14th International Conference on the History of Chemistry

11-14th June 2025
Valencia

Chemistry & Capitalism

Organized and hosted by

EuChemS
European Chemical Society
Division of History of Chemistry

EuChemS Division of History of Chemistry

INSTITUT INTERUNIVERSITARI LÓPEZ PIÑERO

López Piñero Interuniversity Institute University of Valencia

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UNIVERSITÄT BIELEFELD

14th International Conference on the History of Chemistry

11-14th June 2025
Valencia

Chemistry & Capitalism

Book of abstracts

Edited by
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Presentation by the Rector of the University of Valencia

María Vicenta Mestre
Rector of the University of Valencia

The University of Valencia, one of the oldest academic institutions in Europe —founded in 1499—, is proud to host the 14th International Conference on the History of Chemistry (ICHC), organized by the European Chemical Society (EuChemS) together with the López Piñero Inter-university Institute, as part of the celebration of the University's 525th anniversary.

This collaboration reflects not only our university's commitment to the advancement of the sciences, but also its prominent role in the consolidation of the history of science as an academic discipline.

The University of Valencia was founded by the Jurats (governing officials) of the city of Valencia in 1499, based on studies in Medicine, Law, and Theology.

From its origins, the University of Valencia has maintained a strong tradition in the field of chemical studies. Thus, already in the 17th and 18th centuries, the institution was an active hub for the reception and dissemination of modern chemistry. In the 19th century, it decisively promoted scientific education through the creation of specific chairs, laboratories, and specialized publications.

In 1895, the Faculty of Sciences was established at the University of Valencia, offering a degree in Physical and Chemical Sciences.

This tradition has evolved into cutting-edge contemporary chemical research, internationally recognized for its excellence and diversity.

In 1977, the current Faculty of Chemistry of the University of Valencia was created.

Today, chemical research at the University of Valencia is carried out across multiple departments and research centers, covering areas from theoretical and computational chemistry to analytical, organic, inorganic, environmental, and biomedical chemistry, as well as chemical engineering.

This diversity is complemented by intense international collaboration and high scientific output—factors that have helped position the University of Valencia among the top spots in major global academic rankings. In the field of Chemistry, the University consistently ranks among the top 200 universities in the world in rankings such as the ShanghaiRanking's Global Ranking of Academic Subjects (GRAS) and the QS World University Rankings by Subject.

In this context, the hosting of the 14th ICHC in Valencia represents a unique opportunity to reflect, from a historical perspective, on the role of Chemistry in shaping scientific knowledge and its impact on society, reaffirming the University of Valencia as a key institution for the study and remembrance of science.

Address from de Dean of the Faculty of Chemistry

Rafael Ibáñez Puchades
Dean of the Faculty of Chemistry

On behalf of the Faculty of Chemistry at the University of Valencia, it is with great pleasure and a profound sense of honour that I welcome you to the 14th International Conference on the History of Chemistry. We deeply appreciate the dedicated efforts of the organizers—the Inter-university Institute López Piñero - University of Valencia and the Division of History of Chemistry of the European Chemical Society—and the vital support of our local committee. Hosting this distinguished gathering in Valencia is a privilege. The conference's central theme, "Chemistry and Capitalism," is exceptionally pertinent and promises to foster insightful debates on the multifaceted historical relationships between chemical science and practice, industrial development, environmental concerns, and regulatory frameworks.

The legacy of chemical studies at the University of Valencia is an integral thread in the 525-year narrative of our institution. Our journey into chemistry began formally in 1591, when the Paracelsian scholar Llorenç Coçar established a chair in secret remedies (*Remediis morborum secretis et corum usus*), championing the study of iatrochemistry. This tradition evolved, and towards the close of the 18th century, significant reforms under Rector Blasco led to the creation of the first distinct Chair of Chemistry. This chair was distinguished by the tenure of scientist Tomás Manuel Vilanova, a pivotal figure in introducing Lavoisier's groundbreaking chemical principles to Valencia. Building on this rich heritage, formal, independent studies in chemistry were established, with a distinguished trajectory of over 130 years at the University of Valencia. This longstanding commitment to excellence is reflected in our current standing, as our university proudly ranks among the top three in Spain for chemistry in leading international rankings.

Looking to the future, it is clear that pressing challenges, particularly climate change, demand innovative solutions, and chemistry must play a central role. The emerging generations of chemists will carry the significant responsibility of addressing these global issues. To do so effectively, it is crucial they not only master contemporary science but also understand and appreciate the historical journey of those who came before them.

This pursuit of knowledge takes on added significance in an era where, both nationally and internationally, the role of universities as crucial sources of knowledge and platforms for free and open debate is sometimes questioned. Understanding our past achievements, learning from historical contexts, and critically examining the evolution of our discipline – as this conference encourages – not only enriches our scientific endeavours but also reinforces the societal role of the university. It provides the essential foundation for pioneering a sustainable and responsible future for chemistry.

Once again, I extend a very warm welcome to all of you. We sincerely hope that the scientific discussions are fruitful and stimulating, and that your time in Valencia is both enjoyable and memorable. We wish you a highly successful conference and a pleasant stay in our city.

Greetings from the Chair of the Division

Annette Lykknes
NTNU-Norwegian University of Science and Technology
(Chair of the Division of History of Chemistry)

As Chair of our community, I am delighted to welcome you to the 14th edition of the International Conference on the History of Chemistry (ICHC). This marks the third time our conference is held on the Iberian Peninsula—following previous gatherings in Estoril/Lisbon (2005) and Aveiro (2015)—but it is the first time we convene in Spain.

It is a special privilege to greet you this year as Chair of the Division of History of Chemistry. Two years ago in Vilnius, we began discussing our transition from a Working Party of the European Chemical Society (EuChemS) to a full-fledged Division. After a favorable vote in an online meeting in April last year, the decision was finalized, and at EuChemS' General Assembly in Berlin last October, our application was officially approved. As a Division, we no longer hold ancillary status within EuChemS but stand on equal footing with its core chemistry divisions. We aim to maintain a visible presence within the European chemical community while advocating for the importance of knowledge of the history of chemistry.

This year, we will discuss and finalize our newly drafted mission statement and explore the possibility of awarding prizes to distinguished colleagues within our field. I look forward to fostering an inclusive network of outstanding scholars with diverse expertise and backgrounds in the years ahead. I also take this opportunity to express my gratitude to my dedicated and hardworking board members: Carmen Schmechel (Vice-Chair), Silvia Pérez-Criado (Secretary), and Asbjørn Petersen (Treasurer), as well as the exceptional members of our extended board, Christopher Halm and Charlotte Abney-Salomon.

The 14ICHC is made possible through the support of the Inter-university Institute López Piñero – University of Valencia, an academic institution committed to research and outreach in the historical and social studies of medicine, technology, science, and the environment. The Institute is housed in a beautifully restored 18th-century palace in the heart of Valencia, where it hosts both a historical library and a scientific collection dedicated to the history of science at the University of Valencia. Since 2012, the Institute has also offered a Master's and Doctoral program in the History of Science and Scientific Communication. I am thrilled that our conference will take place in such a distinguished scholarly environment.

This year, 113 participants will engage in a dynamic program featuring six sessions, nine panels, a roundtable discussion, three plenary lectures, the Morris Award Lecture, a poster session, and a book session, along with an enriching social program. A new addition to this year's conference is the Early Career Scholar Session, initiated by Christopher Halm and co-organized with Silvia Pérez-Criado and Sofiya Kamalova (also part of the local organizing team). I extend my sincere thanks to the local team for their dedication to hosting the conference in Valencia, Francesca Antonelli, José Ramón Bertomeu Sánchez, Carmel Ferragud, Antonio García Belmar, Ximo Guillem-Llobat, Sofiya Kamalova, Silvia Pérez-Criado, as well as to our program chairs, Ignacio Suay-Matallana (also part of the local organizing team) and Brigitte Van Tiggelen, for their excellent efforts into shaping the scientific program.

We look forward to three days filled with stimulating discussions, valuable networking opportunities, and inclusive activities here in Valencia!

Welcome Address on behalf of the Steering Organizing Committee

Ignacio Suay-Matallana
Universitat de València, Spain
co-chair of the Steering Organizing Committee

Brigitte Van Tiggelen
Science History Institute, USA
co-chair of the Steering Organizing Committee

As chairs of the Steering Committee and also former President and Secretary of the EuChemS Working Party on the History of Chemistry, now a full-fledged Division, it is our distinct pleasure to welcome you to the 14th International Conference on the History of Chemistry (14ICHC).

This edition takes place in Valencia, on the shores of the Mediterranean Sea. The city has some fascinating connections to the history of chemistry. One of the first Colleges of Apothecaries was founded here in 1441, and the University of Valencia, established in 1499, created a chair in secret remedies (Remediis morborum secretis et corum usus) as early as 1591. A few centuries later, in 1786, the university established one of the first modern chemistry chairs in Spain held by Tomás Manuel Vilanova Muñoz y Poyanos (1737-1802), who created a chemical laboratory near the faculty and translated works by Antoine Baumé. Furthermore, Valencia has a long-standing tradition in certain chemical industries, such as the gilded ceramics of Manises, which have been highly valued over the centuries.

For this 14th edition of the ICHC, the theme selected for the conference is Chemistry and Capitalism, with the aim of fostering debates on the historical relationships between chemistry—broadly defined—industry, the environment, and regulation. This theme echoes contemporary challenges and issues, and we are convinced that bringing to the fore those questions grounded in the present in historical perspectives will inform our work as historians of science as much as sustain the relevance of our scholarly inquiries for a wider public.

The history of chemistry indeed is deeply connected to some of the most pressing challenges of our time. In an era marked by war, economic nationalism, and dramatic human-caused or amplified natural catastrophes—such as the massive flood that affected the Valencia region in October 2024—the case studies, historiographical approaches, and debates presented during this conference will offer essential insights for a deeper understanding of our society. They will also foster collaborative reflection on how we manage our academic institutions, industries, and broader societal challenges.

This 14 ICHC includes contributions covering a large spectrum of topics: alchemy, chemical theories and subdisciplines, university, activism, and industry, innovation and standardization, public image of chemistry and instrumental practice, circulation of chemicals and chemical knowledge including globalization, provincialization and exchange zones, as well as discussions on chemical substances, such as colours, commodities, pesticides and toxics.

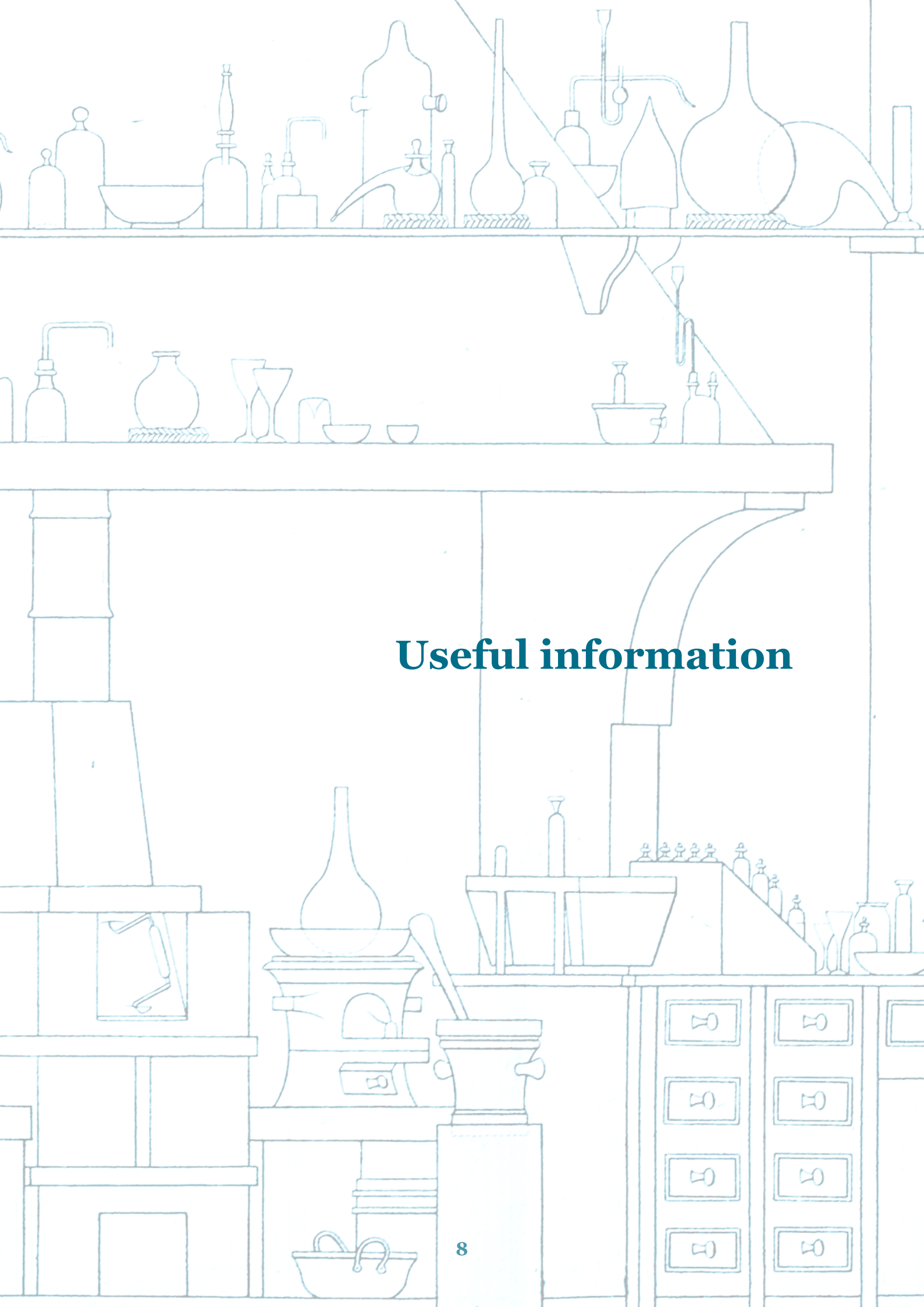
Since their inception in 1991, the International Conferences on the History of Chemistry (ICHC) have become a vital gathering space for our ever-growing and diverse community. As such, the conference series is an essential part of the infrastructure supporting our scholarly pursuits, and while often overlooked and taken for granted this infrastructure can only be maintained through the active care and commitment from many actors who deserve a special mention and our gratitude.

First and foremost, every conference requires a hosting group of people, whose resources, financial, and human, time and focus, are invested for more than a year into the project. This first Spanish edition has been made possible thanks to the enthusiastic invitation, warm hospitality and hard work of our colleagues at the Inter-university Institute López Piñero's hospitality for the occasion. We are indebted to them for what appears to be yet another most successful ICHC meeting.

We also thank the local student workforce dedicated to different logistic tasks, among others the edition of this book, of abstracts, and of course, the whole staff of the López Piñero Inter-university Institute and the University of Valencia for their committed assistance in supplying the material and human resources essential to making this conference a reality.

We would also like to express our gratitude to the various institutions that have sponsored the conference. Nationally, financial support was received from the Catalan Society of Chemistry, the Royal Spanish Society of Chemistry, and the Generalitat Valenciana. Foreign sponsorship came from the Science History Institute, the Commission on the History of Chemistry and Molecular Sciences (CHCMS), the Society for the History of Alchemy and Chemistry, and the University of Bielefeld. Their support has been invaluable—not only in providing a significant number of grants for postgraduate students, but also in promoting the participation of promising young scholars in the 14th ICHC and more generally broadening our reach by advertising the conference beyond our community.

We wish your time in Valencia to be both enjoyable and inspiring, filled with lively discussions and the chance to build meaningful relationships that will benefit all of us, and our field moving forward.



Useful information

Schedule

Wednesday 11th June

11:15	Scientific Tour (from IILP to ADEIT)	
12:15	Registration opens (ADEIT)	
12:30	Early Career Scholar Session (SA, ADEIT)	
13:30	Lunch (CCC)	
15:00	Opening of the 14ICHC (SA, ADEIT)	
15:30	Plenary lecture: Francesca Antonelli (SA, ADEIT)	
16:30	Coffee	
17:00	Session 1: People and Places (SA, ADEIT)	Session 2: Instruments, processes and the art of experimenting (01, ADEIT)
18:15	Walking to IILP + Photo (IILP)	
18:30	Poster session (IILP)	
19:30	Welcome Reception co-sponsored by the Science History Institute (IILP)	

Thursday 12th June

09:00	Plenary Lecture: David Edgerton (SA, ADEIT)	
10:00	Panel 1: Panel 1. Toxic Tales?! - (Il)legitimate uses of chemical substances in twentieth century Brazil (SA, ADEIT)	Panel 2: Chemical Industry Transformed (01, ADEIT)
11:30	Coffee	
12:00	Panel 3: 20th Century Pesticides Chemical Industry (SA, ADEIT)	Panel 4: Provincializing Europe's Chemical Knowledge and Technologies (01, ADEIT)
13:30	Lunch (CCC)	
15:00	Panel 5: New perspectives on Chemistry in 20th-century Universities (SA, ADEIT)	Roundtable on the History of Alchemy and Chemistry (01, ADEIT)
16:30	Book session (SA, ADEIT)	
17:00	Coffee	
17:30 – 19:30	Session 3: Industry in local and global context (SA, ADEIT)	Session 4: Innovation, circulation and standardization (01, ADEIT)
21:00	Conference Dinner (walking from ADEIT)	
21:15	Conference Dinner at El Ateneo	

Friday 13th June

08:45	DHC Business Meeting (IILP)	
10:15	Walking to ADEIT	
10:30	Science History Institute Keynote: Angela Creager (SA, ADEIT)	
11:30	Coffee	
12:00	Panel 6: Exchange zones (SA, ADEIT)	Panel 7: Between private or state ownership (01, ADEIT)
13:30	Lunch (CCC)	
15:00	Panel 8: Chemists as activists (SA, ADEIT)	Panel 9: The wonders of colour (01, ADEIT)
16:50	Coffee	
17:20	Session 5: Public image of chemistry and historical narratives (SA, ADEIT)	Session 6: Chemical theories and (sub)disciplines (01, ADEIT)
18:50	Morris Award Lecture: Carsten Reinhardt. Presented by Frank James (SA, ADEIT)	
19:50	Closing session (ADEIT)	
20:00	Closing Reception co-sponsored by the University of Bielefeld (ADEIT)	

Saturday 14th June

09:00	Departure from IILP
10:00	Visit to the Blast Furnace
12:00	Visit to the Roman Heritage
14:00	Lunch
17:30	Arrival to IILP

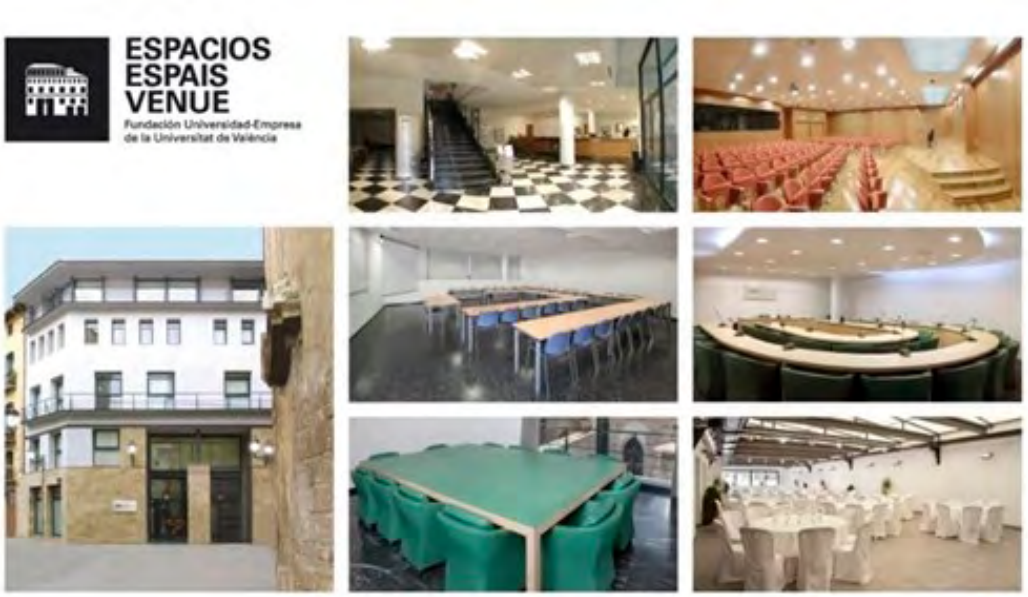
SA: room Salón de Actos; 01: room 0.1

Venues

The conference will be held in two different locations in the city center of Valencia. On one hand, the venue for the parallel sessions and plenary lectures will be ADEIT (Plaza Virgen de la Paz, 3), and the three lunches during the conference will be held at Octubre OCCC (c/ San Fernando, 12). On the other hand, the poster session, welcome reception, and business meeting will take place at the IILP (Plaza Cisneros, 4).

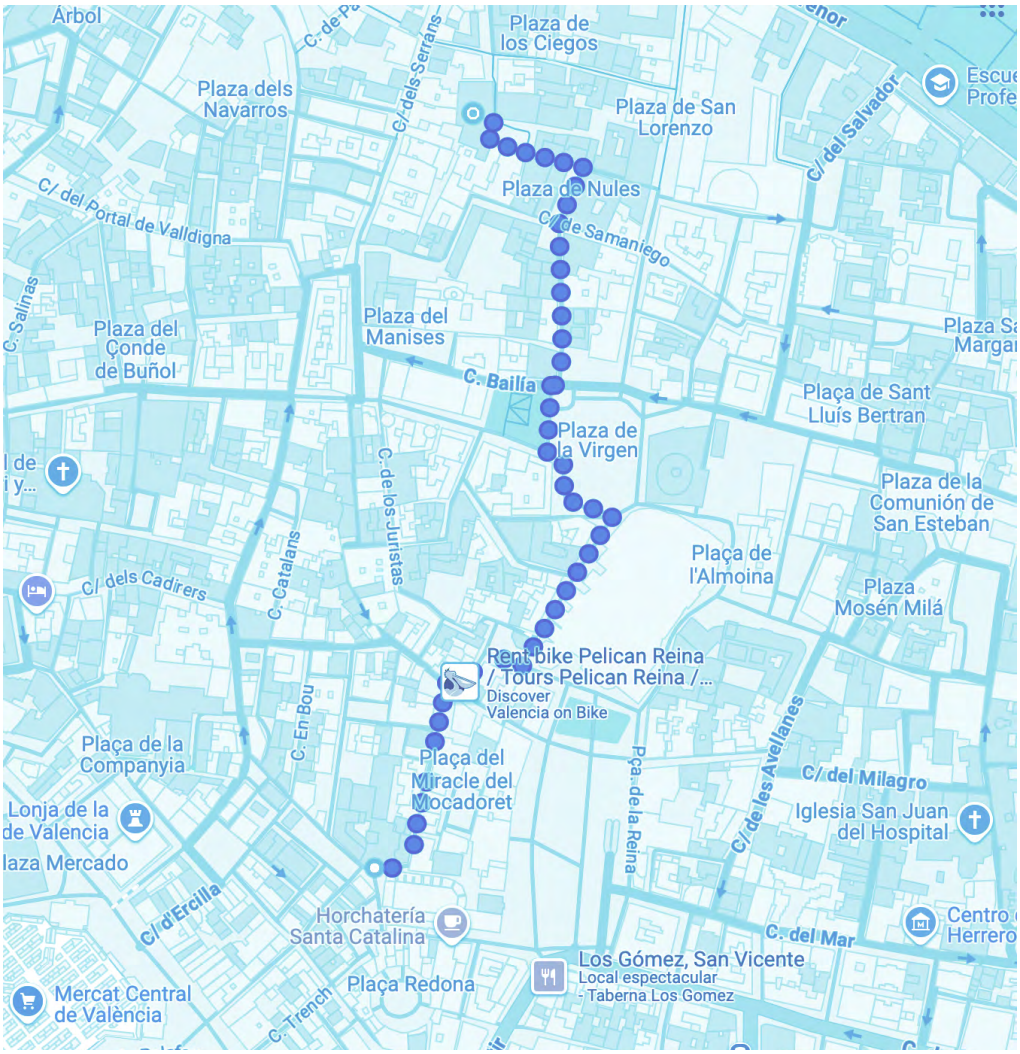
I. ADEIT, University-Business Foundation of the University of Valencia

II. IILP, Lopez Piñero Inter-University Institute - University of Valencia



Route from Lopez Piñero Inter-University Institute (Plaza de Cisneros, 4), to ADEIT, University-Business Foundation of the University of Valencia (Plaza Virgen de la Paz, 3).

Google Maps Link:
https://goo.su/RFuPq



Route from ADEIT, University-Business Foundation of the University of Valencia (Plaza Virgen de la Paz, 3) to restaurant and cafeteria Octubre OCCC (c/ San Fernando, 12).

Google Maps Link:
https://goo.su/kqFPu3

Transport in the city

There is an extensive, low cost public transport network covering the city including bus, underground, tram and taxi. There are different tickets and fares available:

Bus: single ticket (on the bus) for 2€. Also available "bonobus" (10 trips, bought at kiosks for 8,50€). Further information

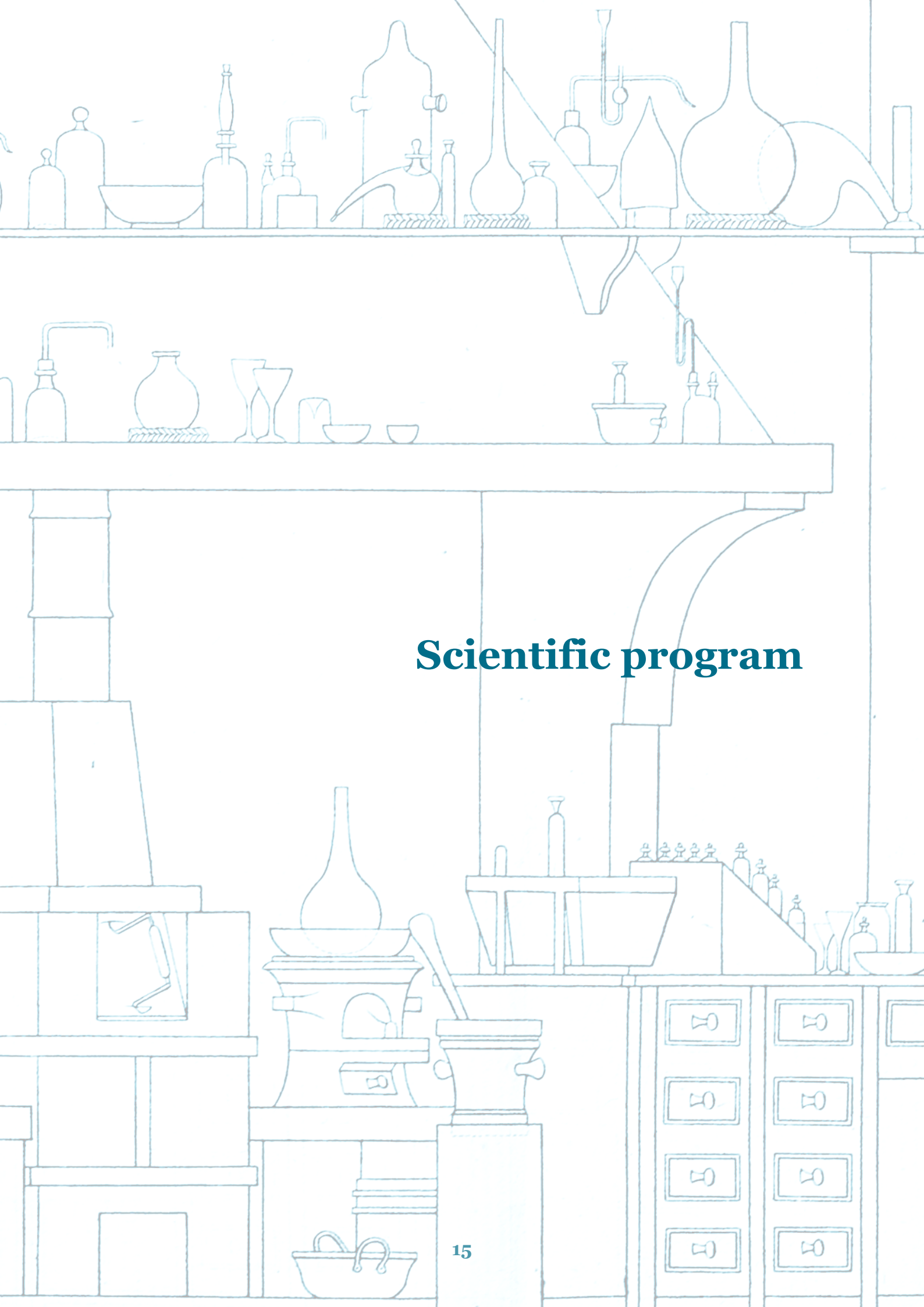
Metro: single ticket fare from 1,50€ to 3,90€ depending on the route. Also available at metro stations the "bonometro" of 10 trips (ranging from 7,20€ to 20€). Combined bus-underground 1-3 day tickets are also available at kiosks. Further information

Taxis: are not expensive (but there is a minimum fare of 4,90€ at daytime and 6€ after 22:00. Prices may vary for the summer period), and you can pick them up at taxi ranks or stop them in the street, or ask the reception desk to call one for you.

Bike: València is a bike-friendly city with over 120 kilometres of cycle paths. There are many stores where you can rent a bike. You can also use the public bicycle system (Valenbisi). Further information

Restaurants

- Restaurante Yuso. Plaça del Carme, 6, 46003 València. Menú, arroces.
- Restaurante Yuso (otro). (Carrer de la Creu 4, 46003 València) Menú, arroces.
- Mattilda resto Bar (C/ Roteros, 21): Cocina mediterránea
- Caballeros 21 (C/ Caballeros, 21): Tapas y aperitivos
- Restaurante Canela (C/ Quart, 49): Arroz y paellas
- Masa madre. (Carrer de baix, 20): cocina italiana, mediterránea.
- Xanglot, carrer de les Avellanes 9.á
- La Riuà. Carrer del mar27. Arrocería
- Delicat. Calle Conde de Almodovar 4. Cocina mediterránea.
- Al Pomodoro (Calle del Mar 22). Comida italiana.
- Blanquita Bar (Plaza Dr. Collado, 8): Tapas y aperitivos.
- Restaurant Palau de Pineda (Plaça del Carme, 4); Menú, arroz.
- La Cigrona Restaurant (C/ dels Serrans 22): arroces y cocina de mercado.
- Arrocería La Valenciana (C/ dels Juristes 12): Arroces y menú desgustación.



Scientific program

Scientific program

Early Career Scholar Session (ECSS)

Organized and moderated by Christopher Halm, Silvia Pérez Criado, and Sofiya Kamalova.
Wednesday, 11 June, 12.30, SA ADEIT

Presenting organisations and journals including the Science History Institute, the Society for the History of Alchemy and Chemistry, the Commission for the History of Chemistry and Molecular Sciences, Ambix, ChemTexts, and more.

Round table: New Computational and Experimental Methods in the History of Alchemy and Chemistry

Organized and moderated by Georgiana Hedesan
Thursday, 12 June, 15.00, 01 ADEIT

With the participation of Thijs Hagendijk, Farzad Mahootian, Peter Oakley, Petr Pavlas, Lucia Raggetti, Carmen Schmechel and Guillermo Restrepo.

Plenary Lectures

PL1. Compound Interests: The Paulze and Lavoisier Families between Chemistry, Administration, and Politics (1760s–1830s).
Francesca Antonelli
Wednesday, 11 June, 15.30, SA ADEIT

PL2. What can chemistry tell us about capitalism, and what can capitalism tell us about chemistry?
David Edgerton
Thursday, 12 June, 09:00, SA ADEIT

PL3. Chemical Passports: Environmental Science, Information, and Regulation in the Trade of Toxic Substances.
Angela N. H. Creager
Friday, 13 June, 10:30, SA ADEIT

PL4. Executive Science. Governmental Research in Germany , 1933 to 1945.
Carsten Reinhardt
Friday, 13 June, 18:50, SA ADEIT

Panels

Panel 1. Toxic Tales?! - (Il)legitimate uses of chemical substances in twentieth century Brazil

Organised by Paulina S. Gennermann
Chair: Letícia dos Santos Pereira
Thursday, 12 June, 10:00, SA, ADEIT

P1-1. "There's a little yellow pill": Valium between intoxicant and medicament, 1960s-1980s.
Paulina S. Gennermann

P1-2. Avoiding Toxic Terms: Chemicals Incorporating the Concept of Agricultural Protection and the Convergence of Brazilian State Strategy with Business Values (1910-1980).
Mariah Freitas Monteiro

P1-3. Man's deadly friend": conceptual disputes over pesticides in Brazil, 1960s - 1980s.
Leonardo Lignani, Júlia Lima Gorges Brandão

P1-4. Peaceful atoms in Cold War Brazil: radioisotope circulation in nuclear medicine, agronomy and biomedical sciences, 1950s-1960s.
Jorge Tibilletti de Lara

Panel 2. Chemical Industry Transformed: Knowledge, Labour, and Professions in the long Eighteenth-Century

Organised by Marco Beretta & Hjalmar Fors
Chair: Charlotte Abney-Salomon
Thursday, 12 June, 10:00, 01, ADEIT

P2-1. Workers in Chemical arts in Eighteenth-Century Paris.
Marco Beretta

P2-2. Copper in Seawater: the Chemistry of Ship Sheathing in the Expanding Eighteenth-century French Empire.
Armel Cornu

P2-3. Imperialist claims: Or, how the 'truth' about pharmaceuticals became chemical knowledge.
Hjalmar Fors

P2-4. Chemistry, Mining, Metallurgy: Chemical and Mineralogical Expertise in Eighteenth-century Habsburg Mining.
Peter Konečný

P2-5. Medical Knowledge, Specialised Shops, and Partnerships: the Apothecaries' Guild's Chemical Activities in Eighteenth-century Paris.
Bérengère Pinaud

Panel 3. 20th Century Pesticides Chemical Industry (Sponsorship by SHAC)

Organised by Silvia Pérez-Criado
Commments and chair: José Ramón Bertomeu Sánchez
Thursday, 12 June, 12:00, SA, ADEIT

P3-1. Biscay's Chemical Shadow: Understanding the Toxic Legacies of HCH Production Through Oral History.
David Beorlegui Zarranz

P3-2. Agricultural Chemicals and the Environment: A View from History.
Frederick Rowe Davis

P3-3. "2,4,5-T On Trial" Narratives of Safety and Risk About Phenoxy Herbicides.
Amy Hay

P3-4. Persuasion by Performing Miracles in Outdoor Laboratories.
Anne Jorunn Frøyen

P3-5. Pesticides and Franco Dictatorship: Building Spain's Chemical Industry.
Silvia Pérez-Criado

Panel 4. Provincializing Europe's Chemical Knowledge and Technologies: Case Studies from Republican China, Colonial Taiwan, and Egypt

Organised by Lejie Zeng, Jonathan Haid & Omri Polatsek
Chair: Sarah Hijmans
Thursday, 12 June, 12:00, 01, ADEIT

P4-1. Sourcing Colors in Crisis: The Revival of Natural Indigo and Dye Production in Wartime China.
Lejie Zeng

P4-2. Camphor Forests in Taiwan and Chemical Synthesis: Colonialism, Capitalism, and the Chemical Industry.
Jonathan Haid

P4-3. Making Fertilizer from the Nile: Chemical Knowledge and Technologies in (post)colonial Egypt.
Omri Polatsek

P4-4. Energy Transition and Technology Transfer: Energy Regimes in Lanzhou Chemical Industry Company (1952-1972).
Xu Chenghao

P4-5. Soviet-Italian Nitrogen Business: The Establishment of the Soviet Nitrogen Industry Amid the Global Drive toward Autarky (1925-1941).
Zinaida Osipova

Panel 5. New perspectives on Chemistry in 20th-century Universities

Organised by José Ramón Bertomeu Sánchez
Chair: Antonio García Belmar
Thursday, 12 June, 15:00, SA, ADEIT

P5-1. Writing the history of chemistry teaching and research at the Norwegian University of Science and Technology.
Annette Lykknes

P5-2. Quantum chemistry in Valencia (1939-1978): making contact zones at the Faculties of Sciences during the Francoist dictatorship.
José Ramón Bertomeu Sánchez

P5-3. The Faculty of Sciences of the University of Lisbon and the gender issue in the emergence of research and teaching spaces in chemistry (and physics).
Ana Simões, Maria Paula Diogo, Cristina Luís

P5-4. Clustering research at the Max Planck Society, Germany, 1948-2000.
Carsten Reinhardt

P5-5. Chemistry studies at the University of Belgrade during communist Yugoslavia.
Vesna Milanović Maštrapović, Dragica Trivić

Panel 6. Exchange zones: negotiating quality and safety among universities and industries (1930s-1970s)

Organised and chaired by Ximo Guillem-Llobat & Ignacio Suay-Matallana
Friday 13 June, 12:00, SA, ADEIT

P6-1. Chemical industrialization in Brazil during World War II: ORQUIMA and the production of caffeine from cocoa (1942-1945).
Letícia dos Santos Pereira

P6-2. Defining new quality standards for rice. The entangled contribution of organic chemistry and engineering (València, 1950s-1970s).
Ximo Guillem-Llobat, Salvador Calatayud

P6-3. Letters, analyses and favors: discussing quality between customs and universities in Spain (1940s-1960s).
Ignacio Suay-Matallana

P6-4. Chemistry, Commodification, and Governance: The Role of Scientific Institutionalization in the Legacy of the Laboratório Químico Municipal do Porto, 1884-1907.
José Ferraz-Caetano

P6-5. The Role of Toxicology Expertise in Addressing Occupational Hazards: Insights from the Ardystil Case.
Sofiya Kamalova

Panel 7. Between private or state ownership: examples of chemical enterprises in Central Europe between the 18th and 20th century

Organised and chaired by Gisela Boeck & Michaela Kröppl
Friday 13 June, 12:00, 01, ADEIT

P7-1. Factory for sulfuric acid and other chemical substances near and in Vienna.
Michaela Kröppl

P7-2. Oil shale as an energy source in Württemberg and the role of the state in its utilisation.
Michael W. Mönnich

P7-3. The Beginnings of a Chemical Industry in Vienna-Liesing.
Rudolf Werner Soukup

P7-4. Products Factory to the Publicly Owned Enterprise Chemical Plant Oranienburg.
Gisela Boeck

Panel 8. Chemists as activists: from Linus Pauling to green chemistry

Organised by Agustí Nieto-Galán
Chairs: Agustí Nieto-Galán and Marcin Krasnodębski
Friday 13 June, 15:00, SA, ADEIT

P8-1. Revolutionizing the chemical industry for the post-growth society: Architects of Sanfte Chemie.
Marcin Krasnodębski

P8-2. Laboratory Luddism: Activist Science and the British Society for the Social Responsibility of Science.
Claire Votava

P8-3. Giorgio Nebbia and the Debate on Solar Energy in post-war Italy.
Daniele Cozzoli

P8-4. Activist-chemists along the River. The story of the Cuenca Matanza-Riachuelo (1990s-today) in Buenos Aires and its significance for radical expertise.
Giusy Pappalardo, Marco Armiero, Adrian Gustavo Zarrilli

P8-5. From Cell Chemistry to Activism: Louis Rapkine's Refugee Scholars in the Second World War.
Agustí Nieto-Galan

Panel 9. The wonders of colour: kernels of chemical knowledge behind premodern craftsmanship

Organised by Matteo Martelli & Lucia Raggetti
Chairs: Gabriele Ferrario and Lucia Raggetti
Friday 13 June, 15:00, 01, ADEIT

P9-1. Bluer than velvet: The pre-modern production of lapis lazuli pigment and the transmission of the per pastillum technique.
Gabriele Ferrario

P9-2. The Colour of the Sky: Technical and Artisanal Knowledge of Lapis Lazuli in Mediaeval Arabic Sources.
Amine Xhakoni

P9-3. Colour Coding: The Spectrum of Natural and Artificial Vitriols.
Giacomo Montanari

P9-4. Fireworks and Wildfire: Mamluk Technical Knowledge between Warfare and Entertainment.
Marco Baschetti; Lucia Raggetti

P9-5. The Alchemy of Lac: from Indian Insects to Byzantine Markets.
Marco Bellini

P9-6. Somewhere Over the Rainbow: The Chemistry of Fabric Dyeing in Medieval Islamic Sources.
Sara Fani, Marianna Marchini

Sessions

Session 1. People and Places

Chair: Gisela Boeck
Wednesday, 11 June, 17:00, SA, ADEIT

S1-1. J. G. Gahn, in the Words of Others.
Charlotte A. Abney Salomon

S1-2. Political Economy, Chemistry, and Territory - Dialogues of J. H. de Magellan with the Duke of Arenberg.
Isabel Malaquias

S1-3. Solving a long-standing mystery: Who is depicted in James Gillray's cartoon of the early Royal Institution?
James Frank

S1-4. The Art of Apothecaries, Alchemy, and Painting in Medieval Valencia: The Case of Guillem Ferrer (†1435).
Carmel Ferragud, Carme Llanes

Session 2. Instruments, processes and the art of experimenting

Chair: Carmen Schmechel
Wednesday, 11 June, 17:00, 01, ADEIT

S2-1. The Unruly Drop: Non-Standard Measurement Units in French Chemistry and Medicine.
Sarah Hijmans

S2-2. α-pinene: An autarkic proposal for the synthesis of polymers in Spain.
Josep Molas Salvat

S2-3. Mass Spectrometry in Austria during Austrofascism and National Socialism on the Example of Hugo Bondy (1900-1985) and Richard Herzog (1911-1999).
Michael Schober, Linda Erker, Johanna Irrgeher, Thomas Prohaska

S2-4. Invisible Labour in the Chemistry Lab: The materiality of practice among makers and users.
Linnea Soler

Session 3. Industry in local and global context

Chair: Sarah Hijmans
Thursday, 12 June, 17:30, SA, ADEIT

S3-1. The glass industry at colonial Jamestown (Virginia): a capitalistic dream that never came true.
Umberto Veronesi, Leah Stricker

S3-2. A Comparative Case Study of the Global Transfer of Chemical Technology: The Development of the Nitrogen Industry in Italy and Japan Before and After the First World War.
Lorenzo Francisci

S3-3. Danish production of sulfuric acid: From monopoly to chaos and back to monopoly.
Asbjørn Petersen

S3-4. The Capitalist Enticement that is Agriculture for Bayer AG.
Betsey Price, Dennis Volz

S3-5. Fighting for development: the Spanish chemical industry and the Rif War (1921-1927) in Morocco.
Javier Martínez Antonio

S3-6. From scientific diplomacy to p olitical diplomacy: T he sulfuric acid industrial plant in Barranquilla, Colombia.
William García Caro, David Felipe Velandia Parra

Session 4. Innovation, circulation and standardization

Chair: Hjalmar Fors
Thursday, 12 June, 17:30, 01, ADEIT

S4-1. Cat Piss and Smoked Herring. Pyrotechnical Innovation, Oeconomy and Smoke-Management in the Seventeenth Century.
Thijs Hagendijk

S4-2. Envisioning rubber as a commodity: the circulation of materials and knowledge between French chemists and Amazonian indigenous peoples during the eighteenth century.
Thiago Faustino

S4-3. The interactions between academics of the University of Coimbra and the Royal Wood Factory, 1790-1822 (Marinha Grande, Portugal).
Diogo Moreno

S4-4. "The Chemistry of Colour and the Chemistry of Life": Dyes, Microbes and Medicine in the German Empire.
Nicole Liao

S4-5. Milk, Blood, and Seaweed: Alternative Plastics of the Early 20th Century.
Zi Yun Huang

S4-6.Scientific and Commercial Standards in Interwar Chemical Photography.
Joris Mercelis

Session 5. Public image of chemistry and historical narratives

Chair: Ernst Homburg
Friday, 13 June, 17:20, SA, ADEIT

S5-1. Vulgarisation in the antiphlogiston revolution of late 18th century Europe.
Jennifer Dobson

S5-2. 'Cultivating Earth, Sustaining the Moon': Bridging Two Epochs of Chemistry and Material Narratives.
Christopher Halm

S5-3. Agnotology, Scientific Manipulation and Secondary Education: The Palomares Nuclear Accident as a Didactic Resource.
Patricia Nájera-Morales

S5-4. On the disappearance of the word "chemistry" in society: Reaction to former exaggerations or normal societal evolution?
Sérgio P. J. Rodrigues

S5-5. The Death of Chemophobia. Revisiting the Public Image of Chemistry.
Christian Schnurr

Session 6. Chemical theories and (sub)disciplines

Chair: Gillermo Restrepo
Friday, 13 June, 17:20, 01, ADEIT

S6-1. Spirits, Vapors, and Volatile Substances in Early Modern Alchemy and Medicine.
Elisabeth Moreau

S6-2. Seeing Heat and Temperature: A Journey Through Scientific Visual Representations.
Thi Thanh Thao Dinh, Annette Lykknes, Helena Bichao, Camilla Berge Vik

S6-3. "In Safety and at their Leisure": The Changing Image of Chemists and Chemistry in the Emergence of Computational Quantum Chemistry in the Late 1960s.
Stylianos Kampouridis

S6-4. The impact of chemists and physicists on the revival of genetics and formation of molecular biology in the USSR.
Vasily Ptushenko

S6-5. "Although this method lacks the physical transparency of the traditional line of attack, its frank pragmatism is surprisingly successful." Artificial Neural Networks in chemistry.
Marcus B. Carrier

Poster Session

Chair: Silvia Pérez-Criado
Wednesday, 11 June, 18:30, IILP

PS1. Early environmental studies in chemistry at Coimbra University: Constraints and research paths.
Pedro J. E. Casaleiro, Fábio R. A Monteiro, Sérgio P. J. Rodrigues

PS2. Industrializing the Academy: Chemistry, Commodification, and the Early Modern Glass Delusion.
Brian S.-K. Li

PS3. The Phlogiston Theory - a model in science education.
Weizmann Institute of Science
Rachel Mamlok-Naaman

PS4. History of polysulfides and their role in the evolution of chemical knowledge: From the discovery of oxygen to the elucidation of their composition.
Alexey Kamyshny

PS5. Polyurethanes - an outstanding invention of the 20th century and an odyssey with Otto Bayer as key player.
Christoph Kröhnke

PS6. Steroid history: from the discovery to the marketplace.
Ivana Kuzminac

PS7. Chemist Sima Lozanić and his influence on Serbia's economic policy in the late 19th and early 20th century.
Vesna Milanović Maštrapović, Dragica Trivić

Abstracts

Early Career Scholar Session (ECSS)

Organised and chaired by Christopher Halm, Silvia Pérez Criado, Sofiya Kamalova
Christopher.Halm@ur.de; silvia.perez-criado@uv.es; sofiya.kamalova@uv.e

The Early Career Scholar Session (ECSS) is a new initiative to be launched at the 14th International Conference on the History of Chemistry (ICHC) to strengthen the integration of early career researchers into the broader history of chemistry community. It provides a dedicated space for early career scholars to engage with peers and experienced members of the community in an inclusive and supportive environment.

The session features a series of short presentations highlighting key societies, journals, institutions, and initiatives relevant to the professional engagement within our field. Topics will include opportunities for networking, publication, funding, and community involvement, presented by organisations such as the Science History Institute, the Society for the History of Alchemy and Chemistry, the Commission for the History of Chemistry and Molecular Sciences, and journals like Ambix and ChemTexts, among others.

Open to all conference participants, the ECSS warmly invites both new and established members of our community to participate, share experiences, and foster intergenerational exchange. The session concludes with a Q&A opportunity and continues informally over lunch to encourage further discussions and connections.

Round table: New Computational and Experimental Methods in the History of Alchemy and Chemistry

Organised and chaired by Georgiana Hedesan
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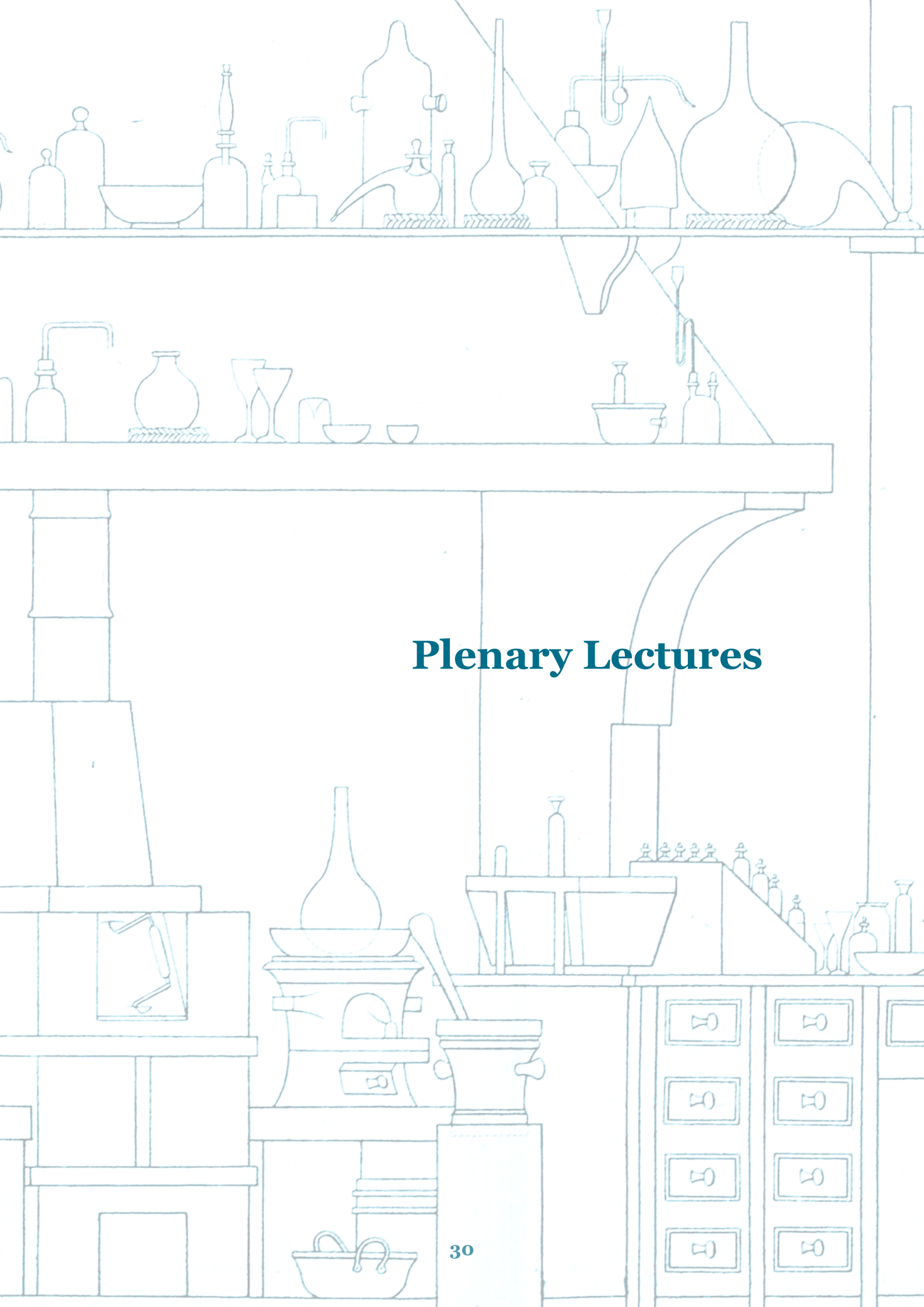
Thijs Hagendijk, *University of Utrecht, t.hagendijk@uu.nl*
Georgiana Hedesan, *University of Oxford, georgiana.hedesan@history.ox .ac.uk*
Farzad Mahootian, *New York University, fm57@nyu.edu*
Peter Oakley, *Royal College of Art, peter.oakley@rca.ac.uk*
Petr Pavlas, *Institute of Philosophy of the Czech Academy of Sciences, pavlas@flu.cas.c*
Guillermo Restrepo, *Max Planck Institute for Mathematics in the Sciences, guillermo.restrepo@mis.mpg.de*
Carmen Schmechel, *Royal Netherlands Academy of Arts and Sciences (KNAW), carmen.schmechel@huc.knaw.nl*

Historical scholarship has traditionally involved the careful analysis of one or several primary sources, available in manuscript or print format. Recently, however, new interest has been paid to exploring alternative methods of scholarship. The proposed roundtable sets two of these new approaches, the experimental and the computational, in dialogue with each other. Experimental history, a methodology that involves trying out past experiments or recipes, reconstructing instruments or reenacting events and performances, has flourished in the past few years. It is arguably better represented in the history of alchemy and chemistry, as it drew from a rising interest in the experimental nature of science in recent decades. By comparison, computational history only dates back to the 2000s, as digital technology grew at a rapid pace, offering new tools of analysis of historical data. Thus, computational approaches in the field of alchemy and chemistry are still in their early days, but interest is rising. The roundtable participants will discuss current or upcoming projects that they are involved in experimental or computational history, or both (e.g. TOME, PRESERVARE, explorations of the chemical space, global history of alchemy, cupellation furnace reconstruction). Several questions will be debated, such as the contribution of these new methodologies to historical scholarship, the epistemological value of such approaches, challenges and opportunities encountered, and how these two methodologies may synergise to advance the history of alchemy and chemistry.



Plenary Lectures

PL 1. Compound Interests: The Paulze and Lavoisier Families between Chemistry, Administration, and Politics (1760s–1830s)

Francesca Antonelli
Università di Bologna
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Presented by Ximo Guillem Llobat

This presentation explores the intricate relationship between science, tax administration, and politics through the history of the Paulze and Lavoisier families in pre- and post-revolutionary France. Recent technical analysis of Jacques-Louis David's celebrated portrait of Antoine-Laurent Lavoisier and his wife Marie-Anne Paulze-Lavoisier (1788) reveals significant compositional changes that transformed the image from one emphasizing their connection to the Ferme générale – the powerful consortium charged with collecting indirect taxes for the French monarchy – to one highlighting their scientific identities: a strategic repositioning during a period of growing hostility toward ancien régime institutions.

I will examine how the Paulze and Lavoisier families navigated these intersecting worlds, with particular focus on Jacques Paulze's influential role i n h is son-in-law's career w ithin t he F erme générale and on the family's note-taking practices and work routines across both administrative and scientific domains. By reconstructing these "compound interests"—at once chemical, political, and economic—I will attempt to restore dimensions of their identity that the Lavoisiers themselves sought, at some point, to downplay. Finally, we will get a glimpse of Marie-Anne Paulze-Lavoisier's continuing negotiation of this complex legacy after surviving the Revolution that claimed her father and husband in May 1794

PL 2. What can chemistry tell us about capitalism, and what can capitalism tell us about chemistry?

David Edgerton
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Presented by Ignacio Suay-Matallana

In recent years there has been renewed interest in the political economy of science. This suggests that in the neoliberal age something called science has been privatised and marketized. The implication that before 1980 chemistry was purely academic, purely concerned with research, and all in the public sector, would be an obvious absurdity to the historian of chemistry. But these lessons still need to be taught to many historians of science. Starting from the not unreasonable position that chemistry is the modal modern science I will suggest some things we can learn from a history of chemical production as historians of capitalism and as historians of science.

Taking capitalist production of chemicals seriously will provide us with and account of chemistry which is mostly not about research, and within the research part, mostly industrial rather than academic research. This is shaped not by an abstract capitalism, but by very particular political economic dynamics, not just industrial competition, but contestation between empires and nations also. Taking the chemical industry seriously in our histories of modern capitalism will have equally important consequences: as well as directing us to the neglected issue of production, it will also lead us away from cliched images of production focussed on Fordism and assembly lines into more rewarding investigations of energetics, economies of scale, and continuous processes, which will yield many surprises.

PL 3. Chemical Passports: Environmental Science, Information, and Regulation in the Trade of Toxic Substances

Angela N. H. Creager
Princeton University
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Presented by Brigitte Van Tiggelen

In the 1980s, some policy experts worked to develop systems in which toxicity information would accompany exports of commercial chemicals across national borders. One referred to these dossiers as "chemical passports." This presentation examines the fate of these efforts by examining activities at the Organisation for Economic Cooperation and Development (OECD), which had been working to eliminate "non-tariff" barriers to free trade of chemicals by harmonizing toxicity test requirements. In 1982, the Reagan administration doomed the OECD's attempt to establish a minimum premarketing dataset across its member countries. In the face of ongoing attempts at facilitating data exachange, the chemical industry resisted data disclosure, ultimately asserting that toxicity information was intellectual property. This episode illustrates a broader "informational" turn in the 1980s, in which the right-to-know movement among environmental groups was accompanied by corporate efforts to block data sharing.

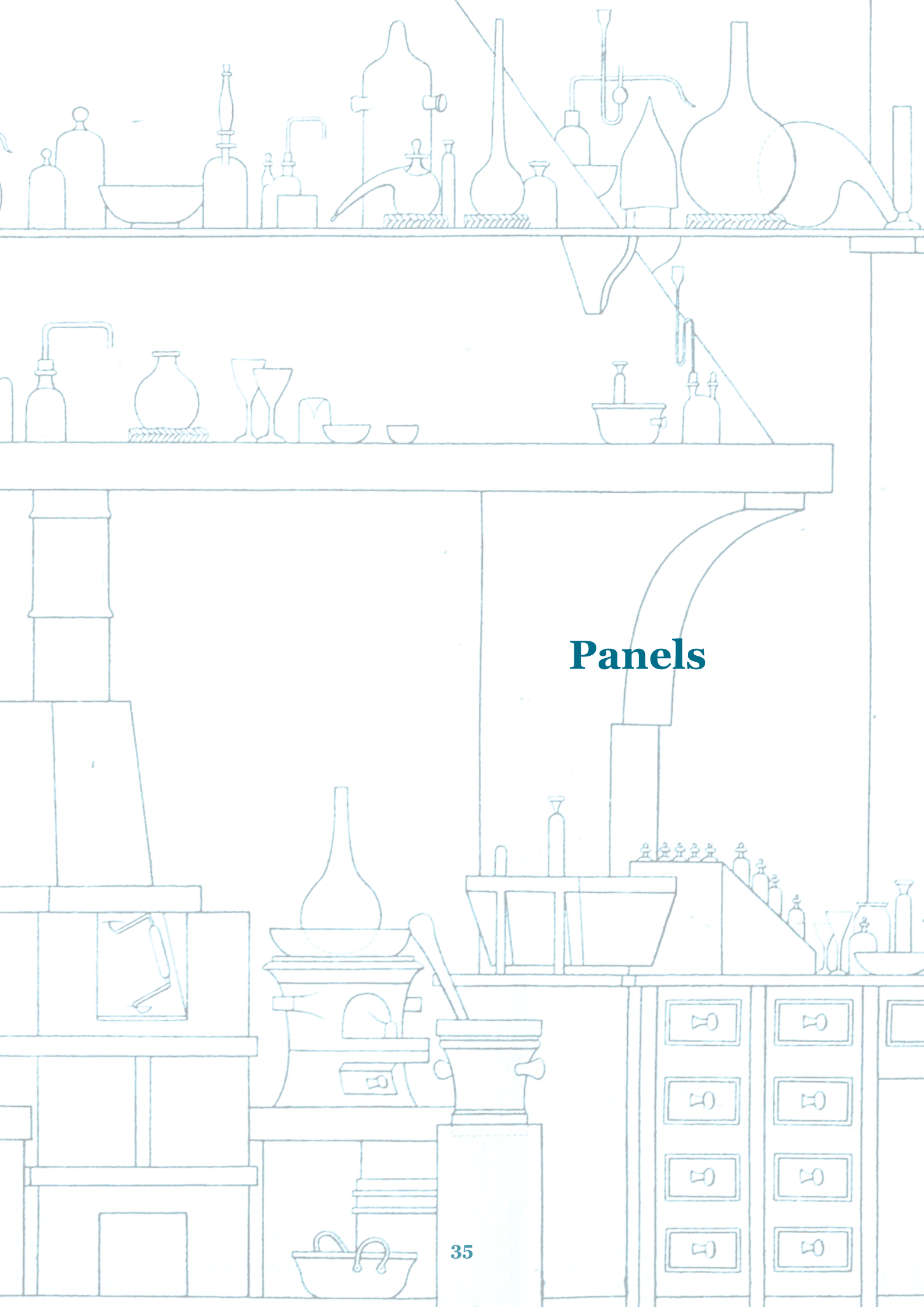
PL 4. Executive Science. Governmental Research in Germany, 1933 to 1945

Carsten Reinhardt
Bielefeld University
carsten.reinhardt@uni-bielefeld.de

Presented by James Frank

In industrialized nation states, research agencies which are organized in the executive branch of government provide much of the institutional framework for regulating the capitalist economy. In National Socialist Germany, the Geological Survey, the Imperial Institute of Physics and Technology, the Materials Testing Office, and the Imperial Institute of Chemistry covered the whole spectrum of regulatory functions from the exploration of raw materials, research and development of novel materials, assessment of functional performance to market organization. Together, these agencies were indispensable for the German war economy, which was guided by a policy of autarky, massive armament efforts, and ruthless exploitation of occupied countries.

In my talk, I will draw on a recently finished project on the history of governmental research in National Socialist Germany. (See https://ns-ressortforschung.uni-wuppertal.de/de/) On the basis of its empirical findings, I aim to develop the concept of executive science as a quite extreme variety of regulatory science endowed with exceptional powers in terms of scientific and political legitimacy, technical quality judgment, and procedural enforcement. In National Socialist Germany, executive science has been active in the domains of both entrepreneurial operations and bureaucratic administration, linking capacities for innovation with regulatory authority. For understanding its specificities, the concepts of New Statehood (Rüdiger Hachtmann), and of an autarkic, self-sufficient, armed state (*autarker Wehrstaat*: Helmut Maier) will serve me as guardrails.



Panels

Panel 1

Toxic Tales?! - (Il)legitimate uses of chemical substances in twentieth century Brazil

Paulina S. Gennermann
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Throughout the twentieth century, Brazil experienced significant changes in socioeconomic trends, including exponential increases in urbanization, consumption, and industrialization rates. The presence of chemical substances in Brazilian daily life increased. Chemical and pharmaceutical industry as well as governmental agents and scientific experts promoted the benefits and even the necessity of using more and more chemical products like pesticides, pharmaceuticals, or radioactive isotopes, usually associating them with images of "modernization". While the usage of those substances had advantages, they came with potential powerful risks for environment and health. The double-edged character of chemical industrial substances and products make them ideal research objects to analyse the public and official framing of critical/suspicious chemicals. The aim of this panel is to decipher and discuss social, political, and scientific entanglements regarding the image of chemical industrial substances in the second half of the twentieth century Brazil. How was a legitimate or illegitimate use of chemicals constructed and justified? What terms were used by whom to describe and classify particular substances? What concepts were implicated by using those terms? Using the case studies of pesticides, psychopharmaceuticals, and radioactive isotopes, this panel seeks to analyse the complex and often puzzling terminology of chemical industrial substances and its underlying consequences for Brazilian society, industry, and politics.

P1-1. "There's a little yellow pill": Valium between intoxicant and medicament, 1960s-1980s.

Paulina S. Gennermann
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paulina.gennermann@uni-marburg.de

In their famous song "Mother's little helper" (1966) the Rolling Stones took up a controversial issue of the 1960s and following decades: The growing medicalization of (female) anxiety and the problematic use of benzodiazepines in modern societies. The song points at the complex entanglements of medicine, doctors, social norms, and economic developments. In my talk I wish to focus on the difficult differentiation between intoxicants and medicaments in the case of diazepam, mostly known under its brand name Valium (Roche), the pill the Rolling Stones refer to.

In Brazil from the 1960s to the 1980s, Valium and other benzodiazepine derivatives were consumed in increasing quantities to treat various symptoms and discomforts. It became famous for its use in cases of anxiety, stress, and sleeping issues. While Valium started as a medicament, it soon was discussed as a potential harm to people's health and an intoxicant. I want to focus on the presentation and the image of Valium in Brazilian society, using newspaper articles as primary sources. What terms were used to talk about Valium? In what contexts was the substance mentioned and why? I will show that there did not seem to be a clear-cut demarcation between intoxicant and medication which led to a fuzzy and hard to grasp status of Valium (even until today). In Brazil, which was under military dictatorship around this time, this fuzziness is of great interest, as drugs and intoxicants were integrated in the discourse about and legitimisation of political persecution and repression. I want to raise the question if and how Valium was impacted by the vigorous political actions against intoxicants, connecting political argumentations with medical perspectives and social opinions.

P1-2. "Man's deadly friend"[1]: conceptual disputes over pesticides in Brazil, 1960s - 1980s

Dr. Leonardo de Bem Lignani
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Between the late 1960s and throughout the 1970s, the production and consumption of pesticides in Brazil increased significantly—a process that contrasts with the global movement criticizing the use of these compounds in a post-Silent Spring world. An important factor in understanding this increase is the industrialization policy implemented by the Brazilian military dictatorship, which governed the country between 1964 and 1985, combining political repression with measures to stimulate economic growth.

Inspired by the "Green Revolution", the government encouraged the use of pesticides to increase agricultural productivity, importing techniques and technologies from the global North, especially the United States. With the aim of expanding national production and reducing dependence on imports, the government favored the entry of multinational chemical companies, allowing them to produce and sell in Brazil substances that were already restricted or banned in their countries of origin. Representatives from companies, government agents and researchers helped spread narratives promoting pesticides as "agricultural defenses" or "remedies", presenting them as useful and safe for both farmers and consumers.

By the late 1970s, the term agrotóxico ("agrotoxic") emerged with a critical perspective, highlighting aspects of poisoning among rural workers, as well as food and environmental contamination. This term was adopted by the environmental movement and agroecological organizations in the 1980s and later used in Federal Law n. 7802 of 1989.

Drawing on government documents, industry campaigns, newspaper articles, and interviews with rural workers, this presentation aims to discuss how symbolic and conceptual disputes over pesticides (amid economic interests and political choices) were a crucial aspect in the spread and resistance to the production and consumption of these substances in Brazil.

1 Headline in *Folha de São Paulo, 07 March, 1975.*

P1-3. Peaceful atoms in Cold War Brazil: radioisotope circulation in nuclear medicine, agronomy and biomedical sciences, 1950-1960s

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This research is part of a broader project that investigates the emergence and incorporation of radioisotopes in Brazilian biological and medical research, with the aim of mapping the transformations that occurred because of the interaction between these elements and groups of scientists, institutions, political demands and socio-environmental problems. In the post-World War II period, radioactive isotopes began to be produced and disseminated on a large scale, both in nuclear tests and as important elements in global scientific diplomacy. These 'new' technological objects represented the peaceful side of nuclear energy, as they would be used in industry, medicine, agriculture and scientific research in general, routes that were apparently very different from those associated with atomic bombs and anxieties regarding nuclear energy.

The specific objective of this paper is to analyze the development of knowledge and scientific practices on radioisotopes based on radioisotope methodology courses that emerged in Brazil in the 1950s. These courses were promoted by international agencies, in partnership with Brazilian institutions and organizations, and their main purpose was to train and introduce doctors, agronomists, biologists, and technicians in general to radioisotope practices.

Based on a cross-sectional analysis of the different scientific disciplines involved, this research demonstrates the role that the emergence of these courses played in the dissemination of ideas about the peaceful uses of atomic energy in Brazil. I conclude that this reflects an important characteristic of science during the Cold War, namely, the intrinsic relationship between diplomacy and new technologies, while also pointing to radioisotopes and nuclear energy as key elements in the development of science in post-World War II Brazil.

P1-4. Avoiding Toxic Terms: Chemicals Incorporating the Concept of Agricultural Protection and the Convergence of Brazilian State Strategy with Business Values, 1910-1980

Mariah Freitas Monteiro, M.A.
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Mariah.FreitasMonteiro@ku.de

In 1910, the Brazilian government established the *Agricultural Inspection and Defense Service*, responsible for pest control measures, inspection of seeds and plants, and providing samples to agricultural producers etc. Over time, as more chemical products were introduced into crop management practices, the concept of *agricultural defense* was affected and became more closely associated with pest control and related chemicals. By the late 1930s, government documents described these substances as *defensive and corrective agents for crops*. The term *agricultural defensive* began to appear in the press in the 1950s, but consolidated itself during the 1970s military dictatorship, when government policies actively promoted pesticide production and use. By then, it had also become a key term in corporate vocabulary in Brazil.

My presentation aims to analyse the ways in which the term *agricultural defensives* enhanced the credibility and legitimacy of pesticides by framing them as essential while downplaying associated risks. Derived from the state-established concept of agricultural defense, it conveyed a positive and assertive connotation which contrasts with terms such as *preparations*, *poisons*, *pesticides* and *agrotoxics*. The term a*gricultural defensives* also had older equivalents in other languages, indicating global influxes and connections. The significant presence of multinational companies in Brazil played a key role in reinforcing its use in the local vocabulary.

The central argument is that the concept of agricultural defensives points not simply to a corporate appropriation of a state-coined term but is indicative of a convergence between state and corporate economic interests, a dynamic that became particularly pronounced in the 1970s. To support this hypothesis, I will analyse documents of the Ministry of Agriculture, advertising materials, and corporate correspondence, aiming to reveal the intertwined narratives that shaped the consolidation of the term.

Panel 2

Chemical Industry Transformed: Knowledge, Labour, and Professions in the long Eighteenth-Century

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The Industrial Revolution has often been considered the catalyst for the capitalist era. It has long been attributed to the ingenuity and resources of the British Isles. However, parallel developments took place on the European continent, albeit they followed somewhat different trajectories. In this session, we explore the complex interplay between chemistry, chemical arts, and the transforming economies of 18th-century Europe, paying heed also to global perspectives. The period saw a massive expansion in commerce and in the quantity and quality of chemical products available on the market. This posed a challenge to the traditional, guild-based, organisation of labour. Simultaneously, governments and private investors recognised the immense potential of this emerging field and allocated substantial resources to the exploitation of natural resources and the establishment of new industries and manufactures. We argue that this transformative process occurred on multiple levels, ranging from the ontological foundations of chemistry to the evolving artisanal and workplace practices, and culminating in the heightened appreciation of chemical knowledge across a wide spectrum of economic activities. By exploring these interconnected dimensions, we aim to shed light on the pivotal role chemistry played in shaping the economic landscape of 18th-century Europe, setting the stage for the Industrial Revolution and the advent of modern capitalism.

P2-1. Workers in Chemical arts in Eighteenth-Century Paris

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Paris underwent significant economic expansion in the eighteenth-century century, driven in part by the growth of guilds involved in chemistry and chemical arts. These guilds collectively employed an estimated ten thousand workers, a substantial portion of the Parisian workforce. Beyond their economic impact, guild members played a role in challenging traditional power structures and paving the way for the political reforms of the labour market.

In my presentation, I intend to reassess the role of chemistry and chemical arts in the economic and social transformation of the French capital. The main guilds involved in chemistry, or which presupposed technical knowledge in this science, were: apothecaries and pharmacists (distinguished only from 1777), jewelers, 'limonadiers' (lemonade makers), distillers, winemakers, brewers, 'vinaigriers' (vinegar makers), glassmakers, enamellers, perfumers, saltpetre-makers, fireworkers, dyers, launderers (with a notable female presence), tanners, and inspectors of wines and spirits. I shall emphasize the quantitative significance of workers engaged in chemical arts, examining their roles, gender distribution, and primary activities.

I will explore the collective identity of this population and argue that their technical expertise and economic clout enabled them to push for changes in the existing organization of labour.

Keywords: Eighteenth century chemistry; Chemical revolution, Industrial revolution; Paris savante.

P2-2. Copper in Seawater: the Chemistry of Ship Sheathing in the Expanding Eighteenth-century French Empire

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My paper examines the role of chemical knowledge in shaping the mineral policies of the eighteenth-century French state. France attempted to supply its expanding colonial empire with the copper needed for its military and sugar industry. Lacking mines of its own, copper had to be sourced from abroad, making the French keen to develop robust metallurgical knowledge that would best utilise the expensive imported raw materials.

My research examines the work of several chemists who conducted metallurgical experiments with the aim of supporting the interests of the state. As the British navy began to sheath its ships in copper, the French kingdom, in the midst of intensified efforts towards its remaining island colonies, followed suit and increased copper imports. Chemists working at scientific institutions, foundries, and harbours conducted tests aiming at improving the copper sheathing of ships, trying to lengthen its lifespan, all while exchanging with a disparate group of savants and entrepreneurs aiming to profit from a solution to the gradual erosion of copper from ships' hulls. The French revolution greatly intensified those efforts, as France's lack of mines became apparent and the revolutionary chemists applied scientific knowledge to bolster France's meagre resources, in desperate times attempting to "convert church bells into canons."

By examining the evolving role of chemical knowledge in the struggle of the French Empire to secure copper resources, my paper critically examines the chemistry of metals in the early modern period, and the complex network within which this knowledge was created and utilised.

Keywords: French Empire; Eighteenth century; Copper mining; Mineral Chemistry.

P2-3. Imperialist claims: Or, how the 'truth' about pharmaceuticals became chemical knowledge

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Not long ago, pharmacy shared a global language: that of taste, smell and sensory assessment. Healers, doctors, and other specialists in medicinals, whether they worked in, e.g., native American, European, or Chinese cultural contexts allowed that sensory properties such as visual appearance, smell and taste bore a connection to a substance's medical effect. The 18th century saw an end to this consensus: pharmaceutical preparations were increasingly defined as objects of chemical knowledge. As such they were to be studied primarily through chemical analysis, a practical skill which at the time only could be learned in scientific and craft settings in Europe and its colonial off-shoots. In the paper I explore how apothecary-chemists such as Carl Wilhelm Scheele (1742-1786) shifted the prerogative to interpret pharmaceuticals to chemistry, and how this change redefined the relationship between European and non-European medical traditions. I regard this as a process of commodification. New material practices, in laboratories and in pharmaceutical production, brought about a concretization of pharmaceutical ingredients, which subsequently were reified as commodities and raw materials. Simultaneously, they were decoupled from plants, animals and previous cultural contexts. Unique properties of medicaments which could not be explored through chemistry were increasingly downplayed. Indeed, beginning in the nineteenth century, learned carriers of medical traditions who did not accept that healing objects and substances were commodities ceased to be co-producers of knowledge. Instead they began their own slow transformation into raw materials: that is, objects of ethnographic investigation.

Keywords: eighteenth-century, global history, pharmaceutical chemistry, medicine.

P2-4. Chemistry, Mining, Metallurgy: Chemical and Mineralogical Expertise in Eighteenth-century Habsburg Mining

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In my paper I examine the role of chemical knowledge in shaping the mining policies of the eighteenth-century Habsburg Monarchy in Central Europe. Since the 16th century Habsburg administrators of the rich Hungarian mines were commissioned to supply the Imperial finances in Vienna with a steady flow of precious metals and copper. To succeed one of the crucial tasks was to train an administrative élite with expertise in different areas of mining knowledge. This task became of eminent importance especially after the richest ore deposits were exploited by the mid-18th century.

Pioneering the trend of establishing special schools a mining school and later a central mining academy was founded in Schemnitz (Banská Štiavnica, now SK). The two first professors (1763-1777) in mineralogy and chemistry were well-respected scientists N. J. Jacquin and G. A. Scopoli, who laid foundations not only to the chemical school with laboratory training and mineral collections, but provided also practical expertise in solving metallurgical problems, and furthermore published on theoretical and applied problems of chemistry and mineralogy.

Looking at these two prominent figures and their work in mineralogical chemistry I examine the evolving role of chemical knowledge in a complex network of academic, industrial, and administrative interrelations. Which in the medium run profoundly shaped both the mining academy and metallurgical production in this part of Central Europe.

Keywords: Habsburg Empire; Eighteenth Century; Metal Mining; Mineralogical Chemistry Teaching.

P2-5. Medical Knowledge, Specialised Shops, and Partnerships: the Apothecaries' Guild's Chemical Activities in Eighteenth-century Paris

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Throughout the 18th century, the apothecaries were often involved in the development of chemical industries. However, their chemical activities were ancient and varied, entailing a complex interplay at multiple levels: economical, medical, technical, and educational. A closer look at the guild's archives and apothecaries' probate inventories should help us understand in what ways apothecaries contributed to rising interest in and supporting the development of chemistry-related enterprises and ideas during the 18th century. The case of the Parisian apothecaries' guild allows to take another look at the guild's approach towards chemical ideas and practices, both ancient and new. First, the guild willingly incorporated chemical activities into its professional standards and expectations. The apothecaries' communal garden located at *rue de l'Arbalète* played a crucial role in this by building a chemistry laboratory in 1700 to manufacture remedies in bulk as well as to provide apprentices with chemistry lessons. In the 1760s, a machine to crush pills into powder was built for the same purpose. Second, an approach by the trajectories and relationships reveals the apothecaries' various chemical activities, whether in terms of medical market, strategies, or even individual techniques. The probate inventories show that shops specialised in certain chemical products, which came with a set of specific related instruments. Partnerships were formed to facilitate the selling of chemical substances. Thus, apothecaries' chemical activities were not always large-scale economic activities, but often a matter of everyday practice that had infused therapeutic demand and that existed through the guild's frame of labour.

Keywords: Apothecaries, guild, chemical remedies, apothecary shops.

Panel 3

20th Century Pesticides Chemical Industry

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This session examines the historical transformation of pesticide production and use, exploring their impact on agriculture, science, and society from the late 19th century to the present. Through case studies from various geographical contexts (Norway, the USA, and Spain), it investigates the power dynamics that legitimized these chemicals, the environmental controversies they triggered, and the social and regulatory responses aimed at addressing their effects.

The session focuses on how different types of pesticides (including DDT and other organochlorines, organophosphates, and phenoxy herbicides) were initially celebrated as "miraculous" technological solutions but later became symbols of the tensions between scientific progress and risks to human health and the environment. It draws on concepts such as "circulation of knowledge," "sites of knowledge," and "knowledge in transit" to explore the challenges of constructing balanced narratives that incorporate diverse voices, including those of scientists, farmers, activists, and chemical industry representatives.

The primary aim is to analyse how scientific practices and official narratives promoted pesticides as essential tools for agricultural modernization, while sidelining alternative knowledge systems and downplaying associated risks. The session also explores how these dominant narratives came into conflict with environmental activism, which sought to reshape public perceptions and regulatory frameworks surrounding these chemicals. Finally, it considers the ethical and methodological challenges of studying such a contested topic with significant contemporary relevance.

P3-1. Biscay's Chemical Shadow: Understanding the Toxic Legacies of HCH Production Through Oral History

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This article outlines the foundational framework of an environmental history project that examines the toxic legacies resulting from the process of pesticide production, spanning from the late 1970s to the present. Specifically, it addresses the environmental crisis triggered by the closure of lindane production facilities in the Biscayan towns of Barakaldo and Erandio, a highly carcinogenic pesticide which was widely used in Spain and Europe in the central decades of XXth century. Aiming to illuminate one of the most overlooked environmental and public health crises of recent decades in a wider process of "noxious deindustrialisation" (Mah, Feltrin, Brown, 2022), the study draws on interviews with affected community members, experts, activists, and policymakers. Through this approach focused on how people's memories relate to landscapes and the environment, it investigates the perceptions, responses, and conflicts surrounding the detection, collection, management and legislation of pesticide waste.

Keywords: lindane, oral history, deindustrialisation, pesticide.

P3-2. Agricultural Chemicals and the Environment: A View from History

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In *Silent Spring*, Rachel Carson synthesized the research of toxicologists, ecologists, and physicians to show that a variety of chemical insecticides had permeated every dimension of the environment. Carson's urgent message inspired the environmental movement. And yet, policy makers interpreted *Silent Spring* as an indictment of one class of insecticides: the chlorinated hydrocarbons and specifically DDT. In addition to questioning the overuse of DDT, Carson worried about the organophosphates, a highly toxic class of insecticides that was originally developed as nerve gasses. Although chlorinated hydrocarbons accumulate slowly in the environment and organisms, the far more toxic organophosphate insecticides result in acute toxicity for insects as well as birds and mammals including humans.

Thus, it is ironic that organophosphates became the dominant pesticides used in agriculture and public health following the ban on DDT and other chlorinated hydrocarbons in 1972. Throughout the 1970s, 80s, and 90s, organophosphates literally flooded agriculture with applications exceeding 100 million pounds *annually* in the United States alone. Other countries followed the U.S. China, for example, banned DDT in 1983 and shifted to organophosphate insecticides. Most of these highly toxic insecticides were still in use until 2001 when the U.S. Environmental Protection Agency banned them after a review launched in 1996. China followed suit banning several of the most toxic organophosphates in 2007. Despite such long-delayed measures, organophosphate insecticides continue to threaten wildlife and humans in subtle yet significant way, as shown in reports that appeared in late 2017, more than 50 years after the publication of *Silent Spring*.

P3-3. "2,4,5-T On Trial" Narratives of Safety and Risk About Phenoxy Herbicides

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Developed just prior to World War II, the phenoxy herbicides offered a solution to many problems. For farmers facing labor shortages, the herbicides meant they could still maximize crop production. For public health officials, the herbicides helped clear out city lots. Timber interests used the herbicides to help clear out brush, as did public road crews. The US Forest Service saw the herbicides provided a way to control brush but also increase water supplies in the arid West. The chemicals were widely used in the 1940s, 1950s, and 1960s but by the late 1970s people began questioning the safety of the "miracle" herbicides.

Based on research done for my published work, this paper examines the rising tensions between the chemical, agricultural, and timber industries as the safety of the phenoxy herbicides were increasingly challenged by scientists, grassroots health and environmental activists, and US Vietnam War veterans. The allied industries held significant advantages – financial resources, regulatory capture, and the employment of thousands. Activists found creative ways to challenge industry narratives of safety while also capitalizing on shifts in environmental understanding and concern. This moment marked scrutiny of chemical regulation and the uneven successes achieved as the chemical industry and its allies faced increasingly vocal and often effective citizen activism.

P3-4. Persuasion by Performing Miracles in Outdoor Laboratories

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From the 1890s, a range of toxic chemicals were introduced in Norway in response to what agricultural experts perceived as an escalating insect and fungicide problem. A chemical solution to the weed nuisance appeared in 1911. By 1920 herbicides, most notably iron sulphate and sulfuric acid, were regularly employed by Norwegian farmers in their war against weeds. This presentation focuses on how pesticides became a cornerstone of modern farming in Norway during the second decade of the 20th. By using the concepts "circulation of knowledge" and "sites of knowledge", I show how experts persuaded farmers to embrace pesticides through "arenas of miracle", outdoor laboratories across Norway at which experts put on a scientific performance before spectating farmers. At these "arenas of miracle" the rehearsed "play" put on by experts sought to demonstrate to farmers how nature could be domesticated through pesticides. However, while some knowledge and practices were portrayed as good and correct, other forms of knowledge and kinds of were either ignored or considered wrong. As such, these "arenas of miracle" served not only as sites of knowledge production and circulation, but also as laboratories of ignorance.

P3-5. Pesticides and Franco Dictatorship: Building Spain's Chemical Industry

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This paper examines the regulation and development of the pesticide industry in Francoist Spain, focusing on the pivotal period between 1939 and 1956. During this time, the implementation of the Pesticide Register (Registro Nacional de Productos Fitosanitarios 1942) represented a significant institutional effort to structure and control the increasing use of chemical pesticides. The study investigates how these regulatory frameworks were instrumental in fostering the growth of a national pesticide industry within the constraints of an autarkic economic system.

The analysis places particular emphasis on the role of major pesticide companies in driving agricultural modernization and integrating advanced chemical technologies into state policies. By reconstructing the profiles of key pesticide producers and examining the regulatory frameworks they navigated, this paper provides a nuanced perspective on how technological and industrial decisions were co-produced with political power in an authoritarian regime. It demonstrates how regulatory structures not only supported the expansion of the pesticide industry but also reinforced the Franco regime's authority by portraying chemical technologies as symbols of progress and modernity.

The paper also explores the intersection of local dynamics with global trends. For example, the transition from older arsenic-based pesticides to more advanced products like DDT paralleled international shifts in agricultural practices. At the same time, regulatory decisions in Spain were shaped by external influences, including global scientific advancements and economic pressures. This convergence of local and global forces highlights the intricate interplay of political, economic, and scientific factors that defined the pesticide industry during this period.

Panel 4

Provincializing Europe's Chemical Knowledge and Technologies: Case Studies from Republican China, Colonial Taiwan, and Egypt

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The globalization of chemical knowledge, technologies, and products during the first half of the 20th century is well known, especially in the history of science and technology and environmental studies. However, most studies of chemical industries and infrastructure depict this history as if it unfolded exclusively in laboratories and factories in Europe and North America, driven forward solemnly by (Western) techno-scientific innovations and consumer demands. To bridge this historiographical gap, this panel seeks to incorporate the Egyptian, Chinese, and Taiwanese contexts into the historical discussion on the manufacturing, consumption, and circulation of chemical knowledge, technologies, and products.

The focus on non-Western chemical sites reveals how chemical knowledge, technologies, and products were used to promote resource extraction. Simultaneously, it shows how the manufacturing of chemical products and technologies was embedded within global structures of capitalism, imperialism, and colonialism. As the three papers suggest, these contexts are crucial to understanding the reciprocal relationship between chemistry and capitalism on the one hand and non-Western localities of resource extraction and global chemical-making processes.

Centering on the period between the 1880s and 1940s, the three papers bring the diverse contexts of Republican China, postcolonial Egypt, and colonial Taiwan into conversation with the conventional historiography on the science of chemistry and chemical industries, technologies, and products. Zeng's paper examines how patriotic intellectuals and vernacular industrialists in Republican China improved agricultural indigo cultivation, extraction techniques, and commercial strategies to address wartime shortages of synthetic dyestuffs, complicating the relationship between natural resources and chemical substitutes. Polatsek's paper explores the Egyptian efforts to achieve nitrogen self- sufficiency while contesting British imperial rule. Haid's paper traces how the colonial and capitalistic restructuring of Taiwan's camphor industry connected it to German synthesis technology and global chemical film production.

P4-1. Sourcing Colors in Crisis: The Revival of Natural Indigo and Dye Production in Wartime China

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The late 19th-century introduction of synthetic indigo from Germany disrupted China's traditional dyeing industry, undermining centuries-old practices that relied on locally sourced plants. However, during both World Wars, disruptions in European synthetic dye imports prompted a resurgence of natural indigo production. This paper argues that these wartime revivals were not mere temporary setbacks but pivotal moments in the development of China's modern chemical industry. Faced with shortages of synthetic dyes, China harnessed its local natural resources, combining agricultural, chemical, and industrial knowledge to sustain dye production despite the challenges of war and limited access to foreign technology.

DyestuH chemists promoted the strategic use of China's abundant natural resources, initiating systematic research into plant-based indigo. In collaboration with agronomists and government agencies, they modernized the indigo production process, improving everything from cultivation to refinement and distribution. This collaboration transformed indigo production from small-scale, household operations to semi-industrialized facilities, creating a more organized and scientifically grounded system. These eHorts peaked in the 1930s and 1940s, driven by the demand for blue dye in military uniforms.

By examining the intersections of national strategy, technological innovation, and resource management, this paper highlights an often-overlooked chapter in China's industrial history, revealing the resilience and ingenuity of dyestuH chemists, agronomists, and government oHicials who laid the groundwork for China's chemical sector in the early 20th century.

P4-2. Camphor Forests in Taiwan and Chemical Synthesis: Colonialism, Capitalism, and the Chemical Industry

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The chemical history of camphor reveals a dynamic interplay between resource extraction, colonial rule, and the chemical industry. Under Japanese colonial rule from 1895 onward, camphor extraction from Taiwan's camphor trees underwent a profound transformation, shifting toward capitalist modes of production fueled by Japanese industrial investments. This transformation led to the establishment of the Japanese Camphor Monopoly in 1899, which sought to control global camphor markets. The monopoly's domination of camphor supplies and the resulting price volatility in Western nations spurred chemical research to synthesize camphor as an alternative to the natural product.

Camphor was essential in producing celluloid, one of the first plastics. The global demand for celluloid surged with the rise of celluloid film stock from 1895 onwards, making camphor a critical resource for the growing film industry. This dependence heightened the urgency for Western chemists to develop synthetic alternatives as monopolistic practices constrained access to natural camphor.

This presentation examines the colonial restructuring of Taiwan's camphor industry and its ripple effects on Western industrial chemistry. It traces the technological, labor, and logistical changes in extracting camphor from Taiwan's forests, situating these practices within broader capitalist exploitation of resources. Simultaneously, it explores the chemical history of camphor synthesis as a response to capitalist monopolization, highlighting how global resource dynamics shaped the chemical industry at the turn of the century.

P4-3. Making Fertilizer from the Nile: Chemical Knowledge and Technologies in (post)colonial Egypt

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This paper explores the history of the unsuccessful attempts to establish a nitrogen fixation plant powered by hydroelectricity in Egypt during the first half of the 20th century. While the plant was eventually erected only during the 1950s, the discussions on its foundation date back to before WWI. Focusing on those debates reveals how chemical knowledge and technologies were intrinsically shaped by the imperial and postcolonial context of the interwar period and fundamentally embedded within political and economic structures.

This paper contextualizes these debates within the global context of the British Empire's attempts to achieve nitrogen self-suJiciency and the local Egyptian anti-imperial struggle and post-colonial state-building project. Egyptian claims for independence from British rule were interlinked with the nitrogen fixation technology, which promised unlimited access to nitrogenous fertilizer to support the Egyptian agricultural-based economy as it aimed to break free from Western economic hegemony.

This paper analyzes how policymakers, experts such as chemists and hydrologists, and the general public discussed the economic, scientific, and political controversies surrounding the establishment of the nitrogen fixation plant during the interwar period. It shows how the imperial and nationalistic developmentalist vision of employing the chemical technology of nitrogen fixation to produce chemical products such as fertilizer for agricultural modernization was embedded in economic and scientific structures and shaped by British Imperialism and the Egyptian anti-colonial struggle against it.

P4-4. Energy Transition and Technology Transfer: Energy Regimes in Lanzhou Chemical Industry Company (1952-1972)

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This paper examines the process of the energy transition from coal-and-alcohol-based chemistry to petrochemical technology in Lanzhou Chemical Industry Company, the first petrochemical industry in socialist China. The company was built under Soviet assistance in 1952-1960 and produced synthetic ammonia and styrene butadiene rubber from coal and alcohol. In 1961, three factors triggered the energy transition: the technocratic vision of petroleum extraction among communist planners, the energy crisis caused by the political campaign "the Great Leap Forward", and the reconfiguration of power relations between labour and experts. Beginning in 1962, mainly due to the Sino-Soviet split, technocrats in the company began to seek technology transfer from Western Europe. Eventually in 1972 the company built up six petrochemical technologies which produced polyethylene, polypropylene, etc., and became the first petrochemical plant in socialist China. This paper aligns with current scholarship of energy history, emphasizing multiple factors (political, economical, cultural, etc.) of energy transition as opposed to the single economic explanation of cost and efficiency. I contribute to this scholarship an analysis of the complex interaction of energy, technology, and power in the context of socialist China, which is rarely explored by scholars. Today, it is important to understand China's historical trajectory of energy transitions and chemical industries, especially considering that China has become the world's largest consumer of primary energy and producer of chemicals, and its pivotal role in the global climate crisis.

Keywords: Energy Transition, Socialist China, Petrochemical Industry, Lanzhou Chemical Industry Company.

P4-5. Soviet-Italian Nitrogen Business: The Establishment of the Soviet Nitrogen Industry Amid the Global Drive toward Autarky (1925-1941)

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This paper discusses the relationship between an Italian synthetic nitrogen production company Casale and the Soviet Union during the interwar years. The synthetic nitrogen industry received a major development push as a result of World War I and revolutionized the geography of nitrogen production, with countries no longer relying on saltpeter imports to fulfill their fertilizer and explosives production needs and instead building factories for autonomous nitrogen production.

Casale was one of the major developers of the new way of obtaining nitrogen, and the USSR chose this Italian company to build its first nitrogen factory. A common view of the early Soviet industrial development emphasizes that the Soviet Union was catching up with the "developed world." The history of the nitrogen industry and Casale's involvement shows that the USSR was purchasing the same chemical equipment that was simultaneously being tested and developed in Italy. "Developed" countries, such as France and Germany, were also constructing plants based on the Casale method, which shows not a "catching up" process, but rather, that in the wake of World War I's disintegration of supply chains, the Soviet Union was part of the global process of searching for a more autonomous nitrogen production.

Using the establishment of the nitrogen industry in the USSR as a case study, this paper contributes to our understanding of the way military and economic upheavals shaped the development of chemistry and its trade across two ideologically different countries: fascist Italy and communist Soviet Union.

Keywords: nitrogen, USSR, Italy, interwar.

Panel 5

New perspectives on Chemistry in 20th-century Universities

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Historical research on science in universities has undergone a profound transformation in recent decades. Moving beyond earlier hagiographic approaches and purely celebratory narratives, the academic community now draws upon a wealth of well-analyzed case studies that provide comparative materials, robust conceptual frameworks, and diverse methodologies. The history of universities is a well-established field, supported by dedicated journals (e.g., *History of Universities*) and distinct research trajectories within the broader history of science, underpinned by numerous concrete examples and case studies. In recent years, special issues (e.g., Chang & Rocke, 2021) and collective volumes (e.g., Simões, Diogo & Gavroglu, 2016; Berkel & Homburg, 2023) have further enriched the field by addressing multiple cases across various contexts.

This panel is designed to present research projects that examine chemistry in 20th-century universities from new and interdisciplinary perspectives. The papers will present case studies from a range of European universities, offering comparative insights into overarching themes such as the interplay between science, universities, and politics in both democratic and authoritarian regimes; gender and class biases in student and faculty recruitment; the synergies and tensions between research and teaching laboratories; teaching practices, including the use of textbooks and other didactic resources; the material and visual culture of classrooms; the instrumental revolution in research and teaching laboratories; the connections between chemistry and other academic disciplines (e.g., medicine, mathematics, physics); and the relationship between academia and industry. Through discussion with the audience, the panel aims to develop comparative conclusions regarding the narratives, protagonists, and conceptual challenges that shape the history of chemistry in 20th-century universities.

P5-1. Writing the history of chemistry teaching and research at the Norwegian University of Science and Technology

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In 2010, the Norwegian University of Science and Technology (NTNU) celebrated its centenary. Book projects to celebrate research and teaching within different disciplines were initiated. The history of the chemistry departments was published in 2015 (co-authored by Annette Lykknes and Joakim Ziegler Gusland). In this paper, I will discuss how we – one historian of chemistry and one historian of technology – approached the task. Specifically, I will dwell with tensions between ideals of how a professional history of an institution should look like and wishes from the chemistry community who financed the book about the extent of the chemistry content of the book. As a professional historian of chemistry well anchored in chemistry, I wanted the book to reflect historical scholarship and at the same time shed light on concrete, tangible chemical practices.

One of the choices we made was to let artefacts in the historical collections at NTNU speak. The Faculty of Natural Sciences keeps instruments, glassware and chemicals stemming from the 1910s and even earlier. Another deliberate choice was to include actors in different roles at the departments. Women's history of chemistry at NTNU are thus represented both by students, secretaries, laboratory technicians, assistants and professors, and stories of male actors who were glass blowers, demonstration assistants, and entrepreneurs were told. Also, we tried to integrate history of chemical ideas into the main story line and discuss how new ideas in the discipline found their ways into teaching.

Keywords: University history, instrument collections, history from below, women in chemistry.

P5-2. Quantum chemistry in Valencia (1939-1978): making contact zones at the Faculties of Sciences during the Francoist dictatorship

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The Faculty of Sciences was established around 1895 in Valencia and initially developed primarily around the study of chemistry during the early 20th century. This paper focuses on the Francoist dictatorship period, which began with the severe repression of faculty members suspected of supporting democratic ideals. During the 1940s, new curricula were introduced alongside the construction of laboratories and classrooms. The paper presents the main features of an ongoing collaborative project examining the history of the Faculty of Sciences, addressing topics such as the interplay between science and politics in dictatorial regimes, autarky, scientific diplomacy and travels, laboratory spaces and new instruments, scientific authority, research schools, emerging disciplines, textbooks and pedagogical practices, as well as issues related to gender and class segregation, and the intersections between science, medicine, and industry. After outlining the broader scope of the project, I will examine a specific case study: the emergence of quantum chemistry in Valencia and the research school led by José Ignacio Fernández Alonso. He completed his Ph.D. at the University of Santiago under the supervision of a Francoist professor and became professor of chemistry at the University of Valencia in 1945. In the early 1950s, he conducted research abroad, collaborating with prominent figures such as Raymond Daudel in Paris, Charles Coulson in London, and Linus Pauling in Pasadena. He translated Pauling's textbooks into Spanish and worked with Rosario Domingo (one of the first female professors at the Faculty of Science) on quantum calculations of chemical bonding. He also encouraged the introduction of modern computing to the University of Valencia, and successfully linked his theoretical research in quantum chemistry to medicine and local industry. Using the idea of "contact zones", I will argue that Fernández Alonso's career is a good example for studying the emergence of "contact zones" among science, medicine and industry in the Faculties of Science during the Francoist dictatorship.

Keywords: University history, quantum chemistry, contact zones, teaching and research.

P5-3. The Faculty of Sciences of the University of Lisbon and the gender issue in the emergence of research and teaching spaces in chemistry (and physics)

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This talk has two parts. In the first, it is presented the context of emergence of the project of writing a history of the Faculty of Sciences of the University of Lisbon, from its creation until the onset of democracy. This will also be enriched with a discussion of sources selected, questions asked, themes tackled, and decisions on how to organize its outputs, scientific- and format-wise. In the second, a close-up into two inter-related specific themes is addressed. It deals with the onset of research at the Faculty of Sciences during the dictatorial regime and the internal and external obstacles to its implementation. The role of women-scientists, both chemists and physicists, in research groups associated with the laboratories of physics and chemistry created within the Faculty of Sciences will also be discussed, together with an assessment of the different reasons – scientific, political and social – behind the protagonism of women researchers.

Keywords: Faculty of Sciences of Lisbon, research, gender, politics.

P5-4. Clustering research at the Max Planck Society, Germany, 1948-2000

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The Max Planck Society, arguably Germany's foremost research organization, in public presentations features three selection criteria for its research fields: Scientific excellence of the leading personnel; subsidiarity to existing university-based topics; and infrastructural needs in national policy. In my talk, I will show that the actual decisions made partially undermined these public criteria. Research at Max Planck Institutes has been mainly driven by considerations based on social connection, epistemic complementarity, and political opportunity. As a result, we recognize clusters of research activities of Max Planck Institutes and Departments mirroring in particular ways general disciplinary and interdisciplinary trends. I will analyze the practices of clustering leading to recognizable structural patterns in their social and epistemological dimensions. Examples are from chemistry-related fields in the material, physical and life sciences during the second half of the twentieth century.

P5-5. Chemistry studies at the University of Belgrade during communist Yugoslavia

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The roots of tertiary-level chemistry education in Serbia date back to 1853. The period from 1872, when Sima Lozanić joined the Great School, until the end of the 19th century, was particularly fruitful. However, this was followed by a period of stagnation due to Lozanić's departure for political duties, and progress was further disrupted by World War I. The interwar period at the University of Belgrade was difficult, chemistry was taught by only one professor with two assistants. After World War II, the situation improved markedly. The authorities prioritized rapid industrialization, which required a larger pool of skilled personnel. Consequently, the first five-year plan for expanding expertise was adopted in 1947. This initiative led to increased student enrollment and significant funding for university education. By the 1950s, the Chemistry Department at the Faculty of Science and Mathematics had grown to include four professors and one assistant. The first post-war generation of chemistry students proved to be exceptional. By the 1960s, 15 doctoral dissertations in chemistry had been defended, and the department had appointed 20 assistants and eight associate professors. In 1961, a new building for the Chemistry Institute was constructed. This era saw the introduction of new research fields and chemistry courses, the publication of numerous textbooks, and the establishment of collaborations with prominent chemists. Following the end of the communist regime in the former Yugoslavia, the 1990s marked a challenging period for the development of chemistry teaching and research at the University of Belgrade.

Keywords: chemistry studies, second half of 20th century, communism.

Panel 6

Exchange zones: negotiating quality and safety among universities and industries (1930s-1970s)

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The session aims to approach the concept of "exchange zones" in defining the quality and safety of substances, and the historical study of interactions between the university, the industry, activists, and the general public. The main aim is to link the analysis of circulation of science with the study of power relations in science. This session is framed in two historiographical concepts: "contact zones", and "trading zones" These two concepts are articulated within the novel historiographical framework of "exchange zones" in order to include a wider array of actors, spaces and practices in the process of production and regulation of technoscience, and especially of food and drugs quality and safety. Through this theoretical framework we shall shed new light on an important bibliography on quality and safety in food (see for instance: Cohen, 2019; Rees 2021, Creager and Gaudillière, 2021) and drugs (see for instance: Gaudillière and Hess, 2013, Carpenter and Tobbell, 2011; Daemmrich, Greene and Elhauge, 2010, Cambrosio, Keating, Schlich and Weisz, 2009).

The session will include case studies from the 1930s to the 1970s in order to consider both democratic and totalitarian regimes in different countries. The main goal is to explore the role of diverse stakeholders and sites of exchange, usually marked by unequal power relationships of some sort (epistemic, economic and in terms of social prestige, etc.), and try to shed new light on the complex characterization of quality and safety while understanding better the nature of the interactions that made these characterizations possible.

P6-1. Chemical industrialization in Brazil during World War II: ORQUIMA and the production of caffeine from cocoa (1942-1945)

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Cocoa (*Theobroma cacao*) is a fruit originally from the Amazon region and has been known to Europeans since the colonization of the Americas. By the early 20th century, cocoa had become Brazil's third most significant export product, primarily cultivated on the coast of Bahia's state and exported to industries in Europe and the United States. In the 1940s, Brazilian President Getúlio Vargas launched an economic project focused on industrialization. This initiative was bolstered by the arrival of Jewish scientists and engineers from Europe, whose expertise played a crucial role in the establishment of new industries, such as ORQUIMA, a chemical company founded in 1942 by Brazilian entrepreneurs and Austrian-Jewish chemists who had fled to Brazil as refugees. In its initial years, ORQUIMA produced chemicals from cocoa — particularly caffeine —to meet the increasing demands of American industries during the war. However, this production ignited significant competition for this commodity, pitting cocoa producers against the chemical industry. This study examines the development of the cocoa derivatives chemical industry in Brazil during World War II, with a particular focus on the ORQUIMA case. Additionally, it explores how the conflict between ORQUIMA and cocoa producers symbolizes a broader struggle between two distinct economic sectors in Brazil during the 1940s.

Keywords: cocoa, chemical industry, World War II, caffeine.

P6-2. Defining new quality standards for rice. The entangled contribution of organic chemistry and engineering (València, 1950s-1970s)

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This paper will analyse the important research on rice quality that was carried out in Valencia in the central decades of the 20th century. We will focus our study on the contributions made by the organic chemists of the *Departamento de Química Vegetal* (DQV), linked to the Faculty of Sciences of the University of Valencia, from 1949 onwards. This DQV had focused its research mainly on citrus fruits and rice, and from the 1960s onwards, with the signing of an agreement with the United States Department of Agriculture, it generated important research that sought to establish new quality standards based on the approaches of organic chemistry, which had traditionally remained on the fringes of the debates on food quality regulation.

A few kilometres south of Valencia there was an important rice-growing area where the *Estación Arrocera de Sueca* (EAS) was established in 1913, which became the main rice research centre in Europe after the Italian *Stazione Sperimentale di Risicoltura de Vercelli*, with which it collaborated closely. This centre was run by engineers and had also addressed rice quality, but from a different disciplinary perspective.

In this study we aim to analyse how this research was developed to establish new quality standards and whether there were really exchange zones between organic chemists and engineers in the development of the research. Traditionally, there had been a strong competition between pharmacists, physicians and engineers to dominate the regulation of food quality. But the strategy of the DQV's chemists to emphasise the interdisciplinary character of their research could make an important difference. Based on the documentation preserved in the centres in which the DQV and the EAS were integrated, we will try to shed new light on these works on quality and contribute to the debate on the importance of exchange zones in the development of science.

Keywords: quality, exchange zones, organic chemistry, rice.

P6-3. Letters, analyses and favors: discussing quality between customs and universities in Spain (1940s-1960s)

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This paper explores the correspondence regarding chemical analyses exchanged by Francisco Bosch Ariño between the 1940s and 1960s. He was the Chair of Chemical Analysis at the University of Valencia and the Director of the Customs Laboratory in that city. He also held other prominent political and professional positions during that period, which enabled him to manage various matters from both scientific and administrative perspectives. In this paper, I will first examine the types of activities conducted at customs laboratories, such as the one in Valencia at that time. I will also analyze letters related to the testing of foodstuffs, including flour, oils, and other products. Many of these letters not only requested information about the chemical composition of samples but also sought advice on resolving bureaucratic issues, tips for improving commercial value, or assistance with legal cases. On some occasions, Bosch Ariño's university and political positions were leveraged to legitimize the results of analyses and to affirm the quality of the products he tested. Finally, I will consider how the concept of quality was shaped not only by chemical and scientific factors but also by the political authority and social prestige of the stakeholders involved in these discussions

P6-4. Chemistry, Commodification, and Governance: The Role of Scientific Institutionalization in the Legacy of the Laboratório Químico Municipal do Porto, 1884-1907

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The Laboratório Químico Municipal do Porto (LQMP, 1884-1907) played a crucial role in advancing scientific practices within Portugal's regulatory frameworks. It showed how chemistry shaped public urban health policy through food regulation by developing rigorous analytical practices. LQMP's legacy in safeguarding consumer health also bolstered Portuguese products' economic viability in international markets, underscoring the laboratory's influence on policy and public trust.

Recent research highlights that scientific institutionalization (SI) was essential to the LQMP's influence. Through SI, the LQMP acquired the necessary political capital to shape Portuguese food and toxicology policies, embedding scientific rigor into governance. These benchmarks resonated internationally, inspiring similar institutions across Europe. This insight was possible through the development of a theoretical SI model, that offered a structured framework to analyze historical chemical laboratories and reveal their unique role in the commodification of science. By uncovering how institutions transformed chemical knowledge into regulated products, this model highlights how chemistry practices became both commodities and governance tools.

In this communication, I present a model of SI based on an in-depth study of the LQMP, offering a framework for analyzing historical scientific institutions. This three-layered model reveals how institutions progress through key stages – establishing authority, legitimizing practices, and embedding governance standards – demonstrating how scientific laboratories influence regulatory frameworks. By capturing these interconnected processes, it is a valuable tool for studying the role of historical laboratories in shaping policy and advancing scientific practice.

Keywords: Scientific Institutionalization, F ood Regulation, Public Health, Analytical Chemistry.

P6-5. The Role of Toxicology Expertise in Addressing Occupational Hazards: Insights from the Ardystil Case

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The Ardystil case refers to an occupational poisoning incident that occurred in Alcoià and Comtat (Spain) in the early 1990s. Several small textile workshops in the area used paints produced by Bayer, which were mixed with solvents and sprayed onto textiles using airbrush guns. This technique was employed in precarious conditions, without proper safety measures, personal protection, or adequate ventilation. As a result, over seventy workers mainly women who exhibited alarming symptoms, and six died from pulmonary insufficiency.

An extensive public health study in Spain established a correlation between the chemical products and the poisoning, but the toxicity mechanism remained unclear. On one hand the Spanish research group that carried out the public health study contacted NIOSH(USA)to test the toxicity of the products, however this collaboration did not result in any conclusive outcomes. On the other hand, a group of experts from Katholieke Universiteit Leuven (Belgium) tested the toxicity of the paints independently from Spanish researchers. They carried out a series of experiments on animals that confirmed the elevated respiratory toxicity of the products used at textile factories. These results attracted the attention of experts from Bayer.

Different groups were involved in testing toxicity thus, it is of interest to analyse the controversy surrounding the toxicity of the products and the references to expert knowledge about the toxicity of the products in the public debate. The different interpretations that were given to the results of the experiments illustrate how scientific knowledge is manipulated when there is a legal dispute. Applying concepts such as “agnotology” and “merchants of doubt” I will analyse the role of toxicology experts in Ardystil case.

Panel 7

Between private or state ownership: examples of chemical enterprises in Central Europe between the 18th and 20th century

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This panel explores the history of chemical companies in Central Europe, starting in the eighteenth century with Dorothea J. Wallich's (1657–1725) efforts to finance alchemical ventures, marking early instances of capital raising. Even well-trained chemists like Ferdinand Friedlieb Runge (1794–1867), managing a chemical factory in Oranienburg, faced persistent financial challenges. State interest in chemical products often led to government support, a practice still observed today.

Efforts to exploit domestic raw materials also played a central role in the industry's development. As industrialization increased demand for oil, in South Germany shale oil production emerged, backed by state-funded enterprises originating from the University of Tübingen. However, cheap imports curtailed production, which resumed only during the Second World War, driven by wartime shortages and forced labor.

In the 19th century, numerous chemical companies emerged in Vienna and nearby regions, producing essential chemicals. Factors such as access to capital, transportation, raw materials, and advancing chemical knowledge shaped these enterprises' success. Notably, Carl Auer von Welsbach (1858–1929) leveraged a process for producing osmium wires to establish two factories.

In socialist countries, foreign currency shortages prompted further searches for domestic resources, though this often hampered productivity. Throughout, the chemical industry's trajectory in Central Europe reflects a continuous interplay of innovation, resource management, and state involvement.

P7-1. Factory for sulfuric acid and other chemical substances near and in Vienna

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The importance of factories for chemical products rose especially in the nineteenth century at the beginning of industrialization. Chemicals – like for example acids, but also different kinds of salts – were increasingly used to produce articles for the daily life. Also, transportation of raw materials and products rose as more and more railway lines were installed in addition to shipment and roads. Places near railways, roads or rivers big enough for materials transports were therefore especially preferred.

Such a place was used by a factory, starting its work in 1790 in "Heiligenstadt" – a place at the river Danube and at this time still outside the city of Vienna – with the production of sulfuric acid. 10 years later, situated only around 15 minutes away and also at the Danube, in Nußdorf another factory place was opened. Together with the sulfuric acid from the first location, sodium chloride from a saline and with collected urine, a variety of vitriols for colors, different acids, ammonia and other chemicals could be produced. The factory was one of the largest of its kind in the monarchy at this time. In 1840, though, the Nußdorf location was closed. At the other place the production continued until 1939. The buildings of the Heiligenstadt factory were totally removed in 1970 and were then replaced by municipal buildings.

The presentation will give a historic overview about this chemical factory and its importance for the living in this area.

Keywords: factory for chemicals, sulfuric acid, industrialization.

P7-2. Oil shale as an energy source in Württemberg and the role of the state in its utilisation

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From the middle of the 19th century, there was an increasing search for ways to meet the steadily growing demand for energy due to industrialisation. At various locations, attempts were made to produce petrochemical raw materials such as illuminating gas, petroleum, asphalt or petroleum jelly from local carbonaceous rocks. In the Kingdom of Württemberg in southern Germany, attention was drawn to flammable rock layers on the northern edge of the Swabian Jura as early as the beginning of the 17th century.

In 1853, Professors Friedrich August Quenstedt (1809–1889) and Julius Schloßberger (1819–1860) at the University of Tübingen analysed the material. In 1855, the '*Tübinger Gesellschaft für Schieferöl-Fabrikation*' was founded as a public limited company with state participation. Under the management of pharmacist Julius Hauff (1835–1899), production of lamp oil from local Lias shale began in Reutlingen-Ohmenhausen until the cheap import of crude oil from the US made production unprofitable.

In the 20th century, attempts to refine oil shale in the region experienced a renewed upswing after the outbreak of the First World War. When fuel supplies ran low at the end of the Second World War, the Nazi regime set up several concentration camps on the edge of the Swabian Alb in 1944 to extract mineral oil from oil shale. This endeavour claimed thousands of lives, but was unsuccessful.

Keywords: Württemberg, Oil shale, Startup, Nazi regime.

P7-3. The Beginnings of a Chemical Industry in Vienna-Liesing

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In this talk an overview of the development of the most important chemical factories in a southern suburb of Vienna will be given. Since centuries, the south-western outskirts of Vienna, which today belong to the city's 23rd district (Vienna-Liesing), have been mined for raw materials. In medieval times, grain was ground in numerous mills along a brook called Liesingbach.

In 1837, Gustave de Milly (1795–1879) from Paris established a candle factory ('*Milly-Kerzen-Fabrik*') in Vienna. Seventeen years later, the factory was moved to a location close to Liesing's railway station. In 1858, Friedrich Albert Sarg (1804–1876) acquired this production facility. Sarg's *Milly-Kerzen- Fabrik* was one of the first to industrially produce glycerine.

Not more than 400 meters from the Milly candle factory, the largest chemical plant within the borders of present-day Austria was located: the *'Fabrik chemischer Produkte Wagenmann' und Seybel*'. In the first years of its existence the company's production range was adapted to supply the Milly candle factory with basic chemicals. Following the Liesingbach further downstream, we arrive at the site of two factories that owe their foundation to the chemist Carl Auer von Welsbach (1858–1929). Since 1887, '*Auer's Incandescent-Lighting Company*' had purchased a factory for chemical products initially founded by Ignaz von Würth (1747–1834) in Vienna-Atzgersdorf and produced Auer's incandescent lamps. After the invention of the metal filament lamp in 1904, the *'Osmiumlicht-Unternehmung*' (later *Westinghouse* and finally *Osram*) produced osmium (later on tungsten) filament bulbs on the right bank of the Liesingbach.

Keywords: stearin candle factory, Auer's incandescent lamp, osmium filament bulb, tungsten filament bulb.

P7-4. Products Factory to the Publicly Owned Enterprise Chemical Plant Oranienburg

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Oranienburg, north of Berlin, is not well known as a centre of the chemical industry. In 1837, however, it was home to eight chemical companies, only a few of which survived the test of time. Today, Orafol Europe GmbH and the pharmaceutical company Takeda, which had predecessors in the area, are still there.

The private sulphuric acid factory, founded in 1814, became Dr. Hempel's chemical factory in 1817 and the Oranienburg Chemical Products Factory in 1832. It produced sulphuric acid, pharmaceutical products and textile auxiliaries. Today, the factory is mainly associated with the work of Friedlieb Ferdinand Runge (1794–1867), its technical director from 1832 to 1852, who, among other things, isolated aniline from tar in Oranienburg. The fact that the factory was extremely harmful to the environment was reported by the writer Theodor Fontane (1819–1898).

The development of this factory is a good example of how ownership changed hands several times, depending on the success of the business and the political situation. It started out as a private company, but when it ran into financial difficulties it was taken over by the state Prussian Maritime Agency - first as a financier, then as an owner - and then sold again. The company went through the mergers and splits typical of capitalism until, after 1945, the sulphuric acid factory, which was very important for the economy, was nationalised but very soon incorporated into another company in the form of a combine to enable more efficient production.

Keywords: production of sulphuric acid, Friedlieb Ferdinand Runge, financing issues, environmental pollution.

Panel 8

Chemists as activists: from Linus Pauling to Green Chemistry

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The session aims to approach *activist-chemists* as epistemologically active actors and their role in the co-production of chemical knowledge. From the Cold War to the present, we want to explore exchange zones and public spheres in which chemists struggled for public recognition and scientific authority and opposed hegemonic chemical projects and practices of their time.

Instead of assuming that resistance contributes to the failure of a chemical project, it may become a constructive force in technological development (Bauer, 1995). In the framework of the new participatory turn, activists' protests outside a research institute, the citizens' vote on a waste disposal facility, or a public debate to submit results to policy makers, all express: "a profound change in the terms and conditions under which scientific knowledge is produced, discussed and legitimated" (Bucchi, Neressini, 2007, p. 449). Civic, citizen, democratic, green chemistry could be therefore related to alternative pathways of doing science that deserve further historical investigation (Hess, 2007). The session addresses some of the following questions:

What was the civic role of chemists as intellectuals in the Cold War? Can Linus Pauling's case be a general pattern or perhaps just an exception when compared, for example, with Adolf Butenandt's?

What was the role of activism in the emergence and institutionalization of green chemistry as an academic discipline?

How activists with chemical degrees have shaped the identity and strategies of environmental organizations such as Greenpeace, Friends of the Earth, and others.

What was the role of activist-chemists in the international arena, especially after the impact of the UN Stockholm Conference in 1972?

In our historical narratives, where is the place for radical, alternative, green, or Communist chemists?

Where are the *women-activist chemists*? Can Rachel Carson's case (1962) – a biologist- be a general pattern to follow, or perhaps Carolyn Merchant's *Death of Nature* (1980) provides better food for thought for a gendered approach?

P8-1. Revolutionizing the chemical industry for the post-growth society: Architects of Sanfte Chemie

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Sanfte Chemie (or gentle/soft chemistry) emerged in the late 1980s and early 1990s, developed under the auspices of Germany's Green Party. Its proponents aimed to transform human interaction with the natural world, envisioning a chemistry that was not simply environmentally friendly but outright antithetical to the foundations of the post-war industrial and consumption-driven economic system in the Western World. Although it has since been overshadowed by the more widely recognized American green chemistry, S*anfte Chemie* was a distinctive project rooted in the European environmental movement, neo-Marxist conceptual frameworks, and the dynamic landscape of German countercultural activism.

By the middle of the 1990s, *Sanfte Chemie* itself had fallen off the Green Party's agenda. Yet, despite its status as a seemingly minor episode in the broader history of sustainability in chemistry, *sanfte Chemie* anticipated many later developments. As a kind of green chemistry *avant la lettre*, it offered an alternative vision to the corporate sustainability narratives, later incorporated by green chemistry itself, as it imagined a chemical industry aligned with post-growth societal ideals.

The architects of this project, especially Hermann Fischer and Arnim von Gleich, gradually shifted from advocating for a radical overhaul of chemistry to pursuing more reformist goals, but they remained involved in the broader environmentalist community, turning from activists to respected businessmen and academics. Their history highlights the difficulties faced by scientists trying to influence the world within the pre-established insitutional frameworks without compromising the zealous beliefs from their youth.

Keywords: Green Chemistry, Sustainability, Political Ecology, Environmental Transition.

P8-2. Laboratory Luddism: Activist Science and the British Society for the Social Responsibility of Science

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This paper explores resistance as a constructive force in the history of science and technology, with a particular focus on the British Society for Social Responsibility in Science (1970s – 1990s). While the BSSRS can be situated within broader movements in nuclear disarmament, environmentalism, and New Left politics, I examine whether the BSSRS can also be understood through the social and conceptual history of Luddism. Numerous distinguished scientists, chemists, and x-ray crystallographers, such as Maurice Wilkins, J.D. Bernal, and Dorothy Crowfoot Hodgkin, counted among its leaders and participants. As the BSSRS evolved, internal factions emerged, with some members seen as too radical and others overly conservative. They addressed a diverse array of topics, including hazards in the workplace, the democratization of science, and the relationship between science, capitalism, and labor.

Scholarship has explored the roots of the radical science movement in the ideologies of British scientists in the 1930s. Recent work has also delved into the 1970s, exploring radical science groups in Italy and the U.S. However, limited attention has been given to the BSSRS itself, and its broader relationship to technoscientific critique, including Luddism. While scholars continue to revisit the original Luddites (1810s) and their relationship to technology and labor movements, few have endeavored to consider Luddism *after* the Luddites, despite its persistence as a cultural catch-all. I aim to contribute to burgeoning scholarship which argues that 20th century Luddism moves far beyond opposing technological developments on the factory floor, and emerges as a "collective pseudonym" for technoscientific discomfort and critique. Thus, I argue that the BSSRS can help to construct a more comprehensive history of Luddism and the "activist-scientist," allowing us to better understand the radical critique of science and capital, the articulation of anxiety in the midst of rapid technoscientific change, and imagined alternatives.

Keywords: British Society for Social Responsibility in Science, Luddism, J.D. Bernal, Dorothy Crowfoot Hodgkin.

P8-3. Giorgio Nebbia and the Debate on Solar Energy in post-war Italy

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This contribution examines the pivotal role played by Giorgio Nebbia (1926–2019) in the discourse on solar energy in post-war Italy, particularly from the 1960s to the 1980s. Trained as an engineer and chemist, Nebbia later became a professor of *Merceologia*—the study of commodities—a discipline historically taught by chemists within economics faculties. In Nebbia's perspective, *Merceologia* encompassed the analysis of production cycles: the transformation of raw materials into commodities and their subsequent development into finished products. This focus on material transformations sparked his interest in the water cycle, which in turn led him to focus on solar energy.

In 1953, Nebbia's fascination with solar energy was ignited when he read a paper by Maria Telkes on a military portable distiller. Inspired, he built a similar device himself, reached out to Telkes, and became actively involved with the Association for Applied Solar Energy (AFASE), which later evolved into the International Solar Energy Society. Through this engagement, Nebbia emerged as one of Italy's leading experts on solar energy. In 1971, he was invited to assist the Vatican in preparing for the United Nations Stockholm Conference, where he participated as a delegate representing the Vatican.

Nebbia's commitment to solar energy was deeply intertwined with his political activism as a communist militant. During the 1950s and 1960s, interest in solar energy in Italy was minimal. However, the 1973 oil crisis significantly altered this landscape. In 1975, the Italian government proposed a plan to construct new nuclear power plants, sparking a fierce debate within the Italian Communist Party (PCI). The party became divided between proponents of nuclear power and advocates for alternative energy sources. Nebbia emerged as a key figure among the PCI's environmentalists, advocating for renewable energy and sustainability.

This contribution highlights how Nebbia's ideas influenced Enrico Berlinguer's vision of austerity in 1977. In 1983, Nebbia was elected as an independent candidate on the PCI list and continued his advocacy against nuclear energy and for environmental protection, leaving a lasting impact on Italian society and environmental policy.

Keywords: Giorgio Nebbia, Solar Energy, Italy, Merceologia.

P8-4. Activist-chemists along the River. The story of the Cuenca Matanza-Riachuelo (1990s-today) in Buenos Aires and its significance for radical expertise

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Flowing through Villa Inflamable, an informal neighbourhood in Buenos Aires named for its proximity to Argentina's major chemical hub, Polo Petroquímico Dock Sud, the Matanza-Riachuelo River embodies the entangled stories of human and more-than-human ecologies within a contaminated landscape. Stretching 64 km across a highly urbanized watershed (Zuleta et al., 2012), the river impacts the lives of over 5 million people. Its legacy has been shaped by decades of environmental activism, where grassroots movements, civil society organizations, experts, and the judiciary led to significant outcomes, ultimately influencing public policy and territorial governance through the creation of a basin authority (ACUMAR) and its mixed-monitoring system (Frydman, 2022).

This contribution examines the Matanza-Riachuelo River's journey to highlight two key themes. First, it reconstructs the pivotal epistemological role played by activist-chemists and allied advocates in transforming the river into a case of environmental justice. Second, it frames the river's legacy as an example of *living heritage*: a dynamic inheritance from the past that holds transformative potential to challenge present-day socio-ecological injustices.

We argue that this case is significant within broader debates on epistemic activism, underscoring the importance of radical experts in constructing what Armiero et al. (2019) frame as *guerrilla narratives:* counter-stories that resist and expose environmental and climate injustices through the voices of marginalized communities across intersections of class, gender, ethnicity, migration, etc.

This contribution is proposed as part of the process of creating a transnational network of scholars, experts and activists within the WRENCH (Whispers of Times. Heritage as Narratives of Climate Change) project, supported by the Belmont Forum.

Keywords: Contaminated Landscapes, Buenos Aires, Environmental Activism, Guerrilla Narratives.

P8-5. From Cell Chemistry to Activism: Louis Rapkine's Refugee Scholars in the Second World War

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This paper aims to shed new light on the role of the French-naturalized enzymologist Louis Rapkine (1904-1948) as an activist during the Second World War. In the 1930s, once settled in Paris, and after a prominent transnational training on metabolism and cell chemistry, Rapkine left aside a brilliant, promising scientific career to get deeply involved in the *Comité d'Accueil et d'Organisation du Travail des Savants Étrangers*, an organization devoted to help foreign scholars escaping from dictatorships. In 1940, sent by the French Government to London on a military mission, Rapkine built a strong collaboration with British academics and intellectuals to strengthen the scientific cooperation among both countries, in a time of extreme emergency.

The paper will particularly focus on Rapkine's collaboration with the "Society for the Protection of Science and Learning" (SPSL), an organization founded in Britain in 1933 as a reaction against the dismissal of thousands of scholars because of their religion, political opinion, or race in the growing hostile context of Nazi Germany, which was later extended to other dictatorships. After a short stay in the UK, Rapkine emigrated to the US where he organized the main programmes of support to French scientists during the War and the later restoration of French science in the early postwar years (Zallen, 1991; Dosso, 1998). Nevertheless, details of his collaboration with the SPSL while in England and from abroad are still unknown. His correspondence with the SPSL, which lasted until his premature death in 1948, will enrich our current historiography on Rapkine, and shall help us, I hope, to better sketch his profile as an activist-scientist (chemist) in that context.

Doris T. Zallen, "Louis Rapkine and the Restoration of French Science after the Second World War", French Historical Studies, 17(1), 1991, 6-37.

Diane Dosso, *Louis Rapkine (1904-1948) et la mobilisation scientifique de la France libre*. PhD Thesis. Université Paris-Diderot. Paris 1998.

Keywords: Activism, Refugees, Cell Chemistry, Louis Rapkine.

Panel 9

The Wonders of Colour: Kernels of Chemical Knowledge Behind Premodern Craftsmanship

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Many forms of premodern craftsmanship were based on chemical notions and artifacts' colour and brilliance were crucial elements in this discourse, even when the theory behind the practice has not voice in the written sources. Though elusive in any language and deeply idiomatic to each cultural tradition, colours were perceived as powerful indicators of natural properties and material transformations. Colours, thus, became essential in the characterization and classification of substances: the same name was often used to label substances with marked chemical differences, which were then differentiated and determined on the basis of their colour (e.g., vitriols and mineral oils). The artificial imitation of natural substances was a coveted goal for craftsmen (e.g., dyed metals and artificial precious stones), and pigments represent a privileged field to investigate art's technical quest in the attempt to imitate nature. Colour also was a way to assess the quality of substances, testing their genuineness with the flame or other kinds of tests. Though there are a number of cases related to different periods and traditions, the enquiry into the premodern history of chemistry also becomes a way to write a material and social history of chemistry.

P9-1. *Bluer than velvet*: The pre-modern production of lapis lazuli pigment and the transmission of the *per pastillum* technique

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This paper examines the pre-modern production of the pigment derived from the semi-precious stone lapis lazuli within a historical and philological context. Lapis lazuli stones, mined in the Badakhshan region, began to be traded to Mesopotamia and Egypt as early as the 4th millennium BCE. The earliest known uses of the precious blue pigment, found in wall paintings and manuscript illuminations, date from the 4th century CE and are associated with the spread of Buddhism along the Silk Road. The relatively complex technique for extracting pigment from the stone was transmitted to the Arabo-Islamic world in the 7th century, and later to the Latin West in the 8th century, where it became known as per pastillum. Through an analysis of relevant archaeological and textual evidence in Arabic, Judaeo-Arabic and Latin, this paper will explore the relationship between tacit artisanal knowledge and its written documentation, offering insights into the cultural and social history of one of the most prized pigments in the pre-modern world.

Keywords: history of colours; artisanal knowledge; pre-modern trade; medieval science.

P9-2. The Colour of the Sky: Technical and Artisanal Knowledge of Lapis Lazuli in Mediaeval Arabic Sources

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In Lapidaries – the literary and technical compilations devoted to the description of minerals and stones – colours did not merely serve as criteria of classification, but as key indicators of stones' virtues and occult properties. This perspective is evident in Arabic Mediaeval technical literature, where the chromatic features provide meaningful insights into the material and scientific aspects, as well as into the aesthetical and social dimensions. Sources such as Baylak al-Ǫibgāqī's *Treasure of the Merchants about the Knowledge of Stones* and al-awbarī's *Book of Charlatans* (13th cent.) document advanced techniques for producing artificial lapis lazuli – both in the form of stone and pigment – underpinning a sharp understanding of material properties, with an emphasis on the chromatic component. Practical tests to assess authenticity were relevant in this literature – as economic interests were involved – and colour played an important role in this. Moreover, this mineralogical tradition describes treatment and procedures associated with different crafts, which reveals technical variants behind the textual ones, and illustrates the exchanges and adaptations this knowledge has undergone in the course of transmission.

Within this framework, lapis lazuli (*lāzuward*) are a meaningful case study for examining the intersection between technical knowledge and artisanal expertise, before the rise of physico-chemical and crystallographic approaches.

Keywords: Lapis lazuli; Artisanal knowledge; Colour; Arabic technical literature.

P9-3. Colour Coding: The Spectrum of Natural and Artificial Vitriols

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From medicine to ink making, vitriols are ubiquitous ingredients mentioned in technical literature since Antiquity. The word itself appears in Medieval Latin, to be used alongside (and later instead of) classical Greek or Latin terms. Thus, "vitriol" became an hyperonym both for different mineral ores and many substances derived from their manipulation, often with colour as the only descriptor to differentiate them. Blue, green, yellow, red, but also black and white are all colours associated with vitriols, to some extent, creating a colourful maze of terminology that it rather easy to get lost into. Many, especially natural, vitriols have been historically associated with well-known minerals, such as melanterite and chalcanthite, while experimental replications and solid-state characterization proved to be useful tools to investigate the more obscure ones, allowing us a better understanding of the practices in which they are involved.

Keywords: vitriols, colours, replication, characterization.

P9-4. Fireworks and Wildfire: Mamluk Technical Knowledge between Warfare and Entertainment

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Fire has played a role in staged prodigies and warfare since antiquity, with particular fiery weapons achieving fame throughout history, such as the Byzantine Greek fire. Less well known, however, is the technical expertise developed during the Mamluk Sultanate (mid-13th to early 16th cent.) and recorded in the handbooks on '*The stratagems of war*', attributed to Alexander the Great. The use of inflammable substances – prepared with a variety of oils and minerals, tars and waxes – was tailored to the needs and tastes of a military élite inspired by 'chivalry and gangsterism', where the art of war intersected with parades and public displays. Special concoctions created coloured flames, adding a spectacular element to weapons and lights. Entertainers and street performers shared the same technical knowledge as the military élite, though their expertise was showcased in different social contexts and recorded in separate handbooks. Al-Zarkhūrī (15th cent.), for example, included in his work a section on coloured oils for party lamps, alongside a more secretive section on fireworks. While colours remained a primary feature in the composition and quality of these substances, the presence of colour in the different ways of 'playing with fire', reveals a sophisticated understanding of the interaction between natural substances and fire.

Keywords: Arabo-Islamic science; Mamluks; Inflammable substances; Pyrotechnics.

P9-5. The Alchemy of Lac: from Indian Insects to Byzantine Markets

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In the writings of an important Byzantine alchemist, the so-called Philosopher Christianos, we find mentioned lac, probably referring to both lac dye and shellac. These products, derived from the secretions of the insect *Kerria Lacca*, have a long but not well-known history in the Mediterranean world. Archaeological finds attest the presence of lac dye at least since the Hellenistic era, while the Indo-Roman trade first and the Byzantine markets later dealt with lac as a commercial good. Collecting the few existing ancient sources on lac, we can trace a preliminary history of its diffusion in the Mediterranean markets. The traditional technical process developed to obtain both lac dye and shellac will be shown, alongside with the shifting evolution of the Greek word for these substances.

Keywords: Byzantine alchemy, shellac, lac dye, Indo-Mediterranean trade.

P9-6. Somewhere Over the Rainbow: The Chemistry of Fabric Dyeing in Medieval Islamic Sources

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In the premodern Arabo-Islamic world, textile arts were highly regarded, often referred to as the "mothers of crafts" (*ummahāt al-sanāʿī*, Ibn Haldūn, 8th/14th c.), and were seen as symbols of civilization and prosperity. These arts demanded a high degree of labor specialization, and a complex vocabulary related to materials and processes. They are extensively detailed in early technical treatises on various crafts, which include sections devoted to dyeing techniques and organized by colour. This paper will focus on the replication of recipes from selected sources spanning from Yemen to al-Andalus, compiled by authors with diverse backgrounds and expertise, such as the Rasulid sultan al-Muzaffar Yūsuf al-Gassānī (7th/13th c.) and the erudite scribe and poet Muhammad al-Qalalūsī (7th/13th c.). This approach will provide insights into the practical knowledge of the time, highlighting the use of specific ingredients and regional terminologies. Moreover, it will allow us to identify the kernels of chemical knowledge underlying the interactions between dyeing substances (vegetal, mineral, and animal-derived substances) and fabrics. The replications, inspired by the textual analysis of the sources, will also offer an opportunity to explore the motivations behind the compilation of these technical texts, as well as their intended audience and circulation.

Keywords: Arabic Premodern Technical Literature; Fabric Dying; Colours; Replication.

Sessions

S1-1. J. G. Gahn, in the Words of Others

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Johan Gottlieb Gahn (1745-1818) has occupied a place of honor in the history of chemistry across the two centuries since his death, not least as the oft-credited discoverer of the element manganese in 1774, but he only began publishing research after 1800, well after most of his best-known projects had been otherwise publicized. By then, members of the chemical community in Sweden and abroad had long recognized his technical and theoretical expertise; many sought his assistance with tricky experiments, which he eagerly provided, and his peers elected him to the Royal Swedish Academy of Sciences in 1784. Rather than seeking scientific notoriety, however, he dedicated his professional efforts to mining management and chemical entrepreneurship.

That he achieved fame within Swedish and European chemistry in his own time was not by his own initiative – he was well known to refuse to claim credit for his findings – but through the promotion and publication of his contributions to research published by his collaborators and friends, including Torbern Bergman and J. J. Berzelius. Drawing on Gahn's extensive correspondence as well as the writing of others on which his fame was built, and in conversation with recent works of scientific biography and its analysis examining the fashioning of the scientific self, this paper examines the generation of a prominent scientific profile in the late eighteenth century not by the researcher in question, but by colleagues, rarely assisted by their subject and at times stymied by his active disinterest in public acknowledgment.

Keywords: mineralogy, Sweden, discovery, biography.

S1-2. Political Economy, Chemistry, and Territory - Dialogues of J. H. de Magellan with the Duke of Arenberg

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The emergence of political economy in the 18th century was closely linked to the advances in chemical science, particularly in the study of gases, largely pioneered by Joseph Priestley. Developments in eudiometry, among other topics, involved various participants, including J. H. de Magellan, who closely followed several of Priestley's experimental studies and, at his request, contributed to their dissemination through his extensive network of correspondents and continental friends. Studies on soil quality and productivity had key figures such as John Arbuthnot and, in particular, Arthur Young, as well as considerations of the potential of grand farms over smaller properties. In this context, we will refer to the dialogues established between J. H. de Magellan and the Duke of Arenberg, the powerful governor of Austrian Flanders and his patron, as understood by J. H. de Magellan, as well as the ensuing controversies.

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Keywords: Political economy and chemistry, grand farms, J.H.de Magellan, Duke of Arenberg.

S1-3. Solving a long-standing mystery: Who is depicted in James Gillray's cartoon of the early Royal Institution?

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A long-standing mystery in the history of chemical iconography is who did James Gillray portray as lecturing in his famous cartoon published in 1802 depicting a lecture in the Royal Institution's new large theatre? It shows the lecturer administering nitrous oxide (laughing gas) to the Treasurer of the Royal Institution, Sir John Hippisley, with rather unfortunate consequences. Standing behind the lecturer is Humphry Davy who had recently joined the Royal Institution, and had discovered the extraordinary physiological properties of nitrous oxide while working in Bristol at the Medical Pneumatic Institution. Looking on from the side is Benjamin Thompson, Reichsgraf von Rumford, who had played a significant, if controversial, role in the Royal Institution since its founding in 1799. But about the identity of the lecturer himself there is no consenus. It is either the first or second professor at the Royal Institution, Thomas Garnett or Thomas Young – the literature divides roughly equally between the two. Using previously overlooked archival material this talk will identify the lecturer and will consider, within the context of the print trade in early nineteenth-century London, how this mystery arose.

Keywords: Thomas Garnett, Thomas Young, Humphry Davy, James Gillray.

S1-4. The Art of Apothecaries, Alchemy, and Painting in Medieval Valencia: The Case of Guillem Ferrer (†1435)

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In the early decades of the 15th century, the number and significance of apothecaries Valencia increased notably, to the point where they established a college in 1441. A distinctive feature of a segment of this group, particularly the most elite, was the practice of alchemy. The diverse uses of alchemy are well known, ranging from the preparation of medicines to the production of pigments, among other applications. A strong connection, both professional and intellectual, between apothecaries, Gothic painters, intermediaries, and art patrons has been identified in Valencia. This network of individuals shared various interests, which resulted in circles of friendship and familiarity.In this presentation, we aim to showcase one of the clearest examples of the apothecary-alchemist figure, deeply embedded in this world of artisans, artists, clergy, and members of Valencia's bourgeoisie: Guillem Ferrer. Documents such as his will, inventory, and the public auction of his belongings allow us to study in great detail his instruments, library, and the products he crafted as an apothecary with extensive knowledge and practice of alchemical techniques. We can also trace the mechanisms of knowledge transmission within and beyond his workshop. Ultimately, we contribute to a portrait of the role of alchemy in a Mediterranean port city that, by the 15th century, had become the most important in the Crown of Aragon.

Keywords: apothecaris, painting, alchemy, Kingdom of Valencia.

S2-1. The Unruly Drop: Non-Standard Measurement Units in French Chemistry and Medicine

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With the slow establishment of the metric system came a large-scale discussion on the merits of various units, among which was the drop. Partisans of the metric system argued that this non-standard unit should be abandoned in favour of the more reliable decimal weight system. How come, therefore, that the drop is still widely used today, in both lay and scientific contexts? In studying the chemical and medical uses of the drop in late-eighteenth and early nineteenth-century France, this talk provides an explanation of why non-standard measuring units survive.

Both chemical and medical practitioners of the early nineteenth century argued that the most accurate units by which to measure fluids were the newly introduced grammes. However, the drop was not simply a measuring unit, but a more complicated tool used by chemical and medical practitioners in a variety of different ways, not all of which could easily be replaced by the scales. Its familiar and flexible nature made it useful not just in prescriptions or instructions to be carried out by lay people and factory workers, but also in experimental procedures that required for the practitioner's attention to be directed at sensory clues rather than at complex measurement operations. Especially in these fields that overlapped with commerce and the arts, we argue that the drop found its use every time a quantity of fluid needed to be very small, but more precision was superfluous, impractical or even damaging for the task at hand.

Keywords: measurement; quantitative chemical analysis; eighteenth- and nineteenth century; medicine

S2-2. α-pinene: An autarkic proposal for the synthesis of polymers in Spain

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In the field of the fascist science, this research is part of the Autarchy/Autarky historiographic debate. It studies the case of the molecule α-pinene chosen as the central axis on which to build a national polymer synthesis industry in Spain. The α-pinene is a molecule of the terpen family identified during the first quarter of the 20th century as the main component of the liquid fraction of pine resin, very abundant and marketed under the name of turpentine. In Spain, the resin exploitation was located in the highlands of Castilla la Vieja by the company La Unión Resinera Española (LURE), under a monopoly regime. Since 1947, but especially in the 1950s, in Spain there has been a proliferation of studies on the reactivity of this molecule based on the structural similarity between one of its derivatives, p-cymene and styrene, to propose a set of synthetic routes with a similar spirit to those of the German autarkic carbochemistry of the 1920s (Reppe Chemie).

The study focuses on this period, in which the α-pinene became an autarkic molecule on which a challenge of technological modernity of the Franco regime was developed. The still tentative conclusions are that the modernity of plastics was used during the 1950s to elaborate a formulation of autarchic synthesis of polymers on the margin of petroleum, the evolution of which went parallel to the dynamics of the introduction of petrochemicals as an indicator of the political, economic and technological hegemony of the USA.

Keywords: plastics, polymers, fascist science, Autarchy/Autarky.

S2-3. Mass Spectrometry in Austria during Austrofascism and National Socialism on the Example of Hugo Bondy (1900-1985) and Richard Herzog (1911-1999)

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A group of Austrian scientists contributed significantly to the development of mass spectrometry in the interwar period. However, its members were affected by the dictatorships of Austrofascism (1933-1938) and National Socialism (1938-1945). The influence of these political circumstances on the scientific careers of researchers in this community is best demonstrated by the biographies of two leading figures in this group: Hugo Bondy (1900-1985) and Richard Herzog (1911-1999).

Hugo Bondy was of Jewish descent but Roman Catholic in his faith. He worked throughout the Austrofascism period at the University of Vienna and constructed the first double-focusing mass spectrometer. Due to the National Socialist takeover of Austria and the establishment of racial and anti-Semitic laws, Bondy was expelled from the university. Nevertheless, he worked as a teacher and caregiver for persecuted children with Jewish heritage during World War II.

Richard Herzog was of Protestant faith and considered by the National Socialist authorities as an "Aryan". He started to work at the University of Vienna in the Austrofascism era. Although Herzog was a member of the ruling party of the regime (*Vaterländische Front*), his career did not advance at the time, despite his very important research in mass spectrometry on geometries and ion and electron optics. Nonetheless, after the expulsion of Jewish colleagues and joining the National Socialist Party, his academic career prospered up to 1945.

These two biographies are taken as examples for a comparison to illustrate the different impacts of the two dictatorships on the process of scientific career development.

Keywords: Mass Spectrometry, Austrofascism, National Socialism, Austrian History.

S2-4. Invisible Labour in the Chemistry Lab: The Materiality of Practice among Makers and Users

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As academics at University of Glasgow, we are aware of the success stories of our historical antecedents: e.g. Soddy, Cullen, and Black. We have become increasingly aware of the invisible labour of the individuals who supported past research through the daily running of the labs. It is the figurehead who is immortalized and credited whereas the complex network of support is often forgotten. Who supported the practical running and research within University of Glasgow chemistry labs? Technicians, glassmakers, cleaners, caterers, wives? Are there gender/race/class issues to challenge? Can we find traces of these individuals in the records?

One of the critical approaches we intend to take in analysing this problem is through the materiality of Chemistry. Our attention is drawn to the craftspeople and technicians of the chemistry labs and the legacy of chemistry glassware and pottery that may still be present in the historical record including images, letters, and artefacts. By investigating what we can "see" and building a picture of the negative spaces of what is missing, we can imaginatively but plausibly reconstruct the experiences of those who laboured to support the acclaimed outputs of the University. We are keen to link the current practice of doing chemistry with its historical antecedents of processes, power, and control.

As newcomers to the history of science, we would welcome your insights on how to creatively engage with the invisible labourers of the past and link their legacies to the decolonization of current chemistry lab culture.

Keywords: Invisible Labour, Materiality, Chemistry Laboratories, Power and Control.

S3-1. The glass industry at colonial Jamestown (Virginia): a capitalistic dream that never came true

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When Jamestown was founded in 1607 it became the first permanent British colony in north America. Virginia was seen as a land of unprecedented opportunity, and among the settlers were chymists and artisans whose duty was to test its natural resources. But while we tend to associate early colonial sites with the quest for noble metals, historical documents indicate that British entrepreneurs hoped to establish a glass making industry too.

By the early 17th century glass had become a most profitable economic commodity. While capitalistic-like production went on in Venice and central Europe, English industry lagged behind and glass had to be imported in large volumes and at a very high expense. Virginia had plentiful resources, including vast pristine forests not subjected to the increasingly restrictive laws regulating the exploitation of woodland in England. We know that a 'trial of glass' was first conducted in Jamestown in 1608, but operations soon ceased as the colony's life grew more turbulent, resulting in the whole enterprise eventually becoming known as a failure.

Excavations at Jamestown have brought to light numerous glass-related remains such as crucibles, waste material and scores of glass fragments, often used as scrap. Through their scientific analysis, this paper places material culture centre-stage, showing that far from being lazy or incompetent, as often assumed, the settlers had come well-equipped with both the tools and the knowledge to produce glass. While never coming true, Jamestown early capitalistic dream represents nonetheless a fascinating story of chymical ingenuity.

Keywords: glass industry; material culture; archaeology of chemistry; heritage science

S3-2. A Comparative Case Study of the Global Transfer of Chemical Technology: The Development of the Nitrogen Industry in Italy and Japan Before and After the First World War

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The history of Italian contributions to the modern chemical industry has received scant attention. This is particularly the case for nitrogen fixation, namely the development of the calcium cyanamide industry and synthetic ammonia processes, both of which had contributed to the widespread production of fertilizers. Italian patent licenses for working the Franck-Caro cyanamide process, made available by the Società Generale per la Calciocianamide of Rome, and the process for synthetic ammonia synthesis, as developed by Luigi Casale, played pivotal roles in shaping the global nitrogen industry during the first three decades of the twentieth century. Despite Italy's historical challenges, including raw material shortages (notably lack of coal), limited capital, and the lack of trained technical managers, these innovations exerted a significant impact.

This study investigates the technical, industrial, and global implications of these patents, and technology transfer, with a focus on their adoption in Japan, where engineer Shitagau Noguchi utilized them to establish the Japanese nitrogen industry through his company, Nippon Chisso Hiryō Kabushiki Kaisha. By combining archival research in Italy, Switzerland, and the United States, the study draws upon unpublished documents, board meeting minutes, and specialized literature to provide a comprehensive analysis of the technological and entrepreneurial dynamics underpinning this development.

Through this approach, the research aims to illuminate the greatly underappreciated role of Italian chemistry in the global chemical industry and contribute to a more nuanced understanding of the transnational flow of technological innovation in the early twentieth century.

Keywords: Italian Nitrogen Industry; Japanese Nitrogen Industry; Calcium Cyanamide; Synthetic Ammonia.

S3-3. Danish production of sulfuric acid: From monopoly to chaos and back to monopoly

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Industrial production of sulfuric acid began in Denmark 1834. Before then a very small production were done by chemists and pharmacists. Outside Denmark production was going up since the 1750s driven by demand from the textile industry. That was not the case in Denmark.

In Copenhagen the Englishman Joseph Owen began 1821 production of bone char for the sugar industry and saw a possibility to use the by product. For this he needed sulfuric acid. 1832 he got the permission to start production in Copenhagen and he even got the privilege to be the sole Danish producer. Not being a chemist Owen brought a French specialist to Denmark and 1834 the production was running. In a few years several other products based on the supply of sulfuric acid was also produced.

1870 Owens company had five sulfuric acid production facilities in Denmark but no longer a monopoly. At that time the importance of sulfuric acid was obvious also in Denmark. In the next six years six other independent sulfuric acid producers emerged. Most of them lived only few years. The primary use of sulfuric acid was now production of fertilizers. Only two fertilizer companies with production in Denmark still existed 1897. Together with a fertilizer trading company they fused into one company that was to have almost a de-facto monopoly all 20th century. Unlucky technical and financial dispositions made the company sell the production facilities to the Finnish company Kemira 1988. For economic reasons Kemira closed the production 2004.

Keywords: Sulfuric acid, monopoly, market forces.

S3-4. The Capitalist Enticement that is Agriculture for Bayer AG

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In keeping with the conference theme, Chemistry & Capitalism, this proposed paper aims to foster debate about the relationship between a giant in the world of chemical products, originally founded in 1863 as the dyestuffs company, Friedr. Bayer et comp., and the capitalist incentives which brought it into the realm of agriculture. Under examination is how the company has, fully within the spirit of capitalism, sought most recently to transform its image from providing exclusively chemical solutions to medical and agro-industrial problems, to offering a partnership between biological and chemical solutions: "paving the way for a more regenerative agricultural landscape" (Ralf Glaubitz, Bayer AG Head of CP Portfolio Management Fungicides, Biologics and Fruits and Vegetables). There has never really been a 'before capitalism' experience for the Bayer company, and while Bayer's undeniable expertise and innovation in the field of chemistry has never been in question, the role that some of its products have played in the destruction of essential parts of the ecosystem has recently tarnished its reputation as industry's antidote to all the challenges of farming. Chemical toxicity within food-production practices and the destruction of pollinators and birds have brought to the fore needed regulation of Bayer's profit-driven activities. Of specific interest here is therefore to trace the profile of the Bayer AG from its discovery of agriculture as an enticing sphere for capitalist expansion right up to its present presentation of itself as THE company at the vanguard of respect for nature and preservation of its biological components.

Keywords (4): Chemistry, Agriculture, Bayer AG, Capitalism

S3-5. Fighting for development: the Spanish chemical industry and the Rif War (1921-1927) in Morocco

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Studies on the influence of armed conflicts in the development of the early 20th century Spanish chemical industry have been hitherto restricted to the impact of the First World War and the Spanish Civil War. In this paper, we will argue that the so-called Rif War that took place in Morocco between 1921 and 1927 had also a substantial role in that process. On the one hand, we will sketch a general panorama of the ways in which that war provided an impulse for the growth, diversification and economic benefit of Spanish companies in areas such as salt electrolysis, artificial dyes or pharmaceutical drugs. On the other hand, we will present specific examples of how certain industries in various geographic settings became transformed in direct and indirect connection with the fighting in Morocco.

Keywords: early 20th century, Spain, Rif War, chemical industry.

S3-6. From scientific diplomacy to political diplomacy: The sulfuric acid industrial plant in Barranquilla, Colombia

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This paper examines the paper of the scientific and political diplomacy in the development of the industrial chemical Colombian early 1940's decade, a period that was adopted the American industrial model, leaving aside the German industrial culture. This shift was determined by the political interest of the liberal class of the time in strengthening the national industrial apparatus and not relying on "imports", while aligning with the political interests of the US during the outbreak of the Second World War, and its subsequent scientific expansion in Latin America.

This change in diplomacy, from scientific to political, took shape with the start-up of the first large-scale sulfuric acid production plant in Barranquilla. It involved the development of an initiative led by Jorge Ancízar Sordo, a Colombian chemist who played a crucial role as Colombia's academic and political representative in the United States. In fact, based on the technical visits he made to different U.S. institutions, as well as on the advice of companies such as the Chemical Construction Corporation and Monsanto Chemical Company, Sordo developed a unique economic and industrial proposal for his time, solid enough to mobilize the political and business class around a major project.

This is a case that serves to analyze how political and academic diplomacy play a key role in the creation of scientific and industrial projects that foster (that favor change, or that are necessary for such change to occur) cooperation between countries with common governmental and economic interests, validated through a particular technical and scientific discourse. In this sense, scientists find themselves in a role that goes beyond laboratories and academic institutions, becoming active political actors in decision making.

Keywords: chemical industry, scientific and political diplomacy, science and power.

S4-1. Cat Piss and Smoked Herring. Pyrotechnical Innovation, Oeconomy and Smoke-Management in the Seventeenth Century

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In 1686, Louis XIV, King of France, witnessed the demonstration of a novel and marvelous piece of engineering: a smoke-consuming engine. To the bewilderment of the audience, the machine was capable of burning "all sorts of Wood in the middle of a Room without making any Smoak" (Royal Transactions). News of the invention traveled quickly and stirred the excitement of natural philosophers, chymists, and engineers alike. It promised the possibility of a smoke-free interior heating system, and its enthusiastic reception can be taken as indirect proof that fire, heat, and smoke management were still considered areas worthy of improvement. King Louis XIV, in turn, ordered the machine to be demonstrated on several other occasions.

In this paper, I argue that the smoke-consuming engine should be regarded as the pinnacle of a longer period of pyrotechnical innovation that had been underway since the sixteenth century. General concerns over the scarcity of fuel and deforestation, together with the persistent nuisances of smoke and fumes, drove engineers to develop more effective furnaces and heating devices. A major structural advancement in pyrotechnics was the application of pipes and enclosed spaces to channel wind, smoke, and heat in ways that more effectively manipulated fire. Although chymists such as Glauber, Lefevre, and Kunckel were quick to adopt these engineering principles, I argue that chymistry—the designated art of fire—played only a marginal role in these pyrotechnical developments. To fully understand the pyrotechnical innovation of the time, we should instead focus on the domestic sphere.

Keywords: 17th-Century Pyrotechnology, Furnace-design, Fuel Scarcity, Smoke-Management.

S4-2. Envisioning rubber as a commodity: the circulation of materials and knowledge between French chemists and Amazonian indigenous peoples during the eighteenth century

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The aim of this paper is to present and discuss the attempts made by French chemists to transform natural rubber into a commodity during the 18th century, highlighting how rubber research developed amidst the knowledge of South American indigenous peoples. Before the so-called "rubber boom," the material was widely used by different indigenous ethnic groups in the Amazon region, who used specific instruments and techniques to make objects for various purposes. However, their method was limited to the region where rubber trees were abundant, as they relied on freshly extracted latex that coagulated quickly enough to prevent it from being transported to France in its natural state. In the form of a cultural biography of rubber, I analyze eighteenth-century French scientific journals to show that the first researches into the chemical properties of rubber developed in order to reconcile indigenous knowledge with the interest in centralizing its production in the metropolis. The results show how tensions between South American indigenous and Western knowledge systems shaped the development of chemistry and the insertion of rubber into capitalist logic, providing an example of how a historiographical approach that highlights indigenous agency in the history of science can offer new insights on the relationship between science, technology and capitalism.

Keywords: rubber, indigenous knowledge, history of science, material culture.

S4-3. The interactions between academics of the University of Coimbra and the Royal Wood Factory, 1790-1822 (Marinha Grande, Portugal)

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The interactions between universities and factories are essential to rethinking production methods. Using the example of a tar factory (Royal Wood Factory, *Real Fábrica da Madeira*), we can observe the evolution of methods through the various kilns built and the importance of using stills to refine the product. In this case, the involvement of chemistry academics and other academic fields was active, working with the factory director to conduct experiments with tar. Besides documentation indicating contact between academics from the University of Coimbra and the factory director, economic data from the factory points to a direct and immediate impact from these interactions. It's important to consider that the kilns weren't built exactly like the original form of the method, they were appropriate and adapted to improve efficiency in the process and to achieve a higher-quality product. Other agents like the tar masters were essentials for the implementation of the new prodution techniques, so much that monetarily was more valued than the director itself.

Keywords: Tar Kilns, Circulation of knowledge, Techniques, Leiria Pine Forest.

S4-4. "The Chemistry of Colour and the Chemistry of Life": Dyes, Microbes and Medicine in the German Empire

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The emergence of the chemical dye industry in the 19th century – famously attributed to the accidental discovery of "Perkin's Mauve" from coal tar – redefined the commercial, industrial, and media landscape of modernity. While scholars in visual and cultural studies have focused on how synthetic colour transformed the world of consumer and popular culture, less attention has been paid to its impact in the life sciences. Tracking early developments in microscopy and staining techniques of living tissues, cells and microbes, I ask the how the diagnostic and therapeutic properties of colour were intertwined with the biomedical industry and nation building initiatives around tropical medicine and hygiene.

I will thus revisit the work of German scientists Robert Koch and Paul Ehrlich who seized upon the chemical properties of aniline and alizarin dyes to reveal and alter once mysterious disease-causing microbes living amidst the milieux of the body. I situate such developments in relation to emerging experiments in the physico-chemical manipulation of living cell tissue - what German-American biologist Jacques Loeb called "Technology of Living Substance". Focusing on how synthetic colour became integral to a larger biopolitical project to identify, separate and govern unruly biological agents from the "healthy" body, I hope to highlight the role of aesthetics in shaping imperial policies to conquer endemic disease across borders and sustain colonial expansion. I thus regard this application in biomedicine as part of colour's larger history as a global commodity wherein colour's embodied effects have been inextricable from colonial trade and biopolitical governance.

Keywords: Colour, Medicine, Biochemistry, Synthetics.

S4-5. Milk, Blood, and Seaweed: Alternative Plastics of the Early 20th Century

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Before petroleum-based plastics became ubiquitous in everyday life, American capitalists and industrialists during the early twentieth century attempted to create new plastics from a myriad of "waste" products. This paper examines the history of plastics made from milk, blood, and seaweed. Drawing on industry magazines from the 1920s and 1930s, I argue that now obsolete plastics such as *Aladdinite* or *Karolith* (both milk-based plastics) set the mold for what plastic embodied as a modern material, with qualities such as cheapness, beauty, inertness, and versatility becoming essential yet incommensurable features. Using examples of milk, blood, and seaweed plastics, I explore plastic's historical materiality in connection to the aspirations and limits of the American chemurgy movement—a branch of applied chemistry that sought to produce industrial goods from agricultural sources, with an ambitious premise that anything made of hydrocarbons can be (in theory) made from carbohydrates.

Keywords: history of plastic, historical materiality, industrial chemistry, American chemurgy.

S4-6. Scientific and Commercial Standards in Interwar Chemical Photography

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While scientists and engineers have engaged extensively in standard-setting activities to help stabilize capitalist market economies, the determination of technical standards has also been a key area in which industrial firms and interests have shaped the development of the sciences. As this paper illustrates, the complex dynamics at play during standardization processes could result in unexpected outcomes. Drawing on a mix of published sources and unpublished reports and correspondence, I discuss how, from the 1920s until the mid-1930s, representatives of various national committees tried to negotiate standards for determining the light sensitivity of photochemical materials at several different international photographic science conferences. In the United States, where industrial corporations had come to dominate photographic research by the interwar period, scientists from the Eastman Kodak Company led these efforts. These researchers argued that, in setting sensitometric standards, scientific considerations should take priority over practical, commercial aims. Significantly, however, Kodak achieved only very limited success in pushing through its proposals. The international community of photographic scientists evidently saw little issue with supporting the "commercial" film speed standards favored by the local academic organizers of the International Congress on Scientific and Applied Photography in Dresden in 1931. I argue that this outcome reflected a particular moment of transition in the political economy of photographic science, in which it remained relatively easy for strategic coalitions of academic and industrial scientists to overcome the influence of the world's largest photographic firm.

Keywords: Technical standards; standardization processes; photographic science; sensitometry.

S5-1. Vulgarisation in the antiphlogiston reolution of late 18th century Europe

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In late 18th century Europe, the phlogiston theory proposed by Becher in the mid-17th century and propagated by Stahl in the 18th century was challenged—and ultimately replaced—by an antiphlogiston current in large part attributable to a group of French chemists led by Antoine Lavoisier.

While scientific research in this period was dominated by those wealthy enough to receive the necessary education and to fund their work, there was an increased interest in and market for science, including chemistry, among the public. This was evidenced in the creation of lecture series open to the public, such as those given at the Jardin du Palais Royal and in Metz, as well as in works of vulgarisation, such as Jane Marcet's *Conversations on Chemistry*, published in 1817. The opening up of scientific discourse is perhaps also reflected in the antiphlogiston group's creation of a new terminology designed in part to remove the mystification that had long characterised the alchemists' writings.

Informed by the concept of interepistemic translation (translation between knowledge systems) as proposed by translation scholars Douglas Robinson and Karen Bennett, this paper will explore the vulgarisation of the antiphlogiston theories in the United Kingdom and France, considering how the theories were spread beyond the prevailing institutions. This exploration will begin with a survey of available newspaper archives and publishers' records, and will, if possible, examine the strategies of vulgarization used to communicate the 'new chemistry'.

Keywords: Lavoisier, translation, vulgarization.

S5-2. 'Cultivating Earth, Sustaining the Moon': Bridging Two Epochs of Chemistry and Material Narratives

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This paper explores the intersections of agricultural chemistry in the late 18th and early 19th centuries with the contemporary chemical and cultural narratives surrounding lunar exploration, offering a comparative historical perspective on the material practices and societal visions shaped by chemistry. While seemingly disparate, the chemical redefinition of soil as a material around 1800 and the appropriation of moon rocks in the Apollo (and Artemis) programmes reveal a shared dynamic: chemistry's role in materialising visions of control, progress, and sustainability.

The first part examines how soil was chemically redefined during the "Oeconomic Enlightenment," transforming it from an agrarian resource into an object of scientific inquiry. This process, which included the classification of marl and the development of experimental techniques in agricultural chemistry, laid the foundation for soil's chemical identity, fostering systems of knowledge that prioritised measurement, categorisation, and optimisation through intervention.

The second part turns to lunar exploration, investigating how moon rocks have been chemically and culturally appropriated as artefacts of progress and sustainability. By tracing parallels between the chemical treatment of soil and the modern narratives surrounding lunar materials, this paper reveals the continuity of chemically driven worldviews that mediate tensions between exploitation and preservation.

Ultimately, this paper bridges two histories of chemistry, highlighting its enduring capacity to shape narratives about both self-determination and control over terrestrial as well as extra-terrestrial environments.

Keywords : Chemical Worldviews, Agricultural Chemistry, Lunar Exploration, Material Practices.

S5-3. Agnotology, Scientific Manipulation and Secondary Education: The Palomares Nuclear Accident as a Didactic Resource

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Science education in secondary schools faces the challenge of fostering critical thinking in students to counteract scientific manipulation and misinformation. In this context, agnotology—the study of the production of ignorance—emerges as a crucial framework for examining the dynamics between science, power, and society. This paper focuses on the 1966 Palomares nuclear accident as a case study of misinformation strategies related to political management of radiological risks, highlighting how media narratives and scientific instruments were leveraged to serve specific interests.

The argument presented is that integrating agnotology into classrooms through the historical and critical analysis of cases like Palomares not only enriches the understanding of scientific methods and their evolution but also equips students with the tools to identify and question contemporary practices of scientific manipulation. This didactic proposal aligns the Physics and Chemistry curriculum with an ethical and social perspective, fostering meaningful learning that merges conceptual knowledge with critical and reflective competencies.

Keywords: Agnotology; Palomares; Secondary education; Scientific manipulation.

S5-4. On the disappearance of the word "chemistry" in society: Reaction to former exaggerations or normal societal evolution?

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The evolution of the slogan of DuPont, an enterprise that we can trace back, at least indirectly, to Antoine Lavoisier, from "Better living through chemistry" to "The miracles of science," is well known. A centenarian Portuguese chemical company employed, till recently, the slogan "Evolving Chemistry" and changed it to "Tomorrow Matters." In Education in Chemistry, various authors proposed the use of expressions such as Structure, Dynamics, Transformations, Mechanisms, Analysis, Synthesis, and Modelation (all with no "chemistry" in the name) instead of the classical areas of chemistry (Organic, Inorganic, Physical, Analytical, and Biochemistry, all with "chemistry" in the name). In addition, products and businesses are presented nowadays in a more "use-oriented" than "origin-oriented" manner than previously. For example, in its annual publication, "The Word in…," "The Economist" does not refer to the "Chemical Industry," but uses categories such as "Automotive," "Defense," "Energy," "Food and Farming," "Health," "Metals and mining" (all including chemical goods and processes). Conversely, in the seventies of the XX century, "Industrial" usually appeared with chemical goods such as sulfuric acid, soda, synthetic rubber, nylon, etc. Finally, the "History of Science Institute" evolved from "The Chemical Heritage Foundation" to reflect its interdisciplinary nature and activities. These issues and others, are reactions to former exaggerations or a normal societal evolution?

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Keywords: Chemical industry slogans, Chemical Industry references, Areas of Chemistry in Education, History of Chemistry Institutions.

S5-5. The Death of Chemophobia. Revisiting the Public Image of Chemistry

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Debates about the public image of chemistry are strongly shaped by the concept of 'chemophobia'. Initially put forward in 1965 by a US-American nutritionist, criticizing too strict regulations on arsenic in foods, the concept has spread widely through communities of toxicologists, chemists, food scientists, and has been taken up in risk and consumer studies. Being inherently normative, the allegation of 'chemophobia' is typically brought forward by members of the chemistry community against the general public, political regulators, or the media, intending to describe an exaggerated, irrational fear of industrially-produced chemicals; a flawed risk perception, it is assumed, leads to a preference for 'natural alternatives', which are 'free from chemicals'.

The talk puts forward arguments against the concept of 'chemophobia'. Empirical studies show that the public image of chemistry is much less negative than members of the chemistry community expect. Rather, assuming 'chemophobia' has become part of the disciplinary self-identity of chemists (a phenomenon that has been called 'chemophobia-phobia'). Typical arguments 'in defense of chemistry' are criticized from a historical perspective, e.g. that chemistry is 'demonized' by the general public, that it is associated with the 'unnatural', that it is 'actually' a driver of ecological modernization, and that a world without chemistry is unimaginable. The talk deconstructs these narratives and instead advocates an ecological and capitalism-critical perspective on the role of chemistry in society.

Keywords: Chemophobia, public image of chemistry, advertisement, ecology.

S6-1. Spirits, Vapors, and Volatile Substances in Early Modern Alchemy and Medicine

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In early medicine, physiological processes were described as transformations that implied the formation of "spirits" and "vapors" through the action of heat within the body. This conception was grounded in the authority of ancient physicians and philosophers, overall, Galen of Pergamon (129-216) and Aristotle (fourth century BC). Interestingly, the medical understanding of spirits was subject to original interpretations in the early modern period. The alchemical philosophy of the Swiss physician Paracelsus (1493-1541) provided new insights into the formation of spirits and their use in therapy. Accordingly, bodily transformations came from the coagulation of spirits into bodies thanks to three alchemical principles, namely, Salt, Sulphur and Mercury. In turn, these spirits, as volatile substances, could be extracted by distillation to make powerful drugs. In this paper, I will explore such views in the medical philosophy of the German physician Daniel Sennert (1572-1637). After examining his explanation of spirits in Galenic medicine and Paracelsian alchemy, I will explore their application to pharmacology, especially in the distillation of metals and minerals for drug making.

Keywords: pre-modern, alchemy, medicine, remedies.

S6-2. Seeing Heat and Temperature: A Journey Through Scientific Visual Representations

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The conceptualization of heat and temperature has developed over time, particularly as scientific understanding has moved from the macroscopic to the microscopic realm. From being regarded as a substance until the mid-nineteenth century, heat was gradually seen as a static concept in connection with thermal equilibrium in the latter part of the nineteenth century, and finally to a dynamic concept, emphasizing energy in transit, from the twentieth century onward. Visual representations of heat and temperature have changed accordingly.

As part of a PhD project which aims to develop and test the affordances of drawing to teach the concepts of heat and energy at secondary school level, we have investigated how scientists have visualized heat and temperature. We reviewed how a selection of 28 textbooks, handbooks, and research reports on heat and temperature presented the concepts and images of heat and temperature across physics, chemistry, and technology from early nineteenth century to the present. The analytical focus is on the relations between the visualizations and 1) the description of the concepts, 2) the target audiences, and 3) the publication types.

We found that few sources depicted "what is heat" directly; instead, they illustrated phenomena *related to* or *caused by* heat. We show how visual representations of heat and temperature continued to depict heat as a static concept, long after it was acknowledged as dynamic. The most conspicuous change in the drawings about heat is the use of arrows, which reflect a process-oriented perspective. From these observations, we present an inventory of phenomena related to heat and examine tools for depicting movement relevant for teaching heat and temperature through drawing.

Keywords: Heat and temperature, Visual representations, Textbooks.

S6-3. "In Safety and at their Leisure": The Changing Image of Chemists and Chemistry in the Emergence of Computational Quantum Chemistry in the Late 1960s

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In the 1960s, chemistry was at a crossroads. As the famous Westheimer Report noted, chemistry was in crisis, and more funds were needed for basic research, particularly electronic instrumentation, for the discipline to catch up with the other physical sciences. At the same time, the student and environmental movement started questioning the role of chemistry in the face of pollution created by the chemical industry, as was emphatically pointed out in Rachel Carlson's *Silent Spring*.

In the laboratory, physical methods like Nuclear Magnetic Resonance transformed traditional experimental research radically. Concurrently, computational quantum chemistry emerged gradually from the 1960s. Based essentially on approximate computational models of quantum theory, it challenged the notion that quantitative predictions could be made only by experimental techniques.

In 1968, two broad-read media outlets, the Time magazine and the New York Times newspaper, presented to the public two short articles about computational chemistry. These articles discussed the research work of IBM Computational Chemist Enrico Clementi on the simulation of a chemical reaction that leads to the creation of ammonium chloride.

In this discussion, a new image of chemists was presented that was away from the dangers of the traditional laboratory and resided in the safety of "test-tube computers". At the same, according to the articles, chemistry could become an "exact science" and achieve a "new precision".

In this presentation, the image of chemists and chemistry through the emergence of computational chemistry will be discussed in the political and social context of the late 1960s.

Keywords: Quantum Chemistry Computers Popularization.

S6-4. The impact of chemists and physicists on the revival of genetics and formation of molecular biology in the USSR

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In the Soviet Union, genetics was a prohibited science after the infamous August 1948 session of the Lenin All-Union Academy of Agricultural Sciences. Biologists were not able to overcome this problem or (those who were in power) did not like to do it. Chemists, physicists and mathematicians made many efforts to help biologists to rehabilitate this scientific discipline and to start the studies in the fledgling molecular biology. While the activities of physicists I.E. Tamm, I.V. Kurchatov, P.L. Kapitza, mathematician A.A. Lyapunov and others are well known, the efforts of chemist N.N. Semenov, the Nobel laureate, remain in shadow.

Notably, not only genetics was attacked for ideological reasons. In chemistry, Y.K. Syrkin and M.E. Dyatkina suffered in the campaign against the quantum-mechanical resonance theory. For a dozen years, N.N. Semenov was under threat of ideological persecution for his theory of chain reactions, despite his high position. The more valuable are his activities in defense of genetics. In this regard, he is mainly known for his invitation of I.A. Rapopot, the discoverer of chemical mutagenesis, to organize work on chemical genetics in the Institute of Chemical Physics in 1957. Much less is known about his efforts to stop the monopoly of Lysenko in 1964-1965. And nothing was previously known about his criticism of Lysenko in 1959. The materials regarding this activity of N.N. Semenov will be presented for the first time in the report.

Keywords: revival of genetics, molecular biology, N.N. Semenov, criticism of Lysenko.

S6-5. "Although this method lacks the physical transparency of the traditional line of attack, its frank pragmatism is surprisingly successful." Artificial Neural Networks in chemistry

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Computer simulations in chemistry started as early as the 1950s but were used more regularly from the 1970s onwards. To name just a few developments, in 1970, the computer program GAUSSIAN developed by the group of John A. Pople at Carnegie Mellon University was released as the first commercially available program for computational chemistry. In the 1990s, Density Functional Theory (DFT) changed the way quantum mechanical computations were approximated in computational chemistry.

Parallel to these developments that were primarily concerned with making the theory of quantum chemistry usable for chemistry, from the late 1980s onwards, artificial neural networks were used to help predict (at least secondary) protein structures—a development that culminated in the Nobel Prize for AlphaFold in 2024. In my talk, I will argue that machine learning did fit the research culture of chemistry especially well. It was the learning by pattern recognition and the avoidance of direct appeals to theory that particularly made the use of machine learning very akin to chemical thinking. I will argue this point historically by presenting on journal articles concerned with the use of artificial neural networks in the search for protein structures. A special focus will lie on the reflections of the authors on the usefulness of neural networks and their comparisons with other computational tools, as well as their relationship to theory.

Keywords: Computational Chemistry, Artificial Neural Networks, Protein Folding, Theory

Poster Session

PS1. Early environmental studies in chemistry at Coimbra University: Constraints and research paths

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In the 1960s, the University of Coimbra's Department of Chemistry embarked on research in photochemistry, marking the onset of chemical environmental studies. Connections between professors who had studied in England and renowned British chemists facilitated the emergence of a new generation of promising chemists from Coimbra pursuing their PhDs in the UK. Among them was Formosinho, who completed his PhD in atmospheric chemistry and photochemistry at the Royal Institution in 1971 under the supervision of Porter, Nobel Laureate in Chemistry. In the Geophysical Institute of Coimbra, which was headed by a chemist between 1963 and 1974, the series of meteorological, magnetic, and seismic data were supplemented with a new set of atmospheric chemistry. This coincided with the emergence of environmental science, necessitating the acquisition of reliable instruments required by this new field of study.

The political events of April 1974 in Portugal had a profound impact on the University. In the Department of Chemistry, four full professors were forcibly dismissed, altering its dynamics. At the Geophysical Institute, the dismissal of the director, Pinto Coelho, led to the abrupt cessation of the atmospheric chemistry project, with some of the instruments being transferred to the Department. This paper seeks to analyse the reasons behind the stagnation of environmental chemistry research in the 1970s, the eventual dispersion of the instruments acquired and how they were subsequently used in other research projects. It also examines the impact of political changes on the content and processes of research.

Keywords: Environmental Chemistry, University of Coimbra Chemistry Department, Geophysical Institute, political changes.

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PS2. Industrializing the Academy: Chemistry, Commodification, and the Early Modern Glass Delusion

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The glass delusion, an early modern mental disorder in which patients believed their bodies to be made of glass, can be reconceptualized as an economic metaphor that illuminates the intersections of late sixteenth and early seventeenth-century chemistry with contemporaneous medical, cultural, and economic developments. The emergence of glass-men coincided with the commodification of *cristallo* glass and the professional anxieties that afflicted many students negotiating a changing economic landscape. Amidst expanded universities and a stagnant job market, pursuing an academic life became precarious. Extensive study ostensibly imbued students with knowledge, yet their learnedness was disenfranchised in a commercializing society concerned with more practical matters. *Cristallo*'s transparency enabled its potency as a metaphor for the luminous clarity of scholarship, yet it was also brittle, symbolizing the gap between the privileged ideal of the academic life and its devaluation in the public consciousness. The processes by which *cristallo* was produced invited further speculation, with writers frequently identifying the fiery conversion of sand into glass as a form of immortalization. These comparisons mirrored scholars' desperate attempts to achieve intellectual immortality despite bodily finitude, a common preoccupation in a field that underwent what could be described as an existential crisis. Scholarly endeavors became likened to the practical work of glaziers, a rhetorical correlation that aligned discourse on universities with emerging trends in industrial production and the commercialization of its products—the glass delusion therefore existed as both a consequence of these developments and extension thereof into the discursive domains of medicine and academia.

Keywords: alchemy, early modernity, glass delusion, mental illness.

PS3. The Phlogiston Theory - a model in science education

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The phlogiston theory was established around 1700 and lasted for about one hundred years. According to the Phlogiston Theory, phlogiston is released during heating processes, and the remaining material becomes lighter. The demise of this theory started with Lavoisier's new insights into the phenomena of chemical reactions in general and combustion in particular, as well as about the composition of air. The rise and fall of the Phlogiston theory is a good example to the process of the replacement of one theory by another, due to new facts and new discoveries. In addition, it stresses the advantages and limitations of scientific models and theories, as well as the nature of science. A brief program, planned for two lessons, was developed around the Phlogiston Theory, in the framework of teaching and learning the "Science: An Ever-Developing Entity" program. Semi-structured interviews with teachers and students were conducted after the completion of the Phlogiston topic. Based on the findings, it is suggested that the brief program, reached its goals. The students, who studied the program, learned more about the scientists – their curiosity and their boldness, as well as about the scientific endeavor, consisting of discoveries, models and theories.

Keywords: Phlogiston, history-based chemistry, teaching and learning, models and theories.

PS4. History of polysulfides and their role in the evolution of chemical knowledge: From the discovery of oxygen to the elucidation of their composition

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Inorganic polysulfides (S_n^{2-}) and their protonated forms play an important role in many fields of chemistry, geology, and technology. These compounds were known from the ancient times as "liver of sulfur", product of the reaction between carbonates of alkali metals and sulfur, which contains, in addition to polysulfides, sulfide, thiosulfate and sulfate. As polysulfides are reactive toward oxygen, the liver of sulfur played an important role in the discovery of oxygen and quantification of its atmospheric content. At the and of XVIII century and in the beginning of XIX century answers to two main questions were sought: 1) Is sulfate in the liver of sulfur is formed during its formation or during dissolution in water? 2) Is sulfur in polysulfides bound directly to the metal in alkali and alkaline earth metals sulphides and polysulfides? In my presentation I will discuss how did the search for answers to these questions evolved. My discussion will focus on three works. The first is the work of Berthollet (1798) which provided a framework for the later research. The second study by Vauquelin (1817) shed a light on the composition and chemical properties of polysulfides. The final answers to these questions were given by Berzelius (1822), who performed a seminal work on the dependance of polysulfides composition on the conditions under which they are prepared. Results of this work were mostly unchallenged until the beginning of the XX century and some of them do not contradict the current state of knowledge.

Keywords: liver of sulfur, hydrogen sulfide, polysulfides composition, sulfate.

PS5. Polyurethanes - an outstanding invention of the 20th century and an odyssey with Otto Bayer as key player

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The invention and industrial development of polyurethanes is closely linked to Otto Bayer (1902-1982). His astonishing originality and creative scientific imagination as well as his sense for chemical and industrial progress in a suitable direction enabled him (besides many other industrial product families during his time as research leader and managing director of the Bayer company) to proceed successfully develop the area the invention of polyurethanes.

The year 1937 is considered the birth year of polyurethanes, which are formed by polyaddition reactions of diisocyanates with diols. This was preceded by the invention of polyamides by W. H. Carothers at DuPont in the USA in 1935, which can be seen as an influential factor for the was not without influence for the invention of polyurethanes two years later. Their industrial production and use on a large scale in the factories of the Bayer company only became possible after the end of World War II, with the innovative genius Otto Bayer playing a key role.

This paper attempts to provide a historical overview of key steps in the invention and commercialization of polyurethanes, which was accompanied by lots of ups and some downs.

PS6. Steroid history: from the discovery to the marketplace

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The first indications of the existence of substances that control important functions in human and animal organisms were found in artifacts from ancient Greece and China. While in the 18th century, English physician and scientist William Withering used plant extracts from the Digitalis genus to treat edema, the connections between the two were not made until the first isolations and synthesis of steroid compounds in the late 1800s and early and mid-1900s. The most important research in the field of steroids was conducted during the 1960s and resulted in the synthesis and bioactivity determination of the most important steroid compounds. This led to eight Nobel prizes and a number of new drugs with steroid structures. Due to their widespread use, drugs containing estrogen and progestogens are considered one of the most commonly used groups of drugs in the history of medicine. The importance and relevance of steroids is also indicated by the size of the market which in 2022 was 62.77 billion US dollars for androgens and anabolics alone. Consequently, steroids are no longer subjects of research solely for chemists and medical professionals; they are also significant for environmentalists, legal experts, and sports professionals. This analysis offers a detailed overview of the distribution of keywords related to steroids in online publications. It examines different types of publications, their countries of origin, research areas, and the historical growth in their numbers, all while drawing connections to historical events and industrial development.

Keywords: steroids, isolation, synthesis, applications.

PS7. Chemist Sima Lozanić and his influence on Serbia's economic policy in the late 19th and early 20th century

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Sima Lozanić (1847-1935) is regarded as the most famous Serbian chemist. A significant part of his distinguished career involved contributions to the field of economics, particularly in developing plans to improve agricultural production and industrialize the country. Lozanić served as Minister of Economy for three terms (1894, 1894-1895, and 1897-1899). During the 1897-1899 period, he drafted 12 economic laws: the Law on Agricultural Stations, the Law on State Economists, the Law on the Improvement of Fruit Growing, the Law on the Improvement of Livestock Breeding, the Law on the Destruction of Pests, the Law on Hunting, the Law on Fishing, the Law on Forests, the Law on Agricultural Cooperatives, the Law on the Improvement of Fund Management, the Law on Telegraph and Telephone, and the Law on Supporting National Industry. Lozanić's ability to create effective laws stemmed from the knowledge he gained during his law studies at Belgrade's Great School, which he completed before shifting his focus to chemistry in the laboratories of renowned chemists Wislicenus and Hofmann. Additionally, his personal interest in economics and agriculture, along with his practical chemical work for state purposes, greatly contributed to the success of his laws. The Law on Supporting National Industry aimed to incentivize the establishment of factories producing goods essential to the country's economy, which could not previously be obtained domestically. This law led to the founding of factories and the employment of a large number of workers in the early 20th century.

Keywords: Sima Lozanić, chemist, minister of economy, economic laws.

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