production, and the geometrical pattern of empty pockets within different materials can predict how much of a specific gas they can adsorb. The implications of molecular chemistry for today's carbon sequestration and extraction of rare earth elements from brine follows from the understanding, common in early petroleum geology, of substances hosting fluids useful for human consumption and energy production. This paper will thus unite strands of the history of chemical and geological porosity measurements and reflect their interaction.

From Solid to Liquid: The Global Chemical Industry and Sulfur Maritime Shipping in Southern Mexico, 1955–1968

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The development of chemical industries induced the expansion of mineral and shipping industry. Among the minerals used by chemical industries, Sulfur is important as raw material of sulfuric acid, a solvent used in a wide variety of synthetic products. Pan American Sulphur Company (PASCO), established in Southern Mexico in 1948, became the third world's sulfur producer from 1955 to 1968. The company sold its mineral on a large-scale as it increased its extraction capacity and developed new ways to transport sulfur overseas. It took advantage of warships reconverted to bulk carriers to distribute sulfur dust in American and European ports from 1955 to 1961. It invested in liquid sulfur terminals in United States, and Great Britain, and designed liquid sulfur tanker ships to the sulfuric acid plants established between 1961 to 1968. These plants were bigger than the previous ones and required a huge and continuous supply of sulfur. Compared with sulfur dust sea transportation, liquid sulfur reduced loading and unloading times, risks of explosions, losses of material and other problems that became relevant in large-scale shipping. PASCO's liquid sulfur illustrate a big change in shipping industry, materialized in the built of increasingly specialized chemical tankers, in the Postwar Era.

About Maria Skłodowska-Curie: Chemistry Context

Ewa Bulska

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The presentation will focus on the fascinating story of Maria Skłodowska-Curie, on her live and her achievements in the context of chemistry, particularly on the exploration of chemical analysis. The experience in chemistry made possible her discoveries, the discovery of the elements polonium and radium, discoveries that not only brought her the Nobel Prize, but were also extremely important for the development of science.

Maria Skłodowska-Curie was awarded twice with a Nobel Prize, the second one was the individual Nobel Prize for Chemistry. Mania, as she was called on her home, grew up amidst conversations about science and education. As an unusually gifted child, she was interested in many areas, including literature, history, but especially natural sciences, in particularly physics and chemistry.

She has gained in-depth knowledge and skills in laboratory work through an internship in the chemical laboratory, which was managed by Napoleon Milicer, a former student of Robert Wilhelm Bunsen (he together with Robert Kirchhoff established the basis of the spectral analysis). In this laboratory Maria completed a systematic course of chemical, qualitative and quantitative analysis, along with the analysis of minerals. She has always appreciated the time spent in the chemistry lab, recalling and emphasizing that 'If Professor Napoleon Milicer and his assistant Kossakowski had not taught me analysis so well in Warsaw, I would never have been able to isolate radium'.

Computational History of Chemistry

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The increasing amount of data and of computing power are turning computational approaches into an integral part of historians' tools. Beyond providing novel ways to solve historical questions, computational history allows for asking and solving novel questions related to large scale patterns. Chemistry, being the science with the largest output of publications associated with its exponential growth of new substances and reactions, is therefore not short of data. This information is today collected in huge electronic databases, which not only bring this corpus of information at our fingertips but also offer many possibilities for conducting computational analyses shedding light on the history of chemistry and the evolution of chemical knowledge. Here we summarise our results on the historical unfolding of the chemical space, understood as the collection of chemicals and reactions reported over the years in the scientific literature. With these tools, we can also analyse how the periodic system emerged from accumulating chemical knowledge. Our results show that the chemical space, as well as the periodic system, has been affected by internal and external factors such as technologies and theories, as well as wars. We conclude by discussing open questions and challenges for the computational history of chemistry.

4 A PANEL:
Constructing Naturalness

(Sponsored by CHCMS)
Chair: Brigitte Van Tiggelen

'Nature' and 'Chemistry' are often perceived as opposites in society. Either something can be natural or chemical. While 'natural' has a positive connotation of healthiness, 'chemical' mostly is understood as risky and unhealthy. Therefore, one might assume that products or substances of both categories are strongly distanced. But what is perceived as 'natural' is highly influenced by social, industrial, and political actions. In our panel we want to discuss the construction of 'natural' products and the possible change of perception. Using different case studies from 20th century Germany, the integration of chemical substances into every-day life will be analyzed following processes of naturalization and normalization. In doing so, the complex relationship of chemistry and nature will be discussed from different perspectives and the usage of terms like 'chemical', 'synthetic', 'artificial', and 'natural' will be critically examined.

The Naturalization of Chemical Substances: How Synthetic Flavors Became 'Natural' During the 20th Century

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Products of the chemical industry are often understood as something potentially dangerous and negative in society. They might cause severe illnesses and contaminate the environment. Nevertheless, the substances of the chemical industry are omnipresent in our daily lives, for example in the form of remedies or cosmetical products. In this talk I will discuss a particular type of chemical substance: Synthetic flavors. In times of industrial food production, industrial produced flavors play an important role in keeping foodstuffs gustatorily attractive, and in creating new types of food. How did industry and politics deal with the characteristic of flavors being important ingredients of food, and with the difficulty of handling 'chemical' substances in such sensitive and important products like food? How was it possible to naturalize synthetic flavors in that context? Using vanillin as a case study, this talk will first highlight industrial strategies for reducing the synthetic character of flavors during the first half of the 20th century, and second discuss the regulation of flavors in Germany during the second half of the 20th century in order to visualize and problematize the naturalization of synthetic flavors.

Activating Skincare: Drugofa's Concept of Effective Cosmetics in 1970s and 1980s Western Germany

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Skincare products are often located in a gray area, either as products for health or lifestyle, between necessity and luxury, and depending on their ingredients, as chemical or natural. The case study of Drugofa´s skincare product line gives insight into this gray area, as well as into the involvement of the pharmaceutical industry in the cosmetics industry in western Germany in the second half of the 20th century. The concept of effective cosmetics that emerged in this case, opens up the opportunity to discuss different types of cosmetic products as well as their presentation as 'chemical', 'natural', 'scientific', or something in between.

Being the subsidiary of the pharmaceutical global player Bayer, Drugofa presented their anti-aging skincare *Quenty and Quenty forty* in the 1970s and 1980s, first in western Germany, and later globally. The advertisement was based on the concept of 'Wirkkosmetik' (effective cosmetics), defined as cosmetic products with biologically active ingredients. In which way did the active ingredients Collagen and Elastin shape the presentation of the skincare lines? What kind of impact had the concept of effective cosmetics on the sales strategy of Drugofa's products?

Producing the 'Natural Cycle': Hormonal Products and How They Link Femininity and Cyclicality

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By 2021, gynecologists have celebrated a new estrogen, estetrol, as an innovation in the manufacturing of hormonal contraceptive products. Contraceptive pills (*Antibabypille* in German) such as Drovelis and Qaira are promoted as an alternative, better version of previous pill-generations, namely as containing 'bioidentical' hormones. Bearing ever new attributions, the term bioidentical continues the long history of describing and circumscribing synthetic hormones as natural, or being identical with the 'female' body and cycle.

When the contraceptive pill was introduced in the beginning of the 1960s, it was primarily used to regulate the menstrual cycle in women. Hormonal products containing the same hormones (always a combination of some kind of estrogen and gestagen) as hormonal oral contraceptives were first developed in order to counter *secondary amenorrhea*, the absence of three or more periods in a row by someone who has had periods in the past. Practitioners first prescribed Duogynon, a hormonal pregnancy test used in the 1960s to 1970s, also to women who lacked what was described a 'normal cycle'. Medical historians have argued that such a naturalized menstrual cycle didn't exist until hormonal products were at hand to regulate it. (Secondary) amenorrhea always was the go-to indication for hormonal products, long before hormones were specifically produced for contraceptive indications.

This paper will trace the concurrent development of the notion of a 'natural cycle' and the search for users of hormonal products. Analyzing prescription suggestions, pharmaceutical brochures and guidebooks, this paper argues that through the hormonal explanation of a woman's 'cycle', hormonal products became naturalized at the same time the body became artificially regulated.

4 B SESSION:
Alchemy: Its Tools, Images and Dreams

Chair: Matteo Martelli

The Archaeology of Alchemy and Chemistry: Past, Present and Materials for the Future

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Historians of science increasingly focus on the materials, the practices and the techniques of scientific endeavors. This is especially the case for the historiography of chemistry, where the manipulation of substances is paramount. As a discipline founded on the analysis of material culture, archaeology represents a valuable vantage point to the study of chemical practices. This paper outlines the development of the so-called archaeology of alchemy and chemistry, a cross- disciplinary methodological approach that uses the scientific analysis of the remains left by al/chemical activities as a way to address broader historiographic questions. The initial studies are characterized by a focus on early modern metallurgy, exposing the overlaps between artisanal and natural philosophical knowledge around the nature of metals. Expending the scope of the discipline, recent research started investigating the role of glass and glass making knowledge in the history of chemistry, and the analysis of remains related to practices of medical alchemy. By highlighting the key contributions of the archaeology of alchemy and chemistry to the history of chemistry, this paper reinforces the argument in favor of using materials as primary sources. To conclude, some ideas and materials for future studies will also be presented.

History of Polysulfides and their Role in the Evolution of Chemical Knowledge: From Ancient Egypt Medicine to the Discovery of Oxygen

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Inorganic polysulfides (Sn^{-2}) and their protonated forms play an important role in many fields of chemistry, geology and technology. Before the introduction of modern chemical nomenclature, inorganic polysulfides were known as 'liver of sulfur', 'divine water', 'hepar sulphuris' and 'dia sulphuris'. These compounds were used for industrial and medicinal purposes already in the ancient world. In the Alexandrian school of alchemy, the liver of sulfur played an important role for dyeing of metals with golden patina and was viewed as a step to their transmutation to gold. During the Middle Ages formation of liver of sulfur by a reaction of sulfur with carbonates of alkali metals, followed by its decomposition with acid was applied as a procedure for purification of sulfur. Due to the wide range of oxidation states of sulfur, attempts to explain transformations of sulfur-bearing compounds, including polysulfides, were made in the framework of phlogiston theory. At the end of the phlogiston era, due to their ability to react quantitatively with oxygen, polysulfides played a crucial role in experiments of Joseph Priestley, Carl Wilhelm Scheele and Henry Cavendish, which led to the discovery of oxygen.

5 A PANEL:
Teaching Chemistry Through History of Chemistry

Chair: Asbjørn Petersen

Many science educators appreciate what history of science can offer in science education, especially to teach about the Nature of Science (or NOS) (Matthews 1994; Allchin 2013; McComas 2020). In museums, historical collections and exhibitions on modern science alike invite visitors to reflect about the development and public image of science. In this session, we discuss how history of chemistry can be used and presented in teaching, textbooks or museum exhibitions. How can pedagogical and museal practices and historical scholarship work together, and what are the possible pitfalls of disseminating history of science in pedagogical contexts? Four papers approach these questions from different perspectives: 1) how students can learn about nature of science from reconstructing an historical model, 2) how chemistry exhibitions in museums can open up for an understanding of the history of chemistry, 3) what aspects of history of chemistry are presented in chemistry textbooks, and 3) to what extent the teaching of chemistry today is based on the incorporation and accumulation of different entities throughout its history. The session will end with closing remarks and a discussion.

Learning Nature of Science (NOS) From the Crookes 3D Model of the Periodic System

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In 1898, the British chemist and science journalist William Crookes published his model of the periodic system, a figure-eight shaped spiral built by his assistant, James H. Gardiner, which he named *Vis Generatrix*. The model illustrates the 'creation of the elements', based on the idea of primary matter, the 'protyle', advocated by William Prout in the early 19th century.

During autumn 2019, science teacher students who followed a history of science course at NTNU- Norwegian University of Science and Technology were assigned to prepare a 3D model of Crookes' periodic system for display in the Natural Science Library. After the course, three students who volunteered to participate were interviewed about their experiences with working on the model, and what they learnt about the Nature of Science (NOS) through digging into the history of the periodic system in general and building the Crookes model in particular. In this paper, I will discuss some aspects of the history of the periodic system that are often neglected in popular accounts, present how the students worked with these aspects and with the Crookes model in the history of science course, and investigate the students' statements in the context of NOS teaching and learning.

Chemistry in the Deutsches Museum

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The chemistry exhibition was part of the canon of the Deutsches Museum from the beginning. In a re-opened (2022) part of the museum, chemistry is presented in three historic laboratories, modern chemistry on various topics and a laboratory area where visitors can experience chemistry live in lectures or do it themselves in the laboratory.

Topics such as nutrition, plastics, or chemical industry show the visitor that chemistry is part of everyday life and doesn't just happen in a laboratory far, far away. We also take the chance to tackle some of the downsides of chemistry and to discuss this with the younger generation. We try to provoke questions such as: Does our picture of alchemy agree with history? How do 19th century theories, like the ones of atomic bonding, still influence our scientific imagination? How did chemical technology change the environment and society in the 20th century? What challenges do we face in the future?

We would like to establish this exhibition as an important, extracurricular place of learning, especially in exchange with teachers and students. Please be invited to a discussion on promises and pitfalls of scientific exhibitions especially with regard to provocative historical topics and stories.

History of Chemistry in German School Textbooks

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History of chemistry does not play a major role in the education of bachelor's and master's students of chemistry, nor in the training of prospective teachers in Germany. It is usually limited to a chronicle of inventions and discoveries or to the naming of chemists and an excerpt of their achievements – often too much reduced – or anecdotes are told. In this talk, the first results of an investigation of school textbooks are presented. The goal was to find out which scientists are mentioned in which context. For this purpose 46 books from the period 1988–2019 were considered. We identified 279 scientists – some of them quite unknown. J. J. Berzelius was mentioned most frequently, in 26 books in connection with catalysis, formula notation, term organic chemistry, term protein. He is followed by A. L. de Lavoisier, who is listed in 33 books (discovery of oxygen, concept of elements, law of conservation of mass, relationship between body heat and combustion of food). As will be shown by example, it must be stated that the achievements mentioned are not presented in context. This shortcoming cannot be remedied by the teachers. They need advanced training. It will be discussed in conclusion, what options are available.

History of Chemistry Through its Practices and Entities

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Chemistry is a young discipline that has integrated a millenary trades, today transformed into technosciences. Chemistry is about the change of substances in small and very large quantities. It is recognized as a practice, that is to say, coordinated and shared activities that are disciplined through the adjustment of 'correct' norms or procedures and that have a stable structure, with the ability to reproduce itself through different learning processes. Chemical practices – -analysis and synthesis – are different from other scientific practices, particularly those from physics. Chemical practices do not try to discover how matter is constituted; what they mainly seek is to build new substances. For chemists, reality is found in the entities, or epistemic objects, that explain chemical practices.

Here I will argue that chemistry, as taught everywhere in the world today, is based on the incorporation and accumulation of different entities throughout its history. Beginning with entities like atoms, and the didactic rise of modern chemistry in 1732 after Boerhaave's publication of *Elementa Chimiae*, to nanoparticles, including molecules, ions (electrons, nuclei, radicals) and spin, the ontological continuity of chemistry is based on the entities that explain chemical practices.

5 B SESSION:
Early Chemical Industries and Practices

Chair: Christine Nawa

Making Chemistry Industrial

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In the six volumes of the recently published A Cultural History of Chemistry each volume includes a chapter on 'Trade and Industry'. Indeed, since the earliest documentation of chemical processes there have existed artisanal practices that – with hindsight – can be called

'chemical'. In the series the changing meaning of chemistry/ chymistry/ alchemy is discussed at several places, but this is less the case for terms such as 'art', 'industry' and 'chemical industry'. In the present paper I will ainvestigate from six interrelated perspectives how between 1700 and 1850 a chemical industry emerged: (1) the establishment of connections between 'chemical' knowledge and artisanal practices; (2) the scaling-up of laboratory practices to a larger 'industrial' scale; (3) growing importance of cultural factors emphasizing the technical and commercial relevance of chemistry; (4) the evolution of the term 'chemical industry'; (5) the broadening of the scope of the chemical industry, by inclusion of older trades and industries into the chemical industry; (6) the development of specific equipment and technological processes that was used only in industrial practice. I will argue that the study of the complex interplay of these six factors is crucial for the understanding of how chemistry was made industrial.

Eisen Mountains – The Century of Bohemian Fuming Sulfuric Acid

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Pyrites from the Bohemian Iron Mountains has served as an iron ore and later as a source of sulfur since the time of the alchemists of Emperor Rudolf II. Demand increased during the Thirty Years' War because sulfur is an ingredient of gunpowder. It was only by chance in 1778 that green vitriol, formed by the weathering of pyrite on tailings heaps, was discovered and a method of producing sulfuric acid by calcining it. Thus began a hundred years of production of fuming sulfuric acid exported from Bohemia to the whole of Europe. In earthenware jars it travelled over land, river and sea to Baku, where it was used for refining oil. In the second half of the 18th century, acid travelled in large quantities to England – initially used to bleach linen, but the main boom in consumption came after 1743, when the first semi-synthetic dye, Saxon Blue, was discovered. 'Bohemian fuming sulfuric acid' became a worldwide phenomenon for a hundred years. The end of the story begins in 1831, when a principle of considerably cheaper contact method of acid production was discovered, sending the roasting chambers of the foothills of the Iron Mountains into the history books.

History of Chemistry Meets Art History and Heritage Science: A Project on the Royal Cobalt Works (Blaafarveværket), Modum, Norway

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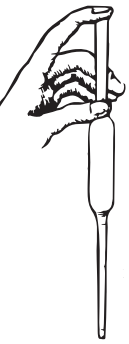
In the year 1776 the Royal Cobalt Works was established in Molden, Norway. It was in operation until 1898. The plant represents one of the most important manufacturers of cobalt and related pigments in Europe. The pigments were used for coloring glass, glazes, and porcelain, and to produce artistic colors. The products were exported to Europe and overseas. The works were closely connected to the School of Mines in Kongsberg, Norway, one of the oldest higher technical learning institutions in Europe. Today the works are a museum complex, consisting of mines, various buildings, living quarters for workers, smelting plant and other facilities.

The present contribution will present a research project at the interface of history of chemical technology, heritage science and art history. Lab note books describing initial experiments as well as production processes, documentation of trading, reports of working conditions, and samples of ores and original pigments are valuable sources to study the production history of one of the most important group of blue pigments. In a close collaboration of chemists, historians, art historians and conservators the project will throw new light on the production, trade, use, and preservation issues of cobalt pigments.



Dynamite and Crops: Ascanio Sobrero Between Chemistry and Agriculture in 19th Century Italy

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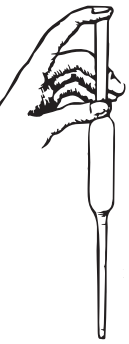
The Italian chemist Ascanio Sobrero (1812–1888) became known for the invention of the nitroglycerin and for the consideration of Alfred Nobel; however, he played a relevant role in agriculture. Sobrero studied medicine in Turin and Paris and then chemistry at the University of Giessen with Justus Liebig: in 1847 he synthesized the nitroglycerin, of which he recognized the characteristics of explosive and vasodilator. In addition, Sobrero, secretary of the Royal Academy of Sciences of Turin and professor of applied chemistry at the Technical School for Engineers, focused on the chemistry applied to agriculture. At the middle of 19th century, the agricultural development played a key role in the modernization of Piedmont first, and then, after the political unification (1861), of Italy. Sobrero, recognizing the fundamental role of chemistry in agriculture, dedicated most of his activities and research (articles, books, public lectures) to improve crops through new and more effective fertilizers, to find remedies to fight crop diseases (for example, for vines and silkworms), to use the dynamite in farming, to popularize and divulgate the chemistry applied to agriculture. The paper intends to describe and examine Sobrero's contribute to the development of the agriculture in a historical perspective.

6 A PANEL:
Face to Face for Science: Chemistry Conferences and Scientific Practice

Chair: Frank James

It has long been known that face-to-face interaction plays a central role in scientific communication. Scientists acquire knowledge through books and journals, of course, but perhaps even more frequently and/or consequentially by talking to each other. Scientific conferences are among the most intense occasions of such informal in-person communication. Since their rise in the late nineteenth century, they have provided platforms for hearing news, debating issues, establishing standards, building familiarity, and creating community. They have also produced hierarchy, conflict, and exclusion.

In this session we examine the role of conferences in scientific practice. What has been the impact of physical meeting on the way knowledge has been created and communicated? How have direct personal contacts affected the development of chemical science? What do conferences reveal about the close relationship between knowledge and acquaintance (two terms translating to the very same word in several languages)? How has conference clubbiness shaped the scientific world? We address these questions by looking at various conference formats – from elite Solvay councils to the massive IUPAC congresses – and by considering the different meeting practices developed in them – from the staged debate to the group photograph.



Chemists Before the Lens: Conventions of Group Photography in Chemistry Conferences 1900–1960

Georgiana Kotsou

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Scientific conferences are constituted by a variety of material, cultural and social components which structure and mediate face-to-face interactions and knowledge exchange, allowing the reproduction of conferences over time. People, locations, hierarchies, traditions, equipment, and leisure practices are captured in a condensed but consistent manner in group photographs, an ongoing tradition of scientific gatherings. Researching conference culture and the scientific practices, materiality's and identities it mobilizes requires the study of the conferences' visual representations, both as depictions of the events and as artefacts producing truths about science and its practitioners. Focusing on the standardization period of regular chemistry conferences, this paper will study the conventions of group photographs in the early and mid-20th centuries. It will discuss what these photographs depict and how these depictions are related to scientific identities and ideas about science popular in their time period. In order to do so, the paper will contextualize the photographs in the environments and events they show by a) studying the institutional practices of group conference photography in relation to other popular genres of group photography (family, school, corporate photography) and b) exploring how the photographs were produced, circulated, and attributed with meaning by their producers and audiences.

Convening for Chemistry in Brussels: The Impact of the Solvay Method on Conference Meetings and the Development of Chemical Science

Alessio Rocci

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Among all the face-to-face interactions of the twentieth century, the Solvay experience played a special role in physics. According to Werner Heisenberg, the Solvay method contributed extraordinarily to the clarification of the physical foundations of quantum theory. The peculiar structure of Solvay Councils stimulated informal in-person communication, an aspect that survives in today's meetings. The convening of the scientific commissions also played an important role in foreseeing the importance of scientific experiments and funding them through the subsidy program. From the very beginning Ernest Solvay wanted to establish a similar practice also for chemistry, but his dream came true only after the end of WWI, and shortly before his death in 1922. We describe the experience of the Solvay Chemistry Councils by analyzing the preparations and proceedings of the first conference. We investigate how the organizers tried to create a community and what issues were debated at the meeting held in Brussels on 21–27 April 1922. This Council brought together physicists and chemists to discuss questions at the boundaries of the two disciplines. We finally address the subsidy program of the International Solvay Institute of Chemistry through the meetings of the Scientific Committee for chemistry.

Spaces, Forms and Functions of Face-to-Face Interaction in Late-Nineteenth Century Scientific Congresses

Thomas Mougey

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This paper examines face-to-face interaction in late-nineteenth century scientific congresses by exploring its various forms and spatial enactments. Conference reports tend to center on general sessions and often obliterate actual exchanges by merely reproducing the presented papers. A closer look into the preparation and proceedings of congresses, however, shows that organizers deployed a wide array of spaces of interactions beyond the session meetings, with each mobilizing face-to-face contacts to pursue different functions, whether social, scientific or diplomatic. Besides the lecture halls, exchanges at scientific congresses took also place in commission rooms, exhibitions, *salles des pas perdus*, reception halls as well as during excursions and visits. To explore these different spaces, retrieve the kind of direct contacts each enabled and question their (knowledge) functions, this paper builds upon empirical research on the main periodical scientific congresses of the period 1850–1900. It includes, the International Geological Congress, International Congress of Historical Anthropology and Archeology, the International Congress of Botany (and or Zoology) and the International Congress of Applied Chemistry. It carries out an exploratory typology of spaces and functions of face-to-face interaction and reflect on their relative standardization across disciplines.

‘The Goddess that We Serve’: Rituals and Rhetoric at Large Chemistry Conferences, 1893–1957

Geert Somsen

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International scientific conferences (including the ICHC) are full of routines and rituals that shape the act of gathering: opening ceremonies, receptions, excursions, banquets, and toasts, to name but a few. Many of these standard practices go back at least to the late nineteenth century when international conferences were first being held. They helped make sense of meeting by the thousands, and of seeing, for the first time, the foreign colleagues and distant peers that one used to only know through publication and correspondence. Conference rituals, that is, gave meaning to the face-to-face experience of international community.

In this paper I examine a number of routine practices and pronouncements, developed at the International Congresses of Applied Chemistry and its successors of the International Union of Pure and Applied Chemistry. Drawing on Émile Durkheim’s work on religious ceremonies, I analyze how such rituals contributed to a sacralization of the common object (the pursuit of chemistry) and to instilling senses of belonging, dedication, service, and sacrifice among attending chemists. These notions not only helped build community, but also informed the various kinds of work and negotiation that international chemistry required, such as the setting of standards and the evaluation of knowledge claims.

6 B SESSION:
Female Chemists and Their Narratives

Chair: Ignacio Suay-Matallana

About the First Female Chemists at the German University in Prague

Gisela Boeck[1], Eva Herrmann-Dresel[2]

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In this study we devote ourselves to women who were the first to receive a doctorate at the German University in Prague. This university had been established in 1882 as a result of national conflicts by dividing Charles University and existed under different names until 1945. Chemistry was especially influenced by Guido Goldschmiedt from 1891 to 1911 and by Hans Meyer from 1911 to 1936. Women had been admitted to this university quite early, since 1897. In 1908, the first doctorate was awarded to a woman in chemistry. In the Meyer era, we first examined the period up to the summer semester of 1926 and were able to prove another 27 doctorates by women. Meyer employed also an astonishing number of female assistants. At least half of the female doctoral graduates came from Jewish families. The doctoral topics were mainly in the field of organic chemistry. In some cases it was possible to trace the women's life paths. Some of them, such as Grete Egerer, Gertrud Kornfeld, Marianne Grünwald, Margarethe Rex, or Hedwig Langecker, remained employed after receiving their doctorates. Other women, such as Alice Hofmann, Gertrud Weil or Emilie Schalek had to give up their careers in favor of the family.

Pioneer Women Scientists in Japan

Yona Siderer

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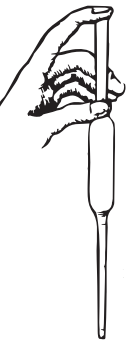
Kuroda Chika (1884–1968) was the one of the first two Japanese women who graduated studying chemistry, at Tohoku University in Sendai (1916). Her early education and subsequent career, research in Japan from 1913, including two years at Oxford University (1921–1923) are narrated. She was a researcher at the Physical and Chemical Research Institute (RIKEN) and a professor at Ochanomizu University in Tokyo. Kuroda's organic chemistry studies, specifically the identification of the constitution of plant dyes is described. Later in her career Kuroda Chika's achievements received prestigious imperial prizes and awards.

The evolution of scientific career options for women in Japan since more than one hundred years ago will be outlined. There was a progress during the years, indicated by a higher percentage of women scientists in the universities, in research institutes and in advanced industry. Changes in the views of the society on women's work will be highlighted. The added value to the Japanese economy and the whole Japanese society by increasing women taking part in the scientific work force will be emphasized.



Beyond the Surface: Agnes Pockels and the Gendering of Scientific Narratives

Brigitte Van Tiggelen

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Agnes Pockels (1862–1935) surfaces regularly as a forgotten or overlooked case of a female pioneer who in her early twenties investigated the properties of films at the surface of soiled water in her kitchen, operating autonomously from her household without official connections with the academic world, and using homely appliances. Publications in *Nature* and her innovative experimental approach are considered as foundational in that she invented a device and laid out a method to measure phenomena related to surface tension and thin films.

Because of the brevity of these biographical mentions and entries, these sketches usually provide only a few recurring features, tapping into pieces of information that are scarce, repetitive, and filtered through meta-narratives they contribute to reinforce. Among the recurring themes are the domestic settings both with its absence of laboratory access and the absorbing duties of a housewife, the *topos* (or cliché) of the kitchen as feminine and domestic scientific workplace, the necessity of a masculine relative to connect to the scientific community and its social practices such as publications, conferences or up to date literature access. In this talk I will examine the successive (self) representations emerging from these narratives.

The First Female Chemists in the Ottoman Empire

İlknur Şahin

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The entry of modern sciences into the Ottoman Empire will be so far that it gets out of hand in Europe. Introduction and settlement of modern sciences in the Ottoman Empire, 19th century is important. The introduction of modern sciences to the Ottomans was reported with the Mekteb-i Tıbbiye-i Şahane, which was opened in 1839. In Mekteb-i Şahane and Mekteb-i Tıbbiye-i Mülkiye, medicine and pharmacy students were taught physics, chemistry and medicine were taught as in parallel with the schools in Europe. Since the application area of chemistry has a wide range, chemistry has been taught at vocational schools such as Mühendishane-i Berrî-i Hümayun, Mekteb-i Fünun-ı Harbiye, Halkalı Agriculture School and Veterinary School. The Ottomans would end up in the 1920s from some kind of use in chemical technology and industrial type during the system period. The importance given to his education during the Ottoman period corrects the correction in an incremental way. The fact that modern sciences were transferred to the Ottoman Empire also sent scientists who would be trained in this field. Prominent names such as Remziye Hisar, Saffet Rıza Alpar, Hatice Bodur, Ayhan Ulubelen and the other first female chemists to grow up in Turkey are very important. The female chemists who grew up at that time shed light on the education-system of teaching in the future. Many scientists come from these prominent designs that they can further express the dimensions of their fields of study. In this context, in this study, Turkey's first female scientists will be discussed and their contributions to modern sciences will be explained.

7 A SESSION:
Laboratory Spaces, Communities and Methods

Chair: Annette Lykknes

About Those Red Bandanas… A Work-in-Progress on History in the Chemistry Lab

Sarah Lowengard

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This presentation explores the role of history and its bastard cousin nostalgia in late 19th- and early 20th-century industry. Narratives of modern scientific discovery in the West seldom identify ways progress or invention accommodates the past, except perhaps through a modest nod to standing on the shoulders of giants. Yet a critical component in the assessment of any new material or process, 'how is it better than what we now have?', looks to the past to establish a viable future. In addition, regular consideration of former practices, approaches, and ideas – sometimes considered a practice adapted from philosophy – may revisit history without acknowledging that discipline's role. In this work-in-progress, I consider ways that existing, older, and even ancient models recur in the chemistry lab. The basis of my study is the textile color industry, and I will draw on records and publications about or for its artisanal workshops and scientific and industrial laboratories. I will explore notions of quality standards amid changing expectations held by producers and consumers. I plan to argue that history, and even a nostalgia for certain aspects of the past, have never been far from the chemical laboratory and had a place in establishing new techniques.

Co-Authorship in Early-20th Century Chemistry: The Case of Theodore Richards

K. Brad Wray

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It is widely recognized that conceptual innovations and the employment of new techniques and instruments contribute to the growth of scientific knowledge in chemistry. In this study I examine another important development in research practice in chemistry, collaboration and co-authorship. I focus specifically on the American Nobel Laureate Theodore Richards' career and publications. During the period in which Richards worked, co-authorship was beginning to become more common than it had been previously. In 1900, Price reports that 'more than 80 percent of all papers (in chemistry) had a single author, and almost all the rest were pairs.' The rate of collaboration and co- authorship increased significantly in the next three decades, the period in which Richard did much of his work. Richards was at the forefront of this new development in chemistry. I present a detailed quantitative analyses that shows that Richards collaborated more than was typical for his time, with many scientists, and in different sized groups. Further, he often had persistent collaborate relationships, extending over a number of years. Further, it appears that these collaboration benefited Richards, his collaborators, and the field of chemistry as a whole.

Modernizing School Subjects: The Case of Radiation and Radioactivity (1930–1970)

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International scientific developments, particularly regarding the study of the structure of matter, led in Portugal to an awareness of the importance of better and broader scientific and technical training. In this sense, curricular changes occurred at the higher education, which also reflected in the introduction of new topics in the official curriculum of physics & chemistry in the Portuguese high schools, in the period ranging from early thirties to the sixties of the twentieth century. Their purpose was to become acquainted with modern themes and research, already circulating in the international scientific community and in the media. Among the new subjects, were the introduction to electromagnetic and corpuscular radiations and radioactivity, and in a broad sense to the structure of matter.

We will present results from an extensive analysis of (text)books then in use at secondary schools, contextualizing them with the various devices that still exist there, related to the above-mentioned subjects. Our purpose was to gain a deeper understanding of how these matters impacted in the secondary studies and in the outreach.

7 B SESSION:
Known and Unknown Risks and Hazards

Chair: Ernst Homburg

Agnotology and Public Health Debates at the Lead Mines of Linares (Spain), 1880–1920

Ignacio Suay-Matallana

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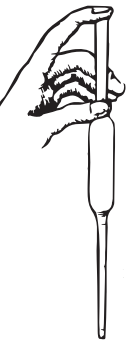
The lead mines of Linares (Jaén, Spain) increase their productivity in the mid-nineteenth century when new companies with international capital and larger-scale processes such as smelters arrived. The growth of mining activity involved new debates about working conditions and the effects of pollution. It will be analyzed how the promoters of the new industries strove, at the end of the 19th century, to count on the complicity of experts and authorities for the invisibility of the risks of lead. They applied different agnotology practices to achieve their interests. Secondly, it will be studied how, at the beginning of the 20th century, other voices, which included both experts and laymen, began to wonder about the impact of lead fumes on the population. Journalistic reports, news in the press, reports of engineers, health workers and social reformers became interested in this question. The reports included very different conclusions and recommended from the total suppression of these industries or the maximum possible distance from the smelters in the urban center to the simple compliance of some supposed safety rules that were under the responsibility of the workers themselves. For all this, different forms of agnotology were used with the aim of minimizing the risks of pollution in health, maximizing the risks on the occupations if the activity of regulated as well as the limits of toxicity and on who had to 'take charge of its control.



The Making of Ignorance in the Regulation of DDT in Franco Spain

Silvia Pérez-Criado

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The various regulations that led to DDT's prohibition in most countries are an exemplary example of regulation of toxic risks. In the context of pesticide regulation during the Franco regime, the ignorance is merely structural ignorance characterized by vast inequalities in power between the chemical industry and agricultural engineers, as compared to farmers and consumers who are exposed to the toxic effects of pesticide management. As part of this work, we aim to understand how the situation got to this point, that is, to understand how ignorance was created and transmitted, and who were involved in creating this ignorance in order to achieve the introduction of synthetic organochlorine pesticides in Spain in the 1940s, until their prohibition in the 1970s. The denunciations of the toxic effects that appeared almost from the beginning were overcome by a series of publicity campaigns, often directed by the State, by agricultural engineers who developed very varied campaigns, presenting pesticides as the unique, modern and efficient solution to solve the pest problem.

On the Trail of Ignorance: Tracing Neglected Connections Between Toxicology and Nanotechnology

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In the last three decades, toxicologists have voiced concerns about the risks of nanosized particles to humans, animals and the environment. Both toxicology and nanotechnology are interdisciplinary fields that cover a broad range of topics. Some of these disciplines (e.g., chemistry) and topics (e.g., cytotoxicity) overlap between the two fields. However, different research communities interested in nanotechnology have largely ignored these overlaps. For example, nano-scientists working on targeted delivery of pharmaceuticals to specific cells have downplayed nanotoxicity studies related to their research. Some of these research groups trivialized existing results in the toxicology literature and succeeded in introducing nano-based drug delivery tools to the market. In addition to this ignorance towards nanotoxicology literature, both nano-scientists and historians of science have overlooked toxicology as an important predecessor field of nanotechnology, not paying enough attention to studies on ultrafine particles. We focus on these two case studies of ignorance and analyze a corpus of toxicology journals from 1980 to 2010 in order to trace how these journals evolved with the emergence of nanotechnology. With this mixed-method approach, we explore neglected connections between toxicology and nanotechnology and analyze how and why these different kinds of ignorance were produced.

8 A SESSION:
Redefining Chemistry in Revolutionary Times

Chair: Christoph Meinel

Georg Ernst Stahl's Chemical Ideas and Their Reworking in his Medical Thought

Carmen Schmechel

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Acclaimed for his medical works, Georg Ernst Stahl (1659–1734) also made important contributions to chemistry. Beyond his famous theory of phlogiston, he developed ideas on fermentation and combustion, and reformulated the acid-alkali theory. Unfortunately for him, his chemistry was quickly overshadowed by Lavoisier's discoveries (especially oxygen), with nineteenth-century historiography imposing 'severe censures' on Stahlian chemical philosophy (Oldroyd 1973). More recently, attention has turned to particular issues in Stahl's chemical thought, such as his hierarchical theory of matter (Klein 2022).

My paper aims to chart the *continuities* between Stahl's chemical and his medical ideas. While Stahl himself separated these two realms, connections persist at the level of theory of matter. His early works on mixtion, and also his *Zymotechnia fundamentalis*, the 'proto-work of biotechnology' (Bud 1992), lay the theoretical groundwork for both his chemistry and medicine. Our own contemporary divide between the history of medicine and that of chemistry may have driven a neglect of these connections.

By exposing the philosophical and methodological commitments in Stahl's *Zymotechnia* (1697), linking them with further ideas in his *Theoria medica vera* (1708) and *Fundamenta chymiae* (1723), my paper attempts to draw a more integrated picture of Stahl's position in the history of chemico-medical thought.

Artificial Laboratory vs. Gods's Nature: Rousseau's Politics of Science

Mi Gyung Kim

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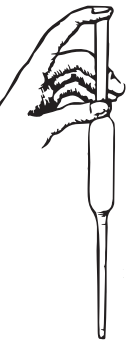
Jean Jacques Rousseau rose to fame with his First Discourse to become an enemy of the sciences when Buffon's *Histoire naturelle* and Diderot's *Encyclopédie* began to reach the subscribers. While his critique of sciences seems to resonate with his later indictment of tedious, costly, and harmful chemical experiments, we cannot rely solely on his *Confessions* and *Reveries* to understand his early engagement with the mix of botany, chemistry, and medicine. *Les Institutions chimiques*, a manuscript he prepared in the 1740s, also indicates an extensive knowledge of contemporary chemical literature. The contrasting portrait – chemistry that relied on the artificial laboratory and botany as a study of the Nature as God created it – is a rhetorical move Rousseau made later in his life. After two decades of political writings, he sharpened the critique of French civilization – artificial civility in social manners, luxury in political economy, elaborate scholarship without purpose, morally corrupting theater, etc. Botany as curious exploration of nature shorn of medical application became a science that would evince the harmony of nature inscribed by God and thereby secure true happiness for man. Chemistry and chemical medicine provided a polarizing contrast in Rousseau's crusade against artificial civilization.



Between Chemistry and Administration. Rereading the Lavoisiers' Travel Journals (1760s–1780s)

Francesca Antonelli

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Travel diaries appear today as important sources for the history of science. Recording experiments and observations on paper is in fact a crucial practice for 18th-century naturalists, even in the context of travel. But how were these records concretely constructed, compiled and used by their owners? Who collected and used the information, besides the naturalists themselves? How were the different fields of knowledge combined in these journals? This paper will propose some tentative answers to these questions, based on a new reading of the travel notebooks compiled by the French chemist and tax farmer Antoine-Laurent Lavoisier (1743–1794) and in part by his wife, Marie-Anne Paulze-Lavoisier (1758–1836), during various trips to the French provinces between 1767 and 1789. Particular attention will be paid to the multiple intersections between the couple's various cultural interests as they emerge from their travel notebooks, and especially chemistry and administration.

Exerting Control. Antoine-Laurent Lavoisier and Scientific Instruments

Marco Beretta

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The recent publication of the catalogue of Lavoisier's instruments has led me to deepen my research into a collection which, for its size and quality, represents a unique testimony of 18th century experimental practice. Although Lavoisier's instruments deal with widely different disciplines such as chemistry, natural philosophy, mathematics, surveying, meteorology and metrology, they nevertheless reveal a bold and consistent epistemological view which rarely comes to the surface of his published works.

After a brief presentation of Lavoisier's collection, I shall illustrate the ways the French chemist conceived and used the instruments.

The Development and Legacy of the term 'Rare Earth'

Charlotte A. Abney Salomon

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Though the term 'rare earth elements' is trivial in the chemical sense, it has proved immensely durable in the public lexicon as a name for the seventeen heavy metals of the group. As many are critical for the manufacture of electronic devices, the supply chains for these metals are the subject of government policy, industrial endeavours, and regular media coverage. Publications frequently note that despite their name, rare earths are in fact relatively abundant and widely distributed, suggesting that the term itself merits correction before these issues can be analyzed.

This project examines the history of the term 'rare earth' and the legacy of its implication that the metals themselves are rare. After the formerly elemental category of earths was redefined as metal oxides or calxes, the group was divided by the designation of a subset of the resultant metals as 'alkaline earth' metals, leaving the rest to be named otherwise. The establishment of the category of 'rare earth' metals is traced through the intersecting and successive developments of early nineteenth-century nomenclature, the periodic system, and the much more recent industrial demand under which many of them, formerly obscure, came to be considered essential to modern life.

Poster Session

A Map of Chemical Heritage Places in Vilnius City

Birutė Railienė

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Historical background of chemical practice and beginning of chemistry as a science are still preserved in Vilnius city, a capital of Lithuania. Starting as a welcoming city for artisans and craftsmen in early middle ages, when the official royal invitation to the craftsmen of Europe was send by the Grand Duke of Lithuania Gediminas (1275?–1341), a city provided good conditions for the development of technological crafts. In the old town of Vilnius, there are still buildings that commemorate the old crafts: glassblowing, leather processing, ceramics, etc. Even street names: Stiklių (glass-blowers), Odminių (tanners), Liejyklos (foundries), etc. witness the location of workshops and manufactures in the old past of the city. An attempt was made to create a map, showing the main historical spots of chemistry in Vilnius: first guilds of craftsmen, teaching chemistry at the Vilnius University and other schools, first research enterprises and institutes. The map will be the introduction to a future project of the Lithuanian Chemical Society to create a virtual guide 'Chemistry in Vilnius'.

Acknowledgements: Some suggestions for the places were kindly provided by Dr Marytė Kuodytė and Dr Justina Sipavičiūtė, the graphical design was created by Audronė Stasiukaitytė.

Emil Fischer's Estate – Museum Archeology at its Best

Susanne Rehn-Taube

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Emil Fischer (1852–1919, Nobel Prize 1902) is one of the best known pioneers of organic chemistry. His nomenclature for sugar molecules is still learned by every high school student. Fischer was also a teacher of an impressively large working group. His and his student's extensive estate of laboratory samples – in German called *Belegsubstanzen* – went with his son, Hermann Fischer (1888–1960) to Berkeley. There the samples, most of them in cigar boxes, were roughly indexed and put into boxes. In this fashion they were donated to the Deutsches Museum. In 1983, the samples arrived in Munich in two large crates with a volume of approximately 1.5 cubic meters – only to fall into a deep slumber.

Thirty years later we have embarked on an extensive inventory process. To date, 127 cigar boxes have been opened and around 2,800 samples in historical test tubes have been digitally registered and photographed. This work could become the basis for a comprehensive investigation of the chemical discoveries of Emil Fischer and his group, including names such as Otto Warburg, Alfred Dilthey (Fischer's nephew) and the well-known name in Germany, Oetker, namely the son of the founder of the famous food company. The paper intends to invite all interested parties to participate in research on this estate!

Psychedelics – Story from Shamanic Rituals to Psychotherapy

Martin Kuchař

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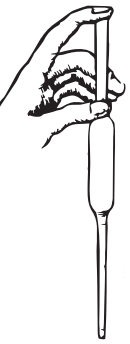
Psychedelic plants and fungi have been used by indigenous people for rituals and medicinal traditions from ancient time. Mesoamericans cultures-built temples to mushroom gods and celebrations using magic mushrooms dating back to 3,000 BC. Modern psychedelic research began when the chemist Albert Hofmann first synthesized lysergic acid diethylamide (LSD) in 1938. Scientific and cultural exploration in the1950s and '60s was followed by a worldwide prohibition, which dramatically slowdown any further research for nearly 50 years. The renaissance of psychedelics research become in 21st century. Studies are taking place in research institutions and in private clinics, which are supported mostly by non-profit organizations. This research includes psilocybin, LSD and ayahusca clinical studies for depression, anxiety and treatment of PTSD. Besides the official research, there is a massive interest of psychedelics experience in western countries. Many ceremonies and neo-shamanic rituals appear in the Europe, which can lead to severe intoxications or psychical harm, if there is in non-medical or non-experienced hands. Clients and even the neo-shamans often do not know what substance or plants extract are administrated. The new role of scientific community is now extended to psychedelics policy advocacy and responsible education of the whole society.



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