ICOHTEC

43rd Annual Meeting | PORTO 2016

Book of Abstracts

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ICOHTEC 2016 — Book of Abstracts

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Centro Interuniversitário de História das Ciências e da Tecnologia (CIUHCT)

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João Machado and Ivo Louro (Local Organising Committee)

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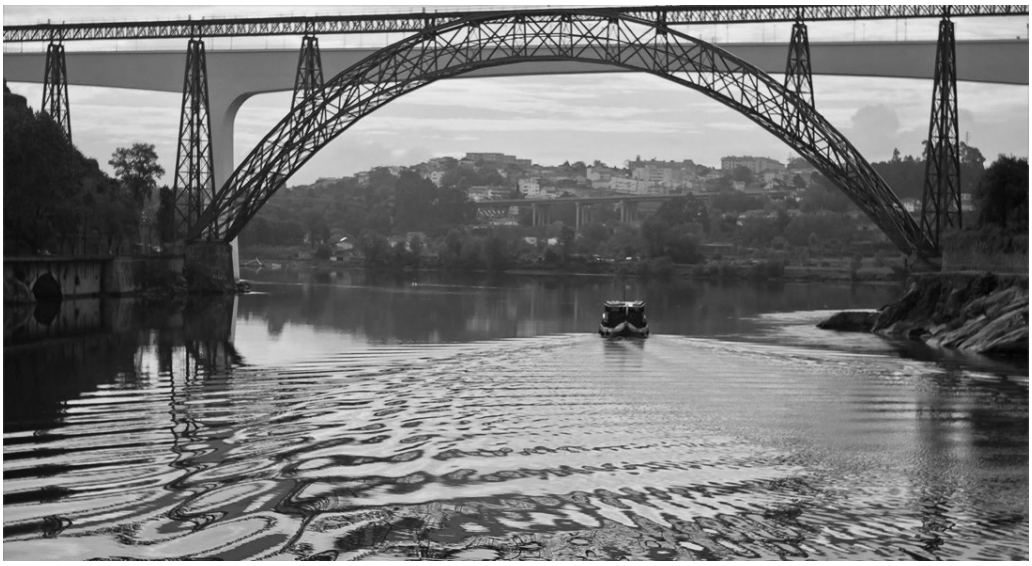
Welcome to ICOHTEC 2016!



Dear Colleagues,

On behalf of the Organizing Committee, it is our great pleasure to welcome you to Porto and to the 43rd *International Committee for the History of Technology - Technology, Innovation, and Sustainability: historical and contemporary narratives.*

It is our most truthful wish that this meeting may foster an excellent atmosphere for scientific exchange and provide a starting point for challenges ahead.

We'd like to welcome everybody. Porto is utterly charming and we encourage you to visit it. Please enjoy your stay. Thank you.

Maria Elvira Callapez and Maria Paula Diogo

THIS YEAR'S CONFERENCE

Innovation and sustainability have become key words of our everyday life, extending from political and economic discourse to teaching curricula and from the lay public to academia. However, the use of these terms is often abstract and simplistic, ignoring the density of their interrelationships in different geographic, historical and civilizational contexts, and the boomerang character of today's world.

The **43rd ICOHTEC** meeting aims at addressing this complex relationship by encouraging papers that contribute to a deeper understanding of the multilayer cultural and material built meaning of innovation and sustainability and on the various roles played by technology in enabling or preventing such interplay.

The symposium covers all periods and areas of the globe. We invite submissions of new, original and unpublished work that offers fresh perspectives for the history of technology as well as exploring sources and methods.

The main theme embraces the concepts of technology, innovation and sustainability as organizing principles, thus perceiving them as actors in the building of today's globalized society.

ICOHTEC 2016 is organised by CIUHCT at Porto, the capital city of the northern part of Portugal, at the Faculty of Arts and Humanities of the University of Porto.

The meeting's logo - a today's sketch of the D. Maria iron bridge - is an homage to European engineering. Authored by Eiffel's atelier, the D. Maria bridge was built of wrought iron to carry the railway across the River Douro at a height of 60 meters above the river. Its two-hinged crescent arch was, at the time, the longest single-arch span in the world. Its construction started on January 5th, 1876 and was completed on October 1st, 1877; the bridge was opened on November 4th, 1877 by King Luís I of Portugal and named after his queen, Maria Pia.

The Portuguese community of historians of technology has already been responsible for the 25th ICOHTEC Annual Meeting, which was held in Lisbon back in 1998, and hosted the 1st Kranzberg Memorial Lecture. Portugal had then an enthusiastic, albeit very small and inexperienced group of young historians of technology, who regarded the organization of ICOHTEC 1998 as a sign of trust by its peers. From then on, the community of Portuguese historians of technology has grown and asserted itself both nationally and internationally. We would like to pay tribute

to Professor Robert Angus Buchanan and Professor Carroll Pursell for their strong encouragement.

We are now, once again, proud to receive in Portugal our fellow historians of technology. Additionally, and for the first time, the ICOHTEC meeting will be preceded by a Summer School, which aims at bringing together young apprentices.

Although some of us are now more mature and experienced, a new generation of very promising young scholars has meanwhile joined us and we are all as enthusiastic as before. We thus hope that the 43rd ICOHTEC Annual Meeting will be both scientifically challenging and socially memorable.

ABOUT ICOHTEC

The International Committee for the History of Technology (ICOHTEC) was founded in Paris 1968 when bitterness divided the nations in the Eastern and Western worlds. The intent was to provide a forum of scholars for the history of technology from both sides of the ‚iron curtain'. It was constituted as a Scientific Section within the Division of the History of Science and Technology of the International Union of the History and Philosophy of Science (IUHPS/DHST). The first President was Eugeniusz Olszewski (Poland), with Vice-Presidents S. V. Schuchardine (USSR) and Melvin Kranzberg (USA). The first Secretary-General was Maurice Daumas (France), through whose initiative the French government hosted the first independent symposium at Pont-a-Mousson (1970). Symposia have been held almost every year, and the proceedings of many meetings have been published, although in a variety of forms.

Whereas national organisations have their membership bases in their respective countries, ICOHTEC has its membership base mainly in Europe, but also in the Americas, Japan, India and Australia. Research activities, in which ICOHTEC members cooperate, reflect this special interest. The issues are investigated on a comparative national basis, stressing aspects of cooperation between various nations, regions or institutions. The first statutes of ICOHTEC were approved in Paris in 1968; they were then amended in 1974, 1985, and 1993.

The aims are as stated in article four of its statutes.

- To establish close working relationships among specialists of different disciplines in order to foster international cooperation for the study and development of the history of technology;
- To promote the study of appropriate historical subjects by establishing and extending the scholarly bases of the history of technology as well as by contributing to the resolution of certain contemporary national and international problems;
- To facilitate research and documentation for scholars in all countries in the history of technology by exchange of information and the creation of the material means necessary for this objective.

ABOUT CIUHCT

The **Centro Interuniversitário de História das Ciências e da Tecnologia**/ Interuniversity Center for the History of Science and Technology (CIUHCT) is a vivid research center that brings together historians of science, technology and medicine of the two major universities in the Lisbon area (the University of Lisbon and NOVA – New University of Lisbon). It has recently been ranked as one of the 11 top research units in Portugal, after an extensive international evaluation process led by the European Science Foundation.

CIUHCT aims at asserting the relevance of History of STM in building citizenship and European identity, focusing specifically, but not exclusively, in STM historical case studies on Portugal in an international perspective. CIUHCT participates actively in international debates on the concepts of center(s) and periphery(ies), on the relevance of STM knowledge in the construction of modern and contemporary societies, using an innovative methodological framework centered on the trilogy circulation, appropriation and innovation.

CIUHCT aims additionally to contribute to the consolidation of a strong scientific community by actively participating in the education of students (graduate and post-graduate level) as well as by enrolling in outreach activities (popularization, exhibits).

CIUHCT's members have a large experience in hosting large meeting on the topics of history of science and technology, and medicine namely ICOHTEC98, STEP1999, ToE1999, SHOT2008, INES2008, STEP2014, and ESHS2014.

WHY PORTO?

Porto is a rich town both from a historical and a contemporary perspective. Its historical center is part of the World Cultural Heritage since 1996 and the city has been enriched with new architectural icons, such as the Casa da Música (House of Music) by Rem Koolhaas and the Museu Serralves (Serralves Museum) by Siza Vieira, which go hand in hand with the 18th century baroque Torre dos Clérigos, by Nicolau Nasoni, and the 19th century architectural masterpieces such as the bookshop Lello & Irmão, the Majestic Café, the Lello bookshop, the Palácio de Cristal (Crystal Palace), and the D. Luís and D. Maria iron bridges. The medieval Ribeira district is a crumbling but fascinating place, ending at a riverfront square ("Praça da Ribeira").

The life of the city is entangled with the famous Port wine, stored in huge cellars on the shores of the river Douro, and draws on a strong commercial and industrial tradition.

The first shipments of wine under the name Port were recorded in 1678. Although the wine is produced inland in the vineyards of the upper Douro Valley, one of the world's oldest and most beautiful vineyard areas, it takes its name from the coastal city of Porto from which it is traditionally exported. Until well into the 20th century, the wine was carried down the river Douro in

special boats known as “barcos rabelos”. The wine was then unloaded into the ‘lodges’ of the Port houses in Vila Nova de Gaia, opposite the old city centre of Porto, to be aged, blended, bottled and finally shipped.

In 1756, under the rule of the Marquis of Pombal, the influential prime minister of King José I renowned by his decisive action during the Lisbon 1755 earthquake, the Port wine vineyards became the first vineyard area in the world to be legally demarcated.

Like other great classic wines, Port owes its distinctive character to a unique association of climate, soil, grape variety and wine making tradition. Traditionally it is served towards the end of the meal with cheese, as a dessert wine or as an after dinner drink; however, the white Port is particularly suitable for an excellent and distinctive aperitif.

For more information, we recommend GooPorto.com and VisitPorto.travel.

THE CONFERENCE VENUE

The ICOHTEC 2016 conference will take place at the Faculty of Arts and Humanities of the University of Porto (FLUP).

FLUP has over 3000 students and offers 13 undergraduate courses (licenciatura), 30 MSc courses and 18 PhD courses. Additionally, we have the local assistance of CITCEM, a large research unit in the field of History.

FLUP's campus is located nearby the Arrábida Bridge, at Campo Alegre. It is a bold large building - 16,000 m2 - that was completed in 1996 and hosts different space typologies, including classes, support spaces, library, three independent blocks institutes and large traffic areas.

At the entrance, the atrium serves as a link to the northern area, lecture spaces, and the southern zone, social area of conviviality and library. The towers of the institutes follow the same organizational principle: an open central space with walkways that establish the connection to the classroom. The library of the School is located in the south, overlooking the Douro river.

The Welcome Reception and the traditional Jazz evening by ICOHTECian musicians, will take place outside the campus; the Gala dinner will take place onboard of one of the boats that cross the river Douro.

COMMITTEES

Local Organising Committee

M. Elvira Callapez (Chair)
CIUHCT, Universidade de Lisboa, Faculty of Sciences, Lisbon, Portugal
M. Paula Diogo (Co-chair)
CIUHCT, Universidade NOVA de Lisboa, Faculty of Sciences and Technology, Lisbon, Portugal
M. Luísa Sousa
CIUHCT, Universidade NOVA de Lisboa, Faculty of Sciences and Technology, Lisbon, Portugal
Ana Paula Silva
CIUHCT, Universidade NOVA de Lisboa, Faculty of Sciences and Technology, Lisbon, Portugal
Maria da Luz Sampaio
CIDEHUS, University of Évora, Évora, Portugal

Programme Committee

Inês Amorim
CITCEM, University of Porto, Faculty of Arts and Humanities, Porto, Portugal
Eike-Christian Heine
Stuttgart University, Department of History, Section for the History of the Impact of Technology, Stuttgart, Germany
Peter Koval
Cluster of Excellence Image Knowledge Gestaltung, Humboldt University, Berlin, Slovakia/Germany
Dick van Lente
Erasmus Universiteit, Rotterdam, The Netherlands
Sławomir Łotysz (chair)
Insitute for the History of Science of the Polish Academy of Sciences, Warsaw, Poland
M. Luísa Sousa
CIUHCT, Universidade NOVA de Lisboa, Faculty of Sciences and Technology, Lisbon, Portugal
James Stark
University of Leeds, Leeds, United Kingdom

Honor Committee

Amélia Polónia
Faculdade de Letras da Universidade do Porto, Porto, Portugal
Ana Simões
CIUHCT, Universidade de Lisboa, Faculty of Sciences, Lisbon, Portugal
Graça Martinho
Vice-Dean, Universidade NOVA de Lisboa, Faculty of Sciences and Technology, Lisbon, Portugal
Jorge Alves
Faculdade de Letras da Universidade do Porto, Porto, Portugal
Teresa Salomé Mota
CIUHCT, Universidade de Lisboa, Faculty of Sciences, Lisbon, Portugal
Ana Cardoso de Matos
CIDEHUS, Universidade de Évora, Évora, Portugal

Local Scientific Secretariat

Ivo Louro
CIUHCT, Universidade NOVA de Lisboa, Faculty of Sciences and Technology, Lisbon, Portugal
João Machado
CIUHCT, Universidade de Lisboa, Faculty of Sciences, Lisbon, Portugal

Daily Schedule

1. Tuesday, July 26

		Rooms
08:30		
09:00		
09:30		
10:00		
10:30		
11:00		
11:30	Registration opens	FLUP 2nd Floor
12:00		
12:30		
13:00		
13:30		
14:00		
14:30	Meeting of ICOHTEC Executive Committee	FLUP 2nd Floor Conference Room 2
15:00		
15:30		
16:00		
16:30		
17:00		
17:30		
18:00	Kranzberg Lecture by Helmuth Trischler	Rectory of the University Of Porto
18:30		
19:00		
19:30		
20:00	Welcome Reception	Rectory of the University Of Porto
20:30		
21:00		

2. Wednesday, July 26

		Rooms
08:30		
09:00		
09:30	Sessions W1A-W1F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
10:00		
10:30		
11:00	*Coffee Break*	FLUP Ground Floor
11:30	Sessions W2A-W2F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
12:00		
12:30		
13:00	*Lunch*	FLUP Cafeteria
13:30		
14:00		
14:30	Sessions W3A-W3F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
15:00		
15:30		
16:00	*Coffee Break*	FLUP Ground Floor
16:30	Sessions W4A-W4F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
17:00		
17:30		
18:00	Entrepreneurs' Roundtable	Anfiteatro Nobre FLUP Ground Floor
18:30		
19:00		
19:30		
20:00		
20:30		
21:00		

3. Thursday, July 28

		Rooms
08:30		
09:00		
09:30	Sessions T1A-T1F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
10:00		
10:30		
11:00	*Coffee Break*	FLUP Ground Floor
11:30	Sessions T2A-T2F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
12:00		
12:30		
13:00	*Lunch*	FLUP Cafeteria
13:30		
14:00		
14:30	Sessions T3A-T3F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
15:00		
15:30		
16:00		
16:30		
17:00	Visit to Port Wine cellars followed by Technological Boat Tour	At the Douro River Meet up at FLUP.
17:30		
18:00		
18:30		
19:00		
19:30		
20:00	Gala Dinner	At the Douro River
20:30		
21:00		

4. Friday, July 29

		Rooms
08:30	Tour to S. João da Madeira's Technological Park *Includes lunch*	Meet-up at FLUP's main entrance
09:00		
09:30		
10:00		
10:30		
11:00		
11:30		
12:00		
12:30		
13:00		
13:30		
14:00		
14:30	Sessions F1A-F1F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
15:00		
15:30		
16:00	*Coffee Break*	FLUP Ground Floor
16:30	ICOHTEC Prizes Winners' Roundtable	FLUP Ground Floor Anfiteatro Nobre
17:00		
17:30		
18:00	ICOHTEC General Assembly	FLUP Ground Floor Anfiteatro Nobre
18:30		
19:00		
19:30		
20:00		
20:30	Jazz Concert	Tram Museum
21:00		

5. Saturday, July 29

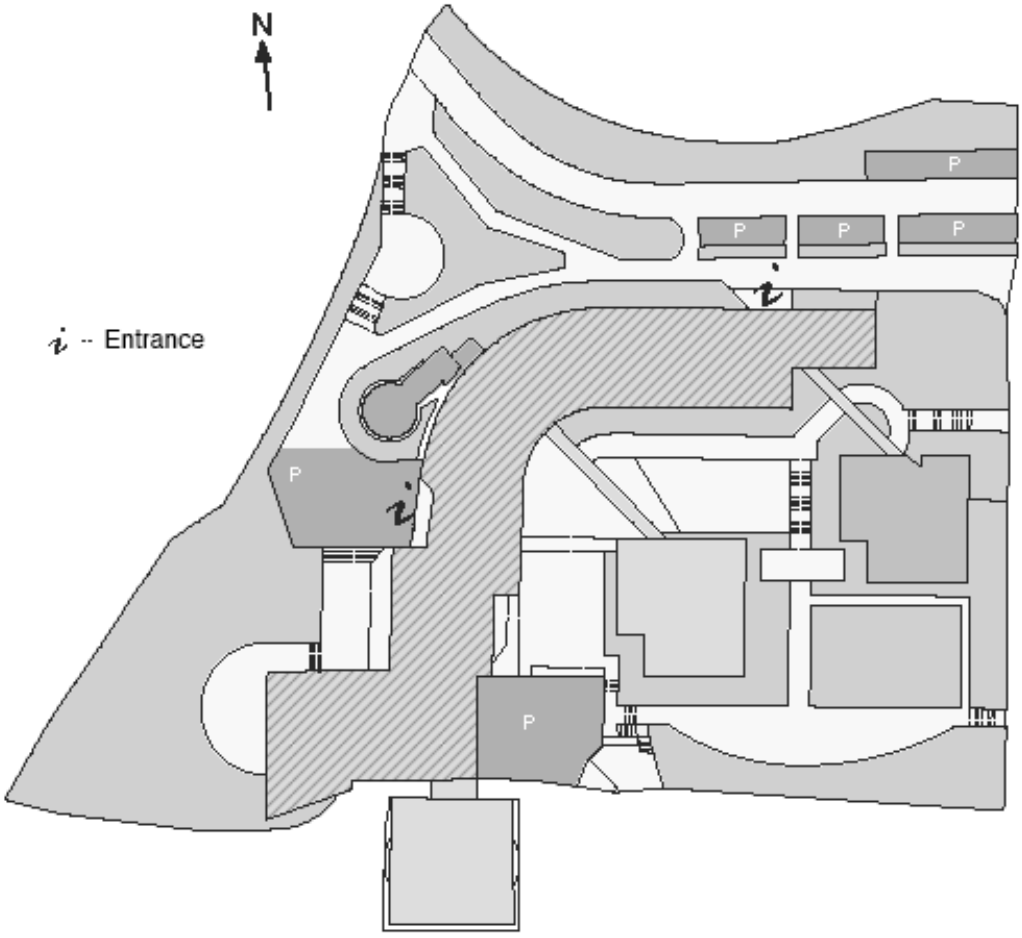
		Rooms
08:30		
09:00		
09:30	Sessions S1A-S1F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
10:00		
10:30		
11:00	*Coffee Break*	FLUP Ground Floor
11:30	Sessions S2A-S2F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
12:00		
12:30		
13:00	*Lunch*	FLUP Cafeteria
13:30		
14:00		
14:30	Sessions S3A-S3F	FLUP 2nd Floor Rooms 201, 202, 203, 208, CR2, A2
15:00		
15:30		
16:00	Pritzker Architecture Tour	Part of the post-conference Social Programme. Meet-up at FLUP
16:30		
17:00		
17:30		
18:00		
18:30		
19:00		
19:30		
20:00		
20:30		
21:00		

6. Sunday, July 30

		Rooms
08:30		
09:00		
09:30		
10:00		
10:30		
11:00		
11:30		
12:00		
12:30		
13:00		
13:30		
14:00		
14:30	Douro Cruise	Part of the post-conference Social Programme. Meet-up at FLUP
15:00		
15:30		
16:00		
16:30		
17:00		
17:30		
18:00		
18:30		
19:00		
19:30		
20:00		
20:30		
21:00		

CONFERENCE MAP

This is a map of the Faculty of Arts and Humanities' campus. Our building is the striped area and its two entrances (West and North) are marked with **i**. Sessions take place in the second floor of this building, in the space between the two entrances, in rooms 201, 202, 203, 208, CR2 (Conference Room 2), and A2 (*Amphitheatre 2*). A few events, like the General Assembly, take place at the *Anfiteatro Nobre*, located in our building's ground floor. Each session's room will have a proper identifier and, of course, the help desk will be located on the second floor and ready to guide you.



REGISTRATION DETAILS

The Help Desk

Located every day between 9am to 6pm at the 2nd Floor lobby of the main Faculty of Arts and Humanities building. A team of helpful staff, identified by their colour t-shirts and familiar with the programme, university and surrounding area, will help you when in need of assistance.

Internet access and Presentations

Network	flupwifi	**Password**	flporto2015

All rooms have free wireless internet access and a laptop is available for the presentations. The presentations should be delivered to the chairs of the sessions in digital format (.ppt or .pptx file). The wi-fi credentials are on display at the Help Desk and conference rooms. For participants who are not travelling with a laptop, there is a computer available in the area near the Help Desk.

Receipts and Certificates of Presence

Certificates of presence will be delivered to attendees at the conference venue. If you chose to collect your receipt at the conference, it will also be delivered to you upon check-in. Although on-site registration, both for the conference and the gala dinner, is available at the Help Desk, the receipts for these expenses will only be sent to participants in September.

Secretariat Contacts

The Help Desk will be open during the Conference days. General inquiries can also be addressed to the LOC at the icohtec2016@ciuhct.org. For inquiries regarding registration, you should contact our registration managers at congressos@novaidfct.pt.

THE KRANZBERG LECTURE

At the Rectory of the University of Porto

The Anthropocene: A Challenge to the History of Science, Technology, and Sustainability

By Helmuth Trischler

Date and Venue

This opening lecture will take place on July 26, from 18:00 to 20:00, at the Rectory of the University of Porto. This building is located at a 2km distance from our main conference venue, the Faculty of Arts and Humanities of the University of Porto.

The Speaker

Helmuth Trischler is head of research at the Deutsches Museum, Munich, professor of modern history and the history of technology at Ludwig Maximilian University Munich, and director of the Rachel Carson Center for Environment and Society. His main research interests are innovation cultures in international comparison; science, technology and European integration; transport history; and environmental history. He has conceptualized the world's first major exhibition on the Anthropocene which has been on display in Munich at the Deutsches Museum since December 2014.

Helmuth Trischler is the author of thirty-six books and edited volumes, some hundred articles, and the co-editor of a number of book series. His recent books include *Building Europe on Expertise. Innovators, Organizers, Networkers* (2014, with Martin Kohlrausch), *Welcome to the Anthropocene: The Earth in Our Hands* (2015, ed. with Nina Möllers and Christian Schwägerl), and *Cycling and Recycling. Histories of Sustainable Practices* (2016, ed. with Ruth Oldenziel).

The Lecture

When the atmospheric chemist and Nobel laureate Paul J. Crutzen and the limnologist Eugene F. Stoermer in 2000 proposed to introduce a new geological era, the Anthropocene, they could hardly foresee the remarkable double carrier to the new term. Only a few years later, the geological community began to investigate the scientific evidence of the concept and established the

Anthropocene Working Group. While the Working Group has started to examine possible markers and periodizations of the new epoch, scholars from numerous other disciplines have understood the Anthropocene as a cultural concept. Anthropologists and historians, sociologist and political scientists, philosophers and theologians, as well as representatives of many other scholarly communities have tried to make sense of the "age of humans" through the lenses of their respective disciplines. In addition, the media have developed a deep interest in the broader cultural ramifications of the concept.

The lecture sheds light on the controversially led debate about the Anthropocene and its inextricably linked dual careers as a geological and a cultural term. It understands the debate about the "age of humans" as a timely opportunity both to rethink the nature-culture-relation and to re-assess the narratives that historians of science, technology, and the environment have used to write. Particularly, it discusses new histories, new ideas to understand historical change, and new temporalities shaped by scholars who have embarked on the challenge of the Anthropocene as a cultural concept to question established stories and narrations.

SOCIAL PROGRAMME

Conference events

July 27

Visit to Port Wine cellars + Technological Boat Tour

Starts at 17:30. Bus meeting point at Conference Venue

The Port Wine Cellars are in the heart of the historical area of Vila Nova de Gaia, across the river from the old city centre of Porto. The cellars are located in long, cool, and dark warehouses, made of granite and with high ceilings that allow for keeping the atmosphere cool and stable throughout the year. In this tour we will visit three different cellars —Offley, Sandeman and Ferreirinha (SOGRAPE group)—, explore the production of the wine, and, in the very end, taste the "ruby" and "tawny" Port Wine.

Boat cruise between bridges followed by Gala Dinner

Starts at 18:30, after the visit to the Port Wine cellars.

When gliding in the waters of the river Douro, one has a different and magnificent picture of Porto and its twin city of Vila Nova de Gaia. The highlight of this tour boat is the six iron and concrete bridges built in the 19th and 20th centuries (one of them is the logo of ICOHTEC2016) and which tell the history of their construction and relation with local urbanism and evoke the economic, political and social history of Porto's bourgeoisie. We then move to a different boat for the Gala Dinner (20h00).

July 29

Tour to S. João da Madeira's Technological Park

Starts at 8:30. Bus meeting point at Conference Venue.
The visit included lunch.

The São João da Madeira tour, developed within a more general industrial tourism project, shows the local industrial tradition, combining old and new industries. Visitors will have the opportunity to explore the companies and factories located in the area and visit the Millinery Museum, thus linking the legacy of the past to the creative present and promote the large local hat industry and the main units of trimming and footwear industry. Nowadays all these brands already have an international reputation, which is the result of technological innovation.

Either by exploring the "hats to pencils" or the "shoe to felt", tours, we will be able to learn more about São João da Madeira's industrial tradition and present-day activity.

Post-Conference events

July 30

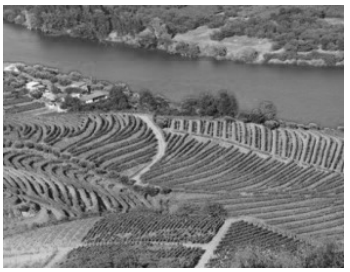
Pritzker Architecture tour

From 16:00 to 22:00. The tour convenes at the conference venue and the itinerary also ends there. Special ICOHTEC price: 85€/person. Book at http://bit.ly/ICOHTEC

Feel the modern façade of Porto, visiting the works of three Pritzker Prize winners and engaging on their style, techniques and materials in a clear and fascinating way. Explore Porto's most modern features, following the artistic footprints of the natives Siza Vieira and Souto Moura, and those of the Dutch Rem Koolhaas.

- Architect guides that will explain the visited buildings in an architectural perspective;
- Cost includes transportation throughout the entire route, entry to the Serralves Museum garden, Piscina das Marés and the Tea House da Boa Nova, and Regional Dinner in Matosinhos restaurant menu with starters, main course (sardines with potatoes, cod fillets with tomato rice, or pork roast with rice and roast potatoes), dessert, drinks and coffee.
- Audio guide equipment will be available if the group has more than 20 people;
- The price shown is for a minimum group of 15 participants.

July 31



Douro Cruise (Porto-Régua-Porto)

Starts at 8:30 and ends at 20:30. Tickets priced at 63€.
Reservations can be arranged by contacting
Maria Campos (maria@rotadodouro.pt).

Rota do Douro is a cruise company that specializes in one and two-day cruises, and it is one of the biggest cruise companies operating on the Douro River. With a diverse and well equipped fleet, they would be more than pleased with having the privilege of accompanying you in visiting and observing one of the largest rivers situated in the Iberian Peninsula. Come and share with us a Porto of Honor while we escort you on a trip designed to provide you with the best means possible to be able to fully appreciate the scenery, that along with its beautiful vineyards and small riverside populations will serve as the background for what will certainly prove to be a most memorable journey. Come and discover the history and beauty of the region responsible for creating one the most widely known beverages in the world!

Any day events

Blue Bus city tour

First at 9:00. Last at 18:30. Tickets as low as 10€.
See this website for more:
http://www.visitporto.travel/visitar/paginas/descobrir/DetalhesCircuito.aspx?Circuito=64

Blue Blus takes you for a visit to the most significant spots in the city, and you can enjoy this tour your own way. There are three ticket options available: Continuous Tour (tour leading you along the city's buildings, monuments and attractions. You may choose where to hop off, but you cannot hop back on); 2-day Tour (you can hop on and off as many times as you wish, for two days); Tour 2+1 (2-day tour by sightseeing bus and cruise in the river Douro, aboard a Rabelo boat – 50 min).

Porto Tramway city tour

Starting at 9:00, every 30 minutes.
Tickets as low as 2.50€ (one trip). Know more at:
http://www.stcp.pt/en/tourism/porto-tram-city-tour/

The network of electric historical tramcars of STCP, SA - Porto Tram City Tours – constitutes an inescapable ex-libris of Oporto city. With a history dating back to 1872, when the first line of "American cars" of the city of Porto was inaugurated, the network of electric cars is currently constituted by 3 distinct STCP lines that run through the most emblematic areas of the city:

- Line 1, or Riverside Line, makes the route between the historic centre of Porto and the garden of Passeio Alegre on a single path along the banks of the River Douro;
- Line 18, or Restoration Line, which runs between Massarelos and the Carmo on a path that connects the historic parish of Massarelos to Garden of Cordage, rope, Twine and its surroundings;
- Line 22, or Low Line, which traverses the emblematic streets of the city centre of Porto in a circular route between Casey and Battle/Guindais.
- Boarding at Cais da Estiva (Porto)
- Lunch on board at 12:00.
- Arrival to Régua at 15:45, followed by transfer via tourism bus to a Port Wine farm
- Transfer to railway of Régua after farm visit. Return to Porto by train at 18:48
- Arrival to Porto railway station at 20:35 (Estação de Campanhã)

Lisbon Experience (Private Tour)

Departure time is adjustable to your needs.
Price starts at 45€ per person. Know more at
http://www.tailormadetravel.pt/index-portugal.html

The Tailor Made Travel company offers customized private tours to sites in the Lisbon area (including Sintra and Cascais) but also to the West region that includes the landmark cities of Fátima, Nazaré and Óbidos. Their Lisbon Experience tour is adapted to your interests — historical, gastronomical, social, cultural. It starts next to your place of accommodation and can last up to a full 8-hr day, going through the richer quarters in the city (Alfama, Chiado, Príncipe Real, Belém). Also of note is their tour to Lisbon's jewish heritage: for 900 years Lisbon has been the most relevant sephardite city in the Iberian Peninsula.

Wednesday, July 27. 09:30-11:00

SESSION W1A — Room 201

11th Annual Symposium of the Social History of Military Technology 1

Organiser: Bart Hacker **Chair:** TBA

Early Modern Norwegian Ski Troops, 1674–1826

Frode Lindgjerdet (Norwegian Armed Forces Museums)

Skis had been widely used by peoples in Scandinavia and Western Russia since the Neolithic period. Yet, it was Norway who became first to employ specially trained ski troops during the continuous warfare between Denmark-Norway and Sweden of the Early Modern period. The officer classes constituted a cosmopolitan social group of mostly continental origin with no knowledge of skiing. Throughout the period Norway became one of the most militarized societies in Europe, but while Danish units consisted mostly of enlisted personnel recruited all over Europe, Norwegian soldiers were by and large conscripted, the reason being lack of a powerful landed aristocracy resisting their workforce bounded by being drafted for service.

But still under dominance of foreign officers, it took dire operational necessity for the knowledge of skiing among the troops to be put into systematic military use. Norway and Sweden share a long border running through mountainous wilderness. The only way to detect massing of troops and supplies on the Swedish side during winter was by using skiers. Horses would not find fodder and would perish in the harsh climatic conditions during what later become known as the little ice age, which excluded traditional scout cavalry. When war broke out, ski troops would shadow enemy units, intercept supply runs and messengers. Sniping at officers and guard posts as well as staging ambushes, forced the enemy to use a lot of energy on building field fortifications and maintaining a high state of alertness even far behind the front lines.

Science, Technology and Religious Control in the Spanish Colegio de Artillería during the 18th Century

Juan Navarro-Loidi (Sánchez Mazas UPV-EHU)

The relationship between science and religion in Spain has been studied by many books. This paper focusses on the not studied manifestations of this relationship in the Spanish Colegio de Artillería from its opening in1764 to the starting of the Peninsular War in 1808.

Spain was a paradigm of Catholic Kingdom in the 18th century and orthodoxy was guaranteed in military institutions such as this College of Artillery of Segovia; but the Spanish artillery had to master the new scientific theories to avoid being behind other kingdom's armies, and the new sciences were not well accepted by the Holy Inquisition. Moreover, the Crown and the Church were aware that new philosophies supported by free-thinkers could come with the innovative sciences of Newton or Lavoisier. These questions caused some problems in the progress of the institution. In this paper several occurrences of the control of the library of the College by the Inquisition are studied and also how there were some complaints for being "jacobinos" (liberals) against the Colegio. Nevertheless, no direct accusation against a professor or a student has been found, except for Proust (and in his case it happened before arriving to Segovia), neither was any strong confrontation for these issues.

The Prussian Kriegsspiel 1824 to 1871: Learning How Technological Change Affects Warfare through the Use of Professional War Games

Jorit Wintjes (Julius-Maximilians-Universität Würzburg)

The 19th century saw dramatic changes in military technology, profoundly changing the nature of warfare, and integrating new technology into the existing operational and tactical thinking became hugely important. In Prussia, from 1824 onwards, the *Kriegsspiel*, the world's first professional conflict simulation in official use, became a key element for learning how to make best use of the new technology. Between 1824 and 1871, the rules went through at least ten different editions, each one revised according to the latest technological and tactical developments. For half a century, professional war gaming remained a Prussian peculiarity; it was only after the Prussian success in the 1870/1871 war that all the other industrialized nations followed suit, first by translating Prussian *Kriegsspiel* rules and soon by adapting them to their own requirements.

Despite its importance, the Prussian *Kriegsspiel* has seen fairly little scholarly interest. The paper will therefore provide a brief historical introduction, then concentrate on impact of certain well-known technological innovations like the needle gun on the rules – to what extent were the rules changed, and did the changes produce results sufficiently close to reality? Finally the paper will take a brief look at post-1871 developments, when the *Kriegsspiel* was introduced into all industrialized armies within a decade. In all, the paper will show that the *Kriegsspiel* and its non-Prussian counterparts are essential for understanding how military establishments in and beyond Europe reacted to the impact of technology on war.

SESSION W1B — Room 202

Current affairs: building an international network on the history of electricity supply and consumption

Organiser: Michael Kay **Chair:** Graeme Gooday

Constructing Images of Electricity: Marketing Strategies of Foreign Companies in Russia (1880 – 1917)

Natalia Nikiforova (Saint-Petersburg Polytechnic University)

In nineteenth-century Russia predominantly foreign companies operated successfully on the electrical market. Russia had its own developments and inventions, but relied on foreign expertise and equipment. In the 1880s three foreign companies supplied power and manufactured electrical appliances in St. Petersburg. These companies developed marketing strategies that would make the novelty acceptable and welcomed by Russian consumers. Companies constructed an image of the technology relying on various themes: elegance and innovation (Siemens & Halske); appeal to women's taste and promise to transform household practices (Belgian Society for Electric Lighting); functionality and simplicity (Helios). Electric lighting was first encountered by audiences through dazzling visual effects at Imperial spectacles. These supported the Emperor's scenario of power and national ideology by using illuminated national flag, symbols, and church crosses. Advertisements developed national pride by utilizing Russian traditional motifs and Lubok, suggested an idealized reality, and emphasized the desirability of material abundance. Electric lighting became a feature in department store advertisements, and was inscribed in the visual culture of modern commodity spectacle inspired by the idea of exhibitions. The paper will look at pictorial conventions, symbolism, historical allusions and social themes in representations of electricity in

Russian advertising, engaging with Loeb's Consuming Angels (1994) and Gooday's Domesticating Electricity (2008), where advertisements were analyzed in relation to the ideas of progress, national identity, social values. This representation of electric lighting as a part of consumer culture and material values develops Richards' conception in The Commodity Culture of Victorian England (1991).

'For Health's sake – Use Electricity': Electrical Advertising in interwar Britain.

Paul Coleman (University of Leeds)

By the end of the First World War the importance of improving the supply of electricity for industrial purposes had been recognised by the Lloyd George government, which viewed access to a 'cheap and reliable supply of electricity' as being vital to the future prosperity of the country.

During the interwar period advocates of electrical products and services in Britain began to advertise domestic electrical goods and services, competing with the established gas industry in an attempt to create a demand for these products. This was demand needed to balance the electrical requirements of industry and lighting enabling companies to produce electricity more economically. Therefore meeting Lloyd George's demand for a 'cheap and reliable supply of electricity', which was required to power his plans to rebuild Britain's economy and society after the war.

This paper builds on Bill Luckin's (1990) Questions of power by examining the language and imagery used to sell electricity to the British public, particularly the appeals to modernity, cleanliness, economy and convenience over older forms of heating, lighting and cooking. Further to this I examine the possible reasons for much of the electrical advertising in Britain at this time being directed housewives. I argue that one potential reason was their enhanced familiarity with electrical devices after operating high voltage electrical machinery in munitions plants during the war. This would also account for the way in which issues related to electrical safety are absent from electrical advertising during this period.

Unpicking "Anglo-American culture". Early telephony in Britain and America

Michael Kay (University of Leeds)

Carolyn Marvin (1989) in her cultural history of electric light and telephony examines the development of and responses to these new technologies. She draws her examples both from Britain and from America, referring to "Anglo-American culture", but in doing so does not draw out the differences between the two national contexts. In my contribution to this roundtable discussion I highlight some of these differences and their significance to the uptake of telephony in Britain, including: the geographical distances involved in communicating within each country, class structure, the establishment of independent telephone companies, the use of private wire telephony, and the context of existing communications methods and technologies.

Scholars of British telephony over the past few decades have often followed the lead of Charles Perry (1977) in noting that the use of telephony in Britain suffered initially from a "delay" (eg Michie, 1985; Hall, 2008; Johnson, 2011). However my research considers the importance of international differences in contributing to differing patterns of telephone use. Indeed, given the problems faced by early telephone users in Britain, it is prudent to ask not why people did not rapidly embrace telephony, but why those who did use it decided to invest in such an expensive and unreliable technology. One answer is that wide-scale use of the telephone in America raised expectations of what a larger exchange network could be, and subscribers optimistically bought into this vision despite the limitations of the technology. This provides evidence for the importance of examining international interactions when considering the development of electrical technologies.

SESSION W1C — Room 203

Petroleum and technology: artifacts, know-how and labor inside and outside the barrel

Organiser: Francesco Gerali **Chair:** Alexandre Herlea

Innovation and Sustainability Patterns in Oil and Gas Petroleum in Romania

Elena Helerea (Transilvania University), Victoria Cotorobai and Laura-Teodora Cotorobai (Universitatea Tehnică Gheorghe Asachi din Iaşi)

Nowadays, the efforts for rational exploitation of the natural hydrocarbon resources and the reduction of environment effects are sustained through new innovations in the renewable resources, as in the case of hydrogen technologies.

The authors propose a paradigmatic analyze of the technological innovations that have revolutionized the oil and gas industry in Romania.

Based on a great volume of references, books, magazines and patent descriptions, the paper analyzes the socio-economic impact of the innovative technologies and inventions in oil and gas petroleum drilling area, in the period of industrialization in Romania, developed by the prolific Romanian engineers and inventors:

Gogu Constantinescu (1881-1965): Rotary motor actuated by alternating fluid-currents (US1334291 A); Pump (US1570554, 1926); Ioan Basgan (1902-1980): A method for increasing the efficiency and improving the rotary drilling through the percussive rotation and dumping the hydro-mechanic pressures (RO22789, 1934); Virgiliu Tacit and Valeriu Puscariu (first patented apparatus for eruptions prevention, in 1912), and Lazăr Edeleanu (1861- 1941) with his innovative process of selective refining of petroleum fractions.

The innovative technologies and inventions in Romania in the area of inorganic gas extraction, together with new techniques of oil & gas regeneration, are also analyzed. The results of this study confirm the hypothesis: the oil and natural gas have played a major role in the evolution of Romanian society since the mid nineteenth century until today, being an indicator of the economic and social development.

'A difficult geology': production of geoscientific knowledge and a missed shale gas revolution

Roberto Cantoni (LATTS - Ecole des Ponts ParisTech)

In 2011 a report released by the US Energy Information Administration attributed to Poland Europe's largest reserves of shale gas. The report, which was based on analogy modelling of Polish shale plays on American ones, and whose estimates were given high resonance in Polish media, triggered a massive response by national and international gas companies. Large international gas companies, both American and European, flocked to Poland and soon started exploratory activities. In the years following the US report, however, other studies by national geologists significantly downgraded previous estimates. Such novel geological knowledge was one of the factors that, together with a new regulatory system implemented by the Polish government, macroeconomic conditions and especially unexpected geological difficulties, eventually prompted most international large companies to leave Poland a few years later. In this paper I focus on the geological aspect, and analyse the dynamics of knowledge production in the geological realm through a series of interviews carried out with governmental geologists, gas companies' consultants and executives. How was geological information used to support an image of Poland as a new energy titan? To which political agenda was this discourse functional? To which extent were geological difficulties unexpected, and construed as the main reason for companies to leave the Polish business? How are current Polish technological and scientific projects being developed in order to approach geological issues? These questions will be addressed through a discourse analysis and interpreted through an historical/STS approach to the problem of energy security in Poland.

Know How, Technology and Economy of the Italian Petroleum Industry between 19th and Early 20th Century

Francesco Gerali (The University of Oklahoma/The University of Western Australia), Paolo Macini and Ezio Mesini (University of Bologna)

The paper investigates the achievements of the Italian petroleum industry in Northern Italy between mid-19th and early 20th century. Here are highlighted some aspects of technological, political and economic history, together with the advances of the geological knowledge of northern Apennines.

In 1911, the Italian government approved the first law of the National State to support domestic oil and gas industry, granting a financial reward for every meter of exploratory drilling. The Italian economist Luigi Einaudi harshly criticized the law because the oil industry managers and technicians at the time did not have both the technological and the financial strength to guarantee satisfactory results.

In the same year, the seminal study by Enrico Camerana and Bartolomeo Galdi was published in Bologna, which is an irreplaceable testimony on the state-of-the-art of hydrocarbon research in Emilia. Italy is not (and never has been) a country of "easy" hydrocarbons. Some of the factors that contributed to the many failures of early oil and gas exploration were the financial inconsistency of the oil companies, the scarcity of geological and technical training, together with the intrinsic difficulties of hydrocarbon exploration in the Italian petroleum systems. The focus of Camerana and Galdi aimed to the precise location of surface oil seepages, and to identify the origin of petroleum systems. Lastly, in the timeframe considered in this study, it is worth recalling the publication of two technical treatises by L. Perreau (1885), and by brothers J. and L. Massarenti (1920), the forerunners of drilling manuals in Italy.

Oil exploration down under: the case of Western Australia at the beginning of the 20th century

Francesco Gerali (The University of Oklahoma/The University of Western Australia)

The lecture focuses on the early development of the oil upstream (exploration & production) in Western Australia in early 20th century. This state was an important training ground for the national oil sector, providing the historian with an original subject of study for understanding Australia's energy history.

The Australia demand for oil at the beginning of the 20th century was covered entirely by imports due to the lack of inland production. Existing metallic mining activity was rewarding Australia through the development of mining technology and the creation of a skilled labor force, but petroleum was not part of this scenario. The drilling engineering and machinery used in the few oil ventures attempted was based on know-how borrowed from water and coal drilling. Geologists at that time could suggest only general theoretical models to outline oil accumulation and stratigraphic sequences, because the scarcity of geological literature.

The development of knowledge requires intense interaction between human society and the surrounding environment, and Australia was a young, huge and little populated country-continent. Finding mineral oil was a complicated art that required time, knowledge, luck, and much science. From 1902, Western Australia was the stage for a series of ambitious oil ventures during an age when the industrial potential of nations was measured by the number of oil barrels they produced and/or consumed. Resourcefulness, readiness to learn, and opening up to international scholarship and industry were the real driving forces of the long maturation of upstream oil in Western Australia.

SESSION W1E — Conference Room 2

Computers in postwar society 1: Uses of Computers: Chess, Medical Expert Systems, Musical Creativity

Organiser: Hans-Joachim Braun **Chair:** Gleb J. Albert

Deep Blue versus Garri Kasparov: How Concepts of Intelligence Changed

Martina Hessler (Helmut-Schmidt-Universität)

In 1997, the IBM Computer Deep Blue defeated the chess world champion Garri Kasparov. The tournament was called a milestone in the history of computer chess. Moreover it was a spectacle, a media event as well as part of IBM's marketing strategy. The battle between the computer and the human shocked so many observers who had always rejected the idea that a computer could beat a chess champion. However, the development of chess programs has been part of artificial intelligence research from the beginning, since, as history of technology has already shown, chess was regarded as a paradigm of human intelligence in artificial intelligence research. While computer chess has already been a topic of research (i.e. Ensmenger 2012), surprisingly, the series of competitions between computers and humans has not come under scrutiny.

The paper firstly outlines the meaning of chess for artificial intelligence research. Second, it focuses on the closely connected question of how intelligence and thinking were conceptualized in the context of computer chess by different groups. The main aim of the paper will be to show how the terms became contested and were redefined by various actors. So, the paper is based on various

sources such as newspapers, philosophical articles that discuss the consequences of the event, papers from artificial intelligence researchers as well as chess magazines. Altogether, the paper will make clear how concepts that are central for human self-understanding, were challenged and redefined in relation to the computer.

Is a Computer Creative? Computers and Musical Creativity since the 1950s

Hans-Joachim Braun (Helmut Schmidt Universtaet Hamburg)

In the late 18th century W.A.Mozart applied aleatory principles in his "musical game of dice"; in 1842 the British mathematician and writer Ada Lovelace wrote about Charles Babbage`s calculating engine that it might be "capable of such expression and adaption as to compose elaborate pieces of music of any degree of complexity and extent". More than hundred years later Alan Turing, as a joke, produced programmed love letters on a computer.

Is the computer itself creative? Or is it always the programmer who is creative, with the computer playing only a role of "derivative creativity?"

This view was definitively predominant in electronic and computer music until the 1980s, but with machine learning, neural networks and "affective computing" this view has changed, at least in some quarters. Algorithms which allow a machine or a machine and humans to display emergent behavior have become an essential means of new media art.

I will argue that in this process and in the discussion of collaborative creativity there are different "stakeholders" involved and I will make an attempt to identify them and assess their various contributions to the debate. One group argues that it is necessary that computers close the "humanity gap" between computers and humans. Others point out distributed creativity in which composers and computers act in synergistic tandem. In interpreting these arguments my thesis is that we need to have a closer look at the definition of creativity, which has undergone a process of change during the last three decades.

From Reasoning to Action. The Paradigm Shift in Robotics

Frank Dittmann (Deutsches Museum)

1997 was an important year for research on Artificial Intelligence (AI). In May 1997, the highly regarded competition between the world champion Garry Kasparov, who is considered as one of the strongest players in chess, and IBM's chess computer Deep Blue took place, won by the machine. Thus a machine had struck the man in the royal game and chess was no AI problem anymore.

In August 1997 also The First Robot WorldCup was held together with the International Joint Conference on Artificial Intelligence in Nagoya, Japan. With the robot soccer game AI found a new central test field for research which had been lost a few months ago because of Deep Blue's victory in chess. A soccer robot has to act purposefully in a dynamic world and in real time despite of incomplete information. Thus the year 1997 stands symbolically for a radical paradigm shift in Artificial Intelligence from reasoning in symbolic spheres to acting in the real world. The presentation deals with reasons and consequences of this paradigm shift.

SESSION W1F — Amphitheatre 2

Wine in History: between Technology, Science and Transfer of Knowledge 1

Organisers: Irina Gouzevitch and Dmitri Gouzevitch

Chair: Antoni Roca-Rosell

The transfer of European wine-making technologies and the rise of national-scaled wine industry as part of a new Europe-oriented imperial Russian culture (18th and 19th century)

Dmitri Gouzevitch and Irina Gouzevitch (Centre Maurice Halbwachs, EHESS)

From the earliest attempts to introduce small-scale wine production in the mid-17th century to the establishment of the national-scale wine industry, Russia took more than two centuries to experience various modes of its organization. As the climate of central regions was too cold to cultivate grapes, the early vineyards with an associated artisanal winemaking appeared in the gradually attached southern territories near Caspian, Azov and Black seas. Obviously, the most of these

industries which served initially almost exclusively the needs of the church and of the royal court could be established thanks to the foreign exerts, mainly from Saxony, Hungary and France. The new "Russian" wine issued with time from this fusion of Western technologies and local tradition meet successfully the growing demand and the particular taste of local consumers who preferred sweet and semi-sweet wines more in line with local habitus and cuisine. The intensification of this process was closely linked with the emerging Europe-oriented imperial culture and its new ambitions in terms of lifestyle and modes of consumption

This paper will be focused at three main periods of this process: Peter I's initiatives which laid the foundations of European-style industrial Russian viticulture (1710s-1720s); the establishment of scientifically based viniculture initiated by the statesmen (Richelieu, Vorontsov) and academicians (Pallas, Steven) who promoted special training (School of viticulture, Sudak, 1804) and research centers (Nikitskij Botanical Garden, Crimea 1812); the exemplary private high tech enterprises of Golicyn (1890s) which became a glory of Russian viticulture (Novyj Svet, Crimea, and Abrau-Durso, Novorossijsk).

The clone wars. An early example of wine technologies: fortified wines and Marsala

Giovanni Ceccarelli and Alberto Grandi (Università di Parma)

Marsala is one of the most renowned Italian wines and can be considered a typical example of the "made in Italy" food industry. This is a peculiar wine, since it undergoes the process of fortification: the addition of spirit to stop fermentation. Madeira was the first to experience this technique; tested first around the 1720s, it was widely used by 1790, and later adopted in producing Port, and Sherry. Longer preservation, granted by fortification, fostered an early long-distance trade of this class of wines: by the end of the 18th c. Madeira, Porto and Sherry became leading products in the international wine trade.

Marsala is "a second comer", starting to be produced by English entrepreneurs when the market was dominated by other products. By the 1850s century, after having faced a fierce competition with several other "clones" of the dominant fortified wines, Marsala is able to fill the gap, acquiring a sound reputation in Britain and USA. We suggest that the adoption/adaptation of techniques/technologies used in producing Porto, Sherry and Madeira was crucial for Marsala's success, making it a product different from the other "clones". Some examples of this transfer include steam-power adoption in all possible production stages, wine mixing and fining techniques,

like the solera method, and the use of tierra de vino. This product was so strongly identified with technology and modernization that, around the 1860s, the surroundings of Marsala are described in English and Italian sources like a piece of industrial Britain in a savage and underdeveloped region.

11:30-13:00

SESSION W2A — Room 201

11th Annual Symposium of the Social History of Military Technology 2

Organiser: Bart Hacker **Chair:** Ciro Paoletti

Ironclad Strategies in the United States and Confederate States Navies: Contrasts in Policies, Processes, Personnel, and Practices

Seymour Goodman (Georgia Institute of Technology)

The race to first battle between steam powered ironclads at Hampton Roads Virginia began with the Lincoln administration's strategy to isolate the rebellious Confederate States diplomatically, economically, geographically and militarily. A large part of this effort was to take the form of a naval blockade of the more than 3500 miles of Southern coasts and inland waterways. The Confederate counter-strategy included the unprecedented attempt to break the blockade through the design, construction, and deployment of several large, powerful ironclad warships. This effort to build the first of these got under way within weeks after the start of the war in April 1861, and the C.S.S. Virginia was completed and went into action within 11 months. This major technological feat was accomplished under exceptionally difficult human and industrial limitations and circumstances. The U.S. Navy, the other contestant in this race, was remarkably slow in coming to grips with the enormous threat the Confederate effort would pose, but the far superior human and industrial resources it had at its disposal enabled it to catch up by fielding one of the most technologically innovative warships ever built in the U.S.S. Monitor. This paper will focus on the people involved--from the different Navy Secretaries to the different crews. Attention will also be paid to the follow-on ships each side constructed and to how support systems worked.

Technological Innovations in the Construction of the Monitors Pará, Alagoas, and Rio Grande in 1868 at the Rio de Janeiro Marine Arsenal

Guilherme de Andrea Frota (Instituto de Geografia e História Militar do Brasil)

The Pará-class monitors were designed to meet the need of the Brazilian Navy for small, shallow-draft armored ships capable of withstanding heavy fire. The monitor configuration was chosen because the turreted design could engage enemy ships and fortifications better than the casemate ironclads already in Brazilian service could do. The basic design derived from John Ericsson's American Civil War ironclad, the USS Monitor, which famously fought the CSS Virginia at which gave its name to the entire class of warships. The innovative hull of the Pará-class ships marked a distinct departure from earlier monitors. It was made from three layers of wood that alternated in orientation. It was 457 millimeters thick, was capped with a 102 millimeter layer of peroba wood. It had a a bronze ram and was all sheathed with the brass called Muntz metal in order to reduce, hence that class was quite innovative for that time.

SESSION W2B — Room 202

Inventing new consumers: innovation, sustainability and consumption

Organiser: Programme Committee **Chair:** Stefan Krebs

"Dial M for Modernity": Technological Change and the Re-education of the Telephone Subscriber

by Jan Hadlaw (York University)

Although dial telephony was invented in the late 1800s, Bell Canada did not adopt it until 1924. Bell's hesitance was in keeping with its goal of controlling any technical and human variables that might affect the quality or profitability of its telephone service. While dial service promised to reduce labour costs, it also made the telephone company reliant on telephone users' ability and

willingness to replace established habits, etiquette, and knowledge with new practices and conceptions of telephony. Subscribers unwilling to place their own calls or not doing so correctly could significantly compromise efficient network operation.

When Bell Canada finally introduced automated exchanges, first in Toronto in 1924 and then in Montréal and Québec City in 1925, it paid great attention to how to best anticipate and manage the human variables that subscribers presented. By the time dial service was introduced in Hamilton in 1929, Bell had developed a comprehensive programme to educate both Bell employees and subscribers about dial service and to promote its proper use.

Drawing on documents and images from the Bell Canada archives as well as media accounts, this paper examines the extensive educational and promotional strategies implemented by Bell to prepare its employees and subscribers for the introduction of dial service. It argues that Bell's programme not only taught its subscribers how to properly use dial telephone technology, but also helped to redraw the boundary between humans and machines, integrating users and non-experts into the operation of large technological systems.

Alternatives to the octopus: independent telephone companies in Britain and America, 1879-1911

Michael Kay (University of Leeds)

After the expiry of Bell's American telephone patents in 1894, a multitude of local independent telephone exchange companies were established around the US to compete with the Bell company's telephone monopoly - likened by some contemporary comentators to an octopus, stretching its tentacles across the country. MacDougall (2014) examines how this American independent telephony movement grew until the late-1900s.

However, this paper explores the way in which similar ventures were promoted in Britain from 1879 until 1893. I demonstrate how these local companies were formed, and why. In doing so I introduce the categories of open and closed networks to explain the success of these smaller systems, and also to help move towards a better understanding of the successes of the small telephone exchanges run by the Post Office in Britain in this period.

I show that together these local independent exchange companies promoted a different ideal of telephony from the national Bell and Edison system: that of a national network composed of

interconnected local systems. This was the same ideal held years later by the American independent telephone companies.

Whereas British independent companies were active up until the expiry of Bell's patents, but not afterwards, in America it was the other way around. As telephone uptake in America was greater than in Britain, the latter has sometimes been portrayed as backwards or delayed (eg Perry 1977). In this instance however British attempts to popularise smaller local telephone networks predated their American counterparts, and I will suggest social and cultural reasons why this was the case.

Expanding the Market…with Steam: Inventing New Consumers with the First Generation of Steam-Powered Vessels

John Laurence Busch (*Independent Historian*)

In 1807, the American Robert Fulton created in New York City the first commercially successful steamboat, proving that it was possible for humans to use an artificial power to alter a person's location to practical effect faster than by natural means. As such, steam-powered vessels may be considered the first "high technology" in history.

But getting the general public to accept these new-fangled contraptions took some effort. In due course, the first generation of steam vessel entrepreneurs found a variety of innovative ways to expand the market for the "new mode of transport," and in so doing, created new categories of consumers that had barely if ever existed before.

This paper and presentation will analyze how the first generation of steam vessel operators (1807~1820) designed and employed their craft in such ways as to encourage patronage, and how different segments of traveling consumers were either greatly expanded or, in some cases, practically created. These range from business hyper-travelers to women to tourists to commuters to escapists. The primary geographic focus will be the United States and the United Kingdom. Also explored will be the variation in consumer creation based upon a variety of factors, including environment and the ability of entrepreneurs to sustain service.

The presentation will close by placing steam-powered vessels in the context of other high technologies, illustrating how this expansion of the consumer market…with steam…represents the beginning of a new world of the high technology consumer.

I will happily entertain Q&A for as long as time allows.

SESSION W2C — Room 203

Hydroimperialism, hydrocapitalism, communism and what else?

Organiser: Ana Paula Silva **Chair:** Ana Paula Silva

Commentator: Maria Paula Diogo

Vltava Cascade as a soviet imperial project? Transformation of a river utilization scheme in Cold War Czechoslovakia 1947-1963

Jiří Janáč (Czech Academy of Sciences)

Between 1947 and 1963 the swift construction of a cascade of dams (Lipno, Orlík, Kamýk, Slapy) transformed the Vltava river into a single large electric-power generator. While projects for utilization of the river have been developed since late 19th century, the final project marked a fundamental discontinuity with the past. Instead of a system of low head dams accommodating various competing uses of the river, the new design with only four high dams gave nearly absolute preference to hydropower.

This sudden change in the design (and planning in general) coincided with abrupt change in the Czechoslovak economic policy. In early 1950s Czechoslovakia abandoned the policy of „national way to communism" and replaced it with more straightforward adoption of the soviet model. In water management it resulted in appropriation of soviet concepts of "big structures of communism", "Stalin's plan for transformation of nature" and development of the new water law, characterized by nationalization of all waters. Furthermore, soviet advisors and experts became directly involved in the planning of water structures.

This paper, by looking at the interaction between soviet experts and ideas and Czechoslovak engineers with their own tradition of water management, seeks to analyse the development of Vltava cascade scheme from the perspective of hydroimperialism. To what extent did the development of Vltava River reveal and reproduce unequal power relations within soviet bloc? Is it possible to see the scheme as a direct application of the soviet hydraulic knowledge including implicit political goals? Were Czechoslovak experts aware of political implications?

The Soviet Union and the Aswan dam (1960-1971): liberation's aid or imperialism?

Benjamin Brendel (University of Giessen)

The Soviet Union didn't rule an informal empire in Eastern Europe only, but was influential in Africa as well. The propaganda machinery presented a picture of the African peoples who were able to destroy the chains of colonialism through soviet technology. Big dams as major development project of both superpowers during the cold, were seen was one way to reach this target. At the same time this aid was a camouflaged tool for changing the societies in an almost imperialistic way to a soviet system. The national elites in Egypt in the 1960s used this idea to connect it with planes for a radical change of the local population at the periphery of the country.

When the water level rose a discourse about the past and the future of the local population started. The Egyptian government, engineers and international archaeologist and anthropologists started a discussion about the importance of the cultural heritage current and from ancient times and the best way to transform the living conditions of the Nubians, which settled there, to a modern level. Cynically nobody asks them about their opinion.

This presentation aims to show the discourse about different conceptions of the past and the future during the construction of the Aswan dam (1960-1971). It shows the constellation of power which were connected to the different conceptions and will connect the mental world of modernity with the suffering of the people on the spot.

Inner and external drivers of the Portuguese Hydroimperialism

Ana Paula Silva (CIUHCT-NOVA)

The electrification of Portuguese colonies (Cape Verde, Guinea-Bissau, São Tomé and Príncipe, Angola, and Mozambique) began with isolated, small-scale generators supplying farms/plantations, industries, and municipalities with lighting, promoted by colonial administrators and private entities. After World War II, the process changed completely. Throughout the 1950s, Europe recovered on the basis of overseas territories development, for which the Marshall Plan allocated funds. Also driven by the urgency to promote the progress of indigenous peoples. Low cost energy was associated with development and economic prosperity, which was eagerly pursued by a little-

industrialised country such as Portugal with a vast empire to administrate and legitimize in the international arena.

Therefore, the Portuguese authorities developed planning and hydropower production strategies. The mastery of river water aimed at (1) irrigating the surrounding land to increase agricultural production, (2) producing electricity at a low cost to promote industrialization and (3) improving communications. Among the big dams the Portuguese built in Africa there are good examples to illustrate the ingenuity of a country under international censure, carrying out a war effort overseas, with scarce financial resources but well trained engineers to accomplish ambitious projects.

This paper will clearly show that construction of dams and its particular design indeed reveal existing power hierarchies; hydraulic knowledge and water regulation practices reproduce unequal power relations; visions of dams are developed in imperial centres by hydraulic engineers, who are the implementers of colonial visions regardless local inhabitants' needs and interests. None of that, however, would have be possible without international ambiguous support.

SESSION W2D — Room 208

Innovation in Oil and Gas Industry 1

Organiser: Eldar Movsumzade **Chair:** Eldar Movsumzade

Commentator: Olga Poletaeva

Development of Pipeline Transportation Technologies of Viscous Oils and Oil Products

Pavel Revel-Muroz (Transneft JSC)

An issue of transportation of high viscous and high pour point oils became especial actual due to their great increase in common amount of oil production.

The majority of produced oil in Russia is high-paraffin, i.e. it contains a great amount of alkanes of neutral or extensive structure. The last one is notable for high pour point temperature that cause deterioration of rheology dynamics (mobility, flow state, etc.) of oil as well as oil products. The fact has an effect on the production and transportation processes of oil. Thus the issue is an object of research to improve technological aspect of oil industry.

The main problems when transporting high viscous and high pour point oil are connected with its low mobility, high pour point temperature and paraffin deposition inside the pipe if the high viscosity is caused by the high content of paraffin.

Commonly known methods of transportation of high viscous oil that were applicable at different time periods are: prewarming ("warm" transportation); heating along the pipe (including the use of skin effect); thermal treatment; the use of low viscous dilutants; the use of gas saturated oil products; the use of water solutions of surface active reagents; the use of depressants.

The use of depressants is the most effective solution to increase low temperature parameters of oil and oil products. Concurrently flow ability of oil is increasing at low temperature conditions. The paper covers the development of named technology relating to oil pipelines of Russia.

Technologies for Effective Work of Main Pipelines

A.A. Nikishin (Ufa State Petroleum Technological University)

Pipeline transportation of Russia (USSR) has over a century history. The appearance was caused by the beginning of industrial production of oil fields of Baku and Grozniy.

Overall length of main pipeline system of JSCo "Stock company "Transneft" is about 50 000 km by the XXI century. It connects almost all regions of oil production in Russia with the refinery centers and export terminals as well as provides stable operation of oil market in general.

A lot of problems we appeared from the beginning of oil pipeline exploitation. The problems were connected with oil pumping from different fields. The main problems are: deposition of asphalt, resin and paraffin materials on the inlet surface of a pipe; pipeline transportation of high viscous and high pour point oils; batching of different oils; transportation of gas saturated oils.

JSCo "Stock company "Transneft" support transportation process of 96% of overall oil produced in the country to oil refinery facilities of Russia, to near-abroad countries as well as transition of oils from Kazakhstan and Azerbaijan through the Russia territory. Great significance is given to implementation of new modern methods when analyzing issues of effectiveness improvement of oil pipeline operation. These methods allow guarantee safe and reliable operation of oil pipeline system when implementing all liabilities of oil pumping.

Development of Technical Aids for Oil Pipeline Diagnostics

Anatoliy Soschenko (Transneft JSC)

Nowadays pipeline transportation is the most economic type of oil, gas and oil products transportation. Stable and safe operation of the system has significance of the first magnitude for economy of Russia.

By the moment overall length of pipelines in Russia is exceeded 200 000 km. Main oil and oil products pipeline systems of Russia were building at the period between 1950 up to 1980. The main part was built between 1960 to 1970 to deliver oil of West Siberia fields to consumers in central region of the country. The period could be characterized with speed construction of long distance and great diameter pipelines.

By the 1990s conventional techniques of reliability guarantee and prevention of unsafe operation of old main pipelines couldn't be applied. Increase in amount of accidents, increase in exemplary damages and toughen of requirements for conservancy lead to development of new techniques in safety operation of main pipelines.

The use of in-line inspection (ILI) is one of the major part of a solution of named issue. By the establishment of the ILI system in Russia the world experience had already had some samples of smart pigging. However that experience was not systematically and mass because of periodical inspection of independent pipeline sections.

The paper covers the reasons that required the development and application of new equipment and techniques while inspecting native oil pipelines.

SESSION W2E — Conference Room 2

Computers in postwar society 2. Computers and the public sphere in western and eastern Europe from the nineteen eighties

Organiser: Dick van Lente **Chair:** Martina Hessler

Hackers on the playground of computer-cultures in the 1980s in Germany

Julia Erdogan (ZZF Potsdam)

There were sub- and countercultures dealing with the computer as a new medium right from the commencement of computer-usage. Thereby, Hackers pursued own practices with it and formed networks as well as influenced other computer cultures. Thus, they shaped the discourse and practices regarding the new technology.

In my presentation, I will focus on the playful aspects of hacking. In his book "Homo Ludens" (1939), Johan Huizinga not only emphasized the important role of playing for the development of culture, but accounts the game as the origin of culture itself. Because games are repetitive practices and are taking place in everyday action, he stresses, they are not merely an "intermezzo". Based on his work, the playful and explorative approach of hackers using technology will be pointed out and connected to computer-usage. Hacking always altered existing boundaries and moved them anew, whereby the use of computers has been significantly affected. Additionally, in reference to Douglas Thomas' assumption that "hacking culture is literally about hacking culture" (Thomas, 2001, p. 37), the general cultural significance of hacking will be examined more closely. In doing so, I will also evaluate the role of the computer as an object in that interaction in more detail. Hackers did not only connect computers to networks and worked with them, in fact they are genuinely connected to the medium. In consideration of Latour's Actor-Network-Theory, one could ask what cultural change could be emphasized through the medium itself.

Crackers and the Formation of the Home Computing Public Sphere in 1980s Western Europe

Gleb J. Albert (University of Zürich)

The spread of home computers in Western Europe since the early 1980s did not just amount to new technologies, industries, business models, or forms of work and leisure. It gave birth to a whole new public sphere, evolving around hobbyist computer usage. This public sphere was constituted by computer user clubs, small-scale programmer-entrepreneurs, specialised journals and newsletters, public events at trade fairs, special TV shows, discussions in the press, and many other spaces of socialisation and community-building. The paper aims to highlight a lesser-known aspect of this burgeoning public sphere – the so-called "crackers", an international subculture of (mostly) teenagers busying oneself with removing copy protection routines from commercial software and spreading its modified copies through their global (postal as well as modem-based) networks. I argue that crackers, despite their self-perception as a seclusive "elite" and their increasing persecution by law enforcement, were active and crucial players in the public sphere of hobbyist home computing. Crackers were not just the cause of moral panics, but also active participants in the discoursive configuration of home computer usage and "misusage" – as covert talk show guests, authors of letters to the editor and classified ads, or subjects of sensational press interviews. Moreover, the crackers' informal knowledge allowed them to play double roles as game developers or journalists, shaping the burgeoning European games industry. Lastly, many of the crackers' cultural practices were appropriated by "regular" hobbyist users and became part of hobbyist modes of communication.

SESSION W2F — Amphitheatre 2

Wine in History: between Technology, Science and Transfer of Knowledge 2

Organisers: Irina Gouzevitch and Dmitri Gouzevitch **Chair:** Irina Gouzevitch

Notes about the Evolution of the Oenological Techniques in the Italian Viticulture and Winemaking (18th-19th Centuries)

Luciano Maffi and Paolo Tedeschi (Universitá di Milano Bicocca DEMS), Manuel Vaquero Pineiro (Università Degli Studi di Peruggia)

Since early 18th century, the oenological sector had been characterised by relevant changes which were related to important innovations, concerned the quality of cellars, their hygienic conditions and the care for the conservation of the wort and wine. This allowed to maintain the quality of the wine constant for a longest period and also to accentuate the difference between the wines produced in different terroirs and cellars. The consequent improvement of the quality of the wine and in particular of the ratio quality/price permitted consumers to drink better wines and progressively reduce the use of bad wine which had only one "appeal", it got easier to work.

This essay illustrates the evolution of oenological instruments, of the technical know-how about winemaking and of the structures of cellars. The winemakers improved cellars and built new rooms for the transformation of the wort and the conservation of the wine. In the 19th century new great modern cellars were built: they were conceived by engineers and this meant that for some producers the wine production was no more a traditional rural activity, but it had to be considered as a modern industry.

This evolution was favoured by the creation of a new wide knowledge in winemaking which was available in the Italian countryside thanks to the enlargement of a new network concerning the winegrowing and the oenological techniques. For the Italian case, some areas in Piedmont and Lombardy drove the renew of the oenological techniques by the diffusion of new journals and books.

Regulating the plastering of wines in Spain by the late-nineteenth century. Public health and the international market in the establishment of safety and quality standards

Ximo Guillem-Llobat (University of Valencia) and Ignacio Suay-Matallana (CIUHCT—U.Lisboa)

This paper will deal with the regulation of plastering and the use of salicylic acid in wine. In the late-nineteenth century, in the midst of growing concern for the adulteration of food and the Phylloxera crisis, the traditional plastering of wine became a controversial issue. Should the use of chemical preservatives be considered an adulteration or would they be acceptable at limited doses?

In Spain, this was a major controversy hugely influenced by the regulations implemented in foreign states and specifically in France, a competitor as well as a major importer of Spanish wines. Local experts, producers and policy-makers were thus involved in a controversy on the regulation of quality and safety which was very influenced by the strong economic interests at stake. The paper will analyse the role of medical expertise in that controversy and will focus on the main state medical institutions (such as the Royal Academy of Medicine) as well as local ones (including municipal laboratories and municipal and provincial health boards).

The development of filtration technologies and their impact on the relationship between characteristics of wine and costumers' expectations in a historic perspective

Thomas Schuetz (Wirkungsgeschichte der Technik)

During a *longue durée* development beginning the 17th Century the practice of decantation for the clearing of wine disappeared in favor for the use of diverse filtration practices - a development, which started with primitive precoat filters and ended with the use of complex reverse osmosis systems. In addition, with the spreading chaptalization and the growing scientific knowledge concerning fermentation, the vinification lost its characteristic of craft and turned into a controlled technological process. As a result of these developments the basic characteristics of wine –remaining sugar, acidity and alcohol – could be designed according to the costumer's expectations. A development that mainly took place in France and the German speaking countries and have been transferred into wine-producing regions all over the world. But in the same time frame the fiction

of rationality of consumers concerning wine changed from regarding wine as basic foodstuff to alcohol as potentially dangerous drug. Which shows the in internalistic approach to the development of filtration technologies can't be sufficient, to understand the complex interrelation between the technically feasible and the demands of the market.

This paper is a side product of a planned research project on the scientification and mechanization of wine production.

14:30-16:00

SESSION W3A — Room 201

11th Annual Symposium of the Social History of Military Technology 3

Organiser: Bart Hacker **Chair:** Margaret Vining

Shields for German Soldiers? A Revisionist Interpretation of the Condom in the First World War

Wolfgang König (TU Berlin/Acatech)

The dominating opinion in academic and public history is that the Germans became familiarized with the condom during the First World War. Soldiers would have used condoms in large quantities and integrated them into their sexual life also after the war. This opinion for instance was disseminated in the prize-winning television series "14 diaries of the First World War" (2014). I shall give examples in which way the film producers adopted and sharpened the existing historiography of sexual behavior and did not hesitate to convert historical evidence into the contrary. It was in particular the series' interpretation of sexuality in the First World War which was received by the German yellow press.

My revisionist thesis is that the modern seamless rubber condom was still wide-spread before the war. During the war, rubber supply in Germany collapsed because of the British blockade. Rubber factories were closed and stopped condom manufacture. The false historiographical opinion

mainly results from the interpretation of the contemporary term "protective means" ("Schutzmittel") as condoms. Actually, "protective means" referred to disinfectants which replaced condoms in wartime. Scarcities of rubber and condoms could be found until the early 1920's. A brief outlook shows that the conditions in the Second World War were very different from the First because German industry succeeded in manufacturing condoms from the artificial rubber Buna.

Military Technology and German Society: The Political and Social Consequences of Artillery in the Great War

Winfried Heinemann (BTU Cottbus)

World War I was dominated by artillery which caused some 80 percent of all losses. However, by about 1870, artillery had still been largely similar to that of the Napoleonic wars. Subsequent developments included steel tubes, recoil systems, and improved breech-loading mechanism. To really put these to effect, individual guns had to be incorporated into a complex system of spotters ("forward observers"), signaling equipment, and mathematical fire control. The need for increased range of spotting led to the development of early military aviation, with many German airfields originating as former firing ranges.

What is more, artillery required inordinate amounts of ammunition, so that all warring nations had to create separate "ministries of munitions". Ministers included the German Jewish industrialist Walther Rathenau or, in Britain, David Lloyd George and Winston S. Churchill. The need for sustained production reinforced the role of the "Home Front", of organised Labour, and eventually of women.

This in turn required a different type of officer – less of a dashing leader on the battlefield and more of a calculating organizer. As a consequence, World War I brought a new and different generation of officers to the fore. In Germany, the inter-war military, and even the first generation of World War II field marshals, was controlled largely by artillery officers.

The example serves to illustrate the interplay between technological developments on the one hand, and social and political change on the other.

How World War I Electrified Italy 1915–1918

Ciro Paoletti (Commissione Italiana di Storia Militare)

In 1914 coal fed Italy's industrial system. Coal also fueled trains and ships. Electricity was not widespread, although railways were already electrified for some hundreds of kilometers.

Italy had no real coal, only lignite. Its caloric power was far less than that of the best British coal, and its production did not exceed 2,000,000 tons per year, which, in terms of produced power, equaled only 1,000,000 tons of British coal. Total Italian consumption was normally around 11 million tons per year, and 9/10 of it came from England.

When the war began, coal and transport prices immediately increased, whilst the available coal decreased. England had to provide coal to its own industry and to France, whose coal mines were lost to German invasion. Italy received some coal from Germany by train, but that ended in 1915, when Italy entered the war. War expanded Italy's industrial system and the increased need for energy. This meant an increased need for coal. What to do?

Italy had to rely on its only other available source of energy, waterpower. Recent technical improvements made it possible to transmit voltages as high as 100,000 over long distances. Hence Italy quickly started building an impressive network of hydroelectric plants. Substantial government financial support helped deal with the dramatic reduction of coal just when a widening industrial system needed more and more energy.

The ratio of coal in total energy consumption declined and remained lower in the following 20 years, despite increasing industrial capacity and total energy needs.

SESSION W3C — Room 203

Early Visions of Geoengineering

Organiser: Bertrand Guillaume **Chair:** Helmuth Trischler

Commentator: Helmuth Trischler

The Birth of Geoengineering. Large-Scale Engineering Projects in the Early Stage of the Anthropocene (1850-1950)

Martin Meiske (LMU Munich/Deutsches Museum/RCC)

Historicizing Geoengineering through the lens of large-scale projects could help us to understand learning-processes in the era of the Anthropocene, which includes a material dimension where humans became a dominating geological agent, as well as a nonmaterial dimension -man's realization of his agency. Cultures of memory and risk management reconstructed from a long history of Geoengineering can tell us why we hesitate to apply technologies today, as well as why we always come back to discuss them.

In my dissertation project I explore in a *first step* the alteration of the upper lithosphere through analyzing three transatlantic project pairs, parallel in time: Railway tunnels, formed by the Mont-Cenis Tunnel (1857–71) at the French-Italian border and its US counterpart, the Hoosac Tunnel (1851–75); Sea canals, consisting of the Panama Canal (1881–1914) and the Kiel Canal in north Germany (1887–95/1907–14); and finally dams or dam-systems like the Fontana Dam (1942–44), built by the Tennessee Valley Authority, and the Rosshaupten Dam (1950–54) in Bavaria.

I argue that the experiences and risk-analyses made in the context of these projects even in-form(ed) the debates on a *second step* – the extended manipulation of other geospheres through Climate Engineering.

In my talk I want to further elaborate this narrative and present first results for the case study group of sea canals for which I reconstructed preconditions like the circulation of knowledge facilitated by the international institutionalization of geo-sciences and engineering, as well as learning processes in the risk-management, and impacts on eco-systems.

Building land, moving water

Thomas van den Brinck (Wageningen University)

During the nineteenth century, various plans were conceived in the Netherlands to dam and drainage the Zuiderzee. Some of them were deemed to be fantasies while others were perceived as realistic.

Important to this investigation is the role that facts played, both in the justification of plans as well as in the arguments to criticize them. After all, it is the mobilization of facts that led to the perceived 'scientific' reality on which these plans were assessed. This (re)organization can be seen as a highly dialectic progress with the acknowledgement of knowledge at stake.

Furthermore, such facts were colored by the local context in which they were used. It is imaginable that the long Dutch tradition in land reclamation, with the corresponding technology and experience, promoted the acknowledgement of specific facts in favor of others.

To investigate this context-sensitive fact producing, the plan of engineer van Diggelen, published in 1849 will be investigated in-depth. It is especially suitable for this inquiry for at least three reasons. It was the first time such a large-scale plan was proposed and backed up with argumentation. It was published at a turning point in the drainage-history in the Netherlands. It was ambiguously received and not realized after all. Together, it means that the plan was conceived when facts and scientific reality were not self-evident.

Rivers or Rain?: The Politics of Irrigation Technology in French Mandate Syria

Elizabeth Williams (Brown University)

This paper examines the contested expansion and construction of irrigation infrastructure in French mandate Syria during the 1920s and 1930s. It aims to contribute to discussions about technological innovation in imperial contexts and its intersection with questions of sustainability in the areas of environmental management and agricultural production. By comparing the implementation of French imperial planners' projects for the region with those proposed by local technocrats and tracing the resulting material impacts over the course of the mandate, it addresses questions of local agency, colonial development, and concepts of technical expertise.

Drawing on archival materials and journals from French and Lebanese archives and libraries, the paper traces the realization (or lack thereof) of irrigation infrastructure articulated within imperial and nationalist visions for the region's development by French officials and local technocrats respectively. French officials emphasized almost exclusively the technological infrastructure associated with large-scale damming and drainage projects. Local technocrats did not contest such technologies' supposed benefits, but instead advocated a combination of projects ranging from the latest technological innovations in dam construction to the maintenance of indigenous irrigation technologies. Expanding rainfed irrigation by building on local knowledge of subterranean canal networks and dry farming techniques, they argued, was essential given the region's vast fertile plains crossed by few rivers. The paper argues that this fundamental tension between French imperial and local technocratic approaches to technological innovation in exploiting the region's water resources and their material repercussions would have serious implications for agricultural production during the mandate and beyond.

SESSION W3D — Room 208

Innovation in Oil and Gas Industry 2

Organiser: Eldar Movsumzade **Chair:** Eldar Movsumzade

Commentator: Olga Poletaeva

The Establishment and Development of a Tanker Fleet

Boris Mastobaev (Ufa State Petroleum Technological University)

From the very beginning a human is bound up with a sea. Seas and the oceans have been feed sources for human being and supported trade development. The bosom of the sea contains a huge amount of mineral sources necessary for human.

By 20th century crude oil had started to play a key role in world economy. The main oil production areas were distant from the consumers thus oil transportation issues came out rapidly. At this period pipeline transportation development had begun. But seas and the oceans were considerable limits for the main pipelines. For this reason a tanker fleet is used for the intercontinental transportation. Statistics shows that the half of produced oil in the world is transported with the use of tankers. Increase in marine transportation of oil had caused a construction of a huge amount of

new tankers especially after the World Wars. Sizes and carrying capacity of tankers were increasing leaving behind the others types of vessels. The tanker velocity increased due to new types of engines. Concurrently tanker design and appearance were changing. When designing engineers and constructors were tending to decrease capital costs of oil tankers and improve economic factors of operation.

The paper fully considers the issues of establishment and development of tanker fleet providing marine and river transportation of oil cargo, designing and construction of hydraulic engineering installations at shipping routes of tankers and development of shipbuilding yards. The paper devotes much attention to scientists, designers and engineers who contribute to the further development of tanker fleet.

Marine Transportation of LNG and Natural Gas

Rim Teregulov (Ufa State Petroleum Technological University)

Nowadays marine transportation of natural gas in liquefied condition is used more and more frequently as well as pipeline transportation. By the day liquefied natural gas (LNG) delivery constitute 45% of overall volume of natural gas market. According to World Gas Union (WGU) estimation the part will rise up to 50—60% by the 2030. On the one hand, the estimation based on the increase in the natural gas liquefying effectiveness and constant decrease in prime cost of the technology. On the other hand good flexibility of LNG delivery system allows vary attendance of different markets well. Another argument is a fact that independent transportation of natural gas as LNG allows exclude possible troubles at negotiations because of transportation routes of pipeline designs.

LNG production is extensively stimulated with the chipper transportation of a huge amount of natural gas with the use of marine transportation as LNG.

Transportation of liquefied methane with the use of tankers is assumed as much promising method of gas supply system improvement in the regions that have no inherent fields of natural gas. That is possible due to the regions had unusable excesses of gas.

The paper covers in complex some issues of establishment and development of tanker fleet that support marine transportation of liquefied gases. Moreover the paper covers problems of design

and constructions of hydraulic engineering installations at shipping routes of tankers and development of shipbuilding yards. The paper devotes much attention to scientists, designers and engineers who contribute to the further development of tanker fleet.

Microwave Radiation in Chemistry and Its Innovations

Eldar Agadzhanovich Gyulmaliev, Vasiliy Borisov, Valentin Tretiyakov, Akhmadsho Ilolov, and Rashid Talyshinsky (Russian Academy of Sciences)

Microwave spectroscopy - is an area of spectroscopy that studies the electromagnetic spectrum of substances in the centimeter and millimeter wavelength ranges. The ability to create microwave spectroscopic equipment appeared after the Second World War. Radar technology became available to allow scientific research. In 1934, was published an article by S.E. Cleeton and N.H. Williams, which was the first work at the intersection of the optical and microwave spectroscopy. An essential condition for carrying out research in the field of microwave spectroscopy is sample being in a gaseous state or under vapor pressure above 10-4 mm. Hg. v. to prevent the intermolecular interaction. In the area of microwaves are observed transitions between different rotational levels of the molecules. Measuring of the rotational spectra frequency allows to determine the structure of molecules and the nature of the chemical bond. Comparison of experimental and theoretically calculated rotational spectra allows to determine the configuration of molecules, bond lengths and angles between them. Thus, microwave spectroscopy is of great importance for the development of molecular structure theory. A spectroscopy is constantly innovative.

Bases for Creation of the Innovative Reinforced Polymers

Eldar Movsumzade, Olga Poletaeva, Eduard Karimov, Oleg Karimov, and Marsel Yalalov (Ufa State Petroleum Technological University)

This material is aimed to show the main scientific discoveries in the field of polymer materials that became the foundation for creation and development of reinforced polymer materials.

The most common reinforced polymer materials are the epoxy matrix-based composites. The first patent for the use of diepoxy compound was granted in 1938. Since then there has been an in-depth study of the possibilities of epoxy matrix-based materials. The idea of epoxy resins in composite systems consists in consideration of linear polyatomic alcohol with epoxy groups on the

ends of molecules. High reactivity of these groups provides the possibility of combining the epoxy resins with different chemical compounds that play a role of hardening agents (curatives).

We believe that the general principles of reinforcing the polymers allowed considerable strengthening the materials on the basis of other polymers: polystyrene, polyamides, polycarbonates, polyphenols, etc. A wide variety of polymers with the possibility of their use for the synthesis of carbon fiber-reinforced plastics (CFRP) is associated with the development of the synthesis of monomers which began in the 1930s thanks to the study of the reaction of polymerization. A considerable leap forward in the development of this process occurred in 1956 with the development of polyethylene production by the method of polymerization of ethylene at low pressure in the presence of Ziegler catalysts. It was developed a process for producing polypropylene on the basis of the works of Italian scientist Natta.

SESSION W3E — Conference Room 2

Computers in postwar society 3. Development and uses of computers in a capitalist, communist, and post-communist context

Organiser: Dick van Lente **Chair:** Dick van Lente

The Code of Banking: Software uses in West- and East-German banks, 1960-1990

Martin Schmitt (ZZF Potsdam)

The history of banking software has hardly been written. Most literature on the use of computers in the banking industry focuses on the hardware and its restrictions (cf. Cortada 2006). This is astonishing, because with the advent of the computer as a universal machine since the 1960s business processes have been written into code, not hard wired into the machine. Furthermore, not the processor, but the system software determined what was presented on screen to the banking employee. The hardware, on the other hand, has become increasingly interchangeable. Michael S. Mahoney already pointed out in 1988 that historians should broaden their view from the hardware side to the whole picture of computing, including the uses of software in industry. However, not many scientists followed this plea, not even Mahoney himself.

This paper sheds light on how German saving banks used software to computerize themselves during the period of the Cold War. The aim is to place uses of software in a Deleuzian assemblage of the computer, the user, the code and its execution.

The paper compares software uses and ways of production in East and West Germany. How have comparable institutions and their respective employees dealt with the new ways of interactive data procession through visual software products? Has there been something like a capitalist or socialist (banking) software?

Substituting trade and research. The Polish intelligence services' support for microelectronics and the IT-industry, 1971-1989

Miroslaw Sikora (Institute of National Remembrance)

The Information Age only arrived in Poland during the 1990s At the beginning of the 70s there were approximately 70 thousand computers working in the US, but only 200 in Poland. The technological gap in the performances of these machines was about 15 years. Responsible for that backwardness were the embargo by NATO countries on the sale of so-called dual-use components to communist countries, which caused a permanent scarcity of semiconductors and ICs behind the "Iron Curtain;" and the constant shortage of convertible currencies for import purposes, especially after Poland declared insolvency toward the western banks in 1981.

Therefore, the Polish intelligence agency attempted to acquire computers, peripheral devices and technical documentation in clandestine ways. Hundreds of companies in the USA, Japan and in Western Europe were penetrated. Not only the Polish economy was to benefit, but also the Ministry of Interior's surveillance apparatus. Flashy spy-operations and successful bribing of enabled Polish scientists to keep abreast of worldwide trends in IT. None of this had a decisive impact on the Polish microelectronic industry however.

This paper is based on documents of the communistic security service which have recently been made available for research. It tries to explain: the dynamics of intelligence -gathering, -processing and -implementing; - the influence of this intelligence on R&D and the production of microelectronic equipment? – and the scale of expenditures on intelligence's activity.

Engineering Culture as the Post-Soviet Heritage

Liliia Zemnukhova (Sociological Institute of the RAS)

The engineering culture which emerged and developed during the Soviet period produced a power for the development of IT in postcommunist Russia. The huge traditions of widespread education and extracurricular activities, non-formal communication and intense knowledge exchange produced a mature basis, which helped to overcome the difficulties after the collapse of the Soviet Union. During the 1990s, the Government considerably underfunded educational and research institutions, which provided training and knowledge transfer. Professionals from academia largely quited their positions in order to search for better positions and salaries, even abroad. Western countries tended to headhunt students from technical universities. Established more or less by the mid2000s, the IT industry revived good old traditions from Soviet times, when academic communities used to facilitate non-formal meetings, events, or even structures. The phenomenon of "scientific schools" became crucial for the process of knowledge exchange within the Soviet Union and Comecon and even spread further to the Western world. Exceptional talent and distinguished leadership of such scientists as A. Ershov, L. Lyapunov, M. Gavrilov, V. Glushkov and some others created and spread academic and engineering culture. Based on interviews, I will show how practices and values, which appeared in the Soviet think tanks like "Akademgorodok", became in some sense a prototype of IT culture of contemporary professional communities and academia-industry relations.

SESSION W3F — Amphitheatre 2

Wine in History: between Technology, Science and Transfer of Knowledge 3

Organisers: Irina Gouzevitch and Dmitri Gouzevitch **Chair:** Ignacio Suay-Matallana

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Making the perfect cork stopper for the Champagne wine sector. The evolution of the cork industry in Catalonia

by Ignacio Garcia (Universidade NOVA de Lisboa, CEHFCi-U.Evora)

When Champagne wine makers decided to swap the wooden stoppers in use in the mid-17th century for cork stoppers, they caused an unprecedented change of events in the wine and the cork

industry. They sought an alternative to the stoppers used at the time, which were wrapped in hemp soaked in olive oil, failed to provide an effective seal, played a dubious role in the preservation of wine and were always popping out. The solution was cork.

Since then, the Champagne's finest wines have always used cork stoppers, and until very recently, it has been the Catalonia cork sector that has provided France with most of the best cork stoppers. Currently, Catalonian producers such as Diam apply their know-how to the development of better solutions which allow the use of a premium product to be broadened to Champagne wines, creating products geared towards specific segments. Thanks to that, the familiar popping sound of champagne bottles opening has not become a thing of the past at the Champagne wine industry.

This paper analyzes the innovation process of the several Catalonian firms. It will be shown that the growth of the companies was supported, in all cases, by a notable capacity for technological innovation. The paper will draw together the successes and failures of individual firms in order to present a nuanced yet comprehensive vision.

The place of the bottled wines in the trade of sauternes at the XVIIIth century

Stéphanie Lachaud (CEMMC, Université Bordeaux Montaigne)

The marketing of the bottled wine remains a minority in the XVIIIth century. However, this modality of sale takes an increasing size, mainly linked to the installation in the area of Bordeaux of English-style glass factories. The shape of the bottle named bottle of Bordeaux then appears. However, if this new mode of packaging spreads in the wine storehouses of the traders of the port of Bordeaux, what about in the countryside of the wine-making hinterland? It is then necessary to wonder about the conditions of progressive but still limited adoption of this technical innovation, by evoking the various sources of supply, the spreading of the uses of bottles, needs which she answered but also the limits which she included, as well as the possible controversies and conflicts at the time of the use of this new packaging. This idea will allow using archives drawn from the correspondence of traders, from the notaries' registers, but also from private archives. Interest of this communication will be to measure both the geographical and social spreading of these innovations, to show if the more modest wine growers begin or not to employ them at the end of the century.

16:30-18:00

SESSION W4A —Room 201

11th Annual Symposium of the Social History of Military Technology 4

Organiser: Bart Hacker **Chair:** Jorit Wintjes

Turkish Airman and Aviation Industrial Entrepreneur: Vecihi Hurkus

Esat Arslan (Cag University Turkey)

The Ottoman Empire was not indifferent to technical progress, and in 1903, shortly after the Wright brothers' first flight, strived to learn about the latest technical developments. The empire quickly adopted aircraft and balloons for its army.Vecihi Hurkus was a military pilot during the Great War. During the war he designed a fighter aircraft, though the project was never realized. After the war, he worked as an aircraft engineer under the auspices of the Turkish National Defense Ministry in Gaziemir/Izmir, the site of the Air Technique Schools Command. In 1923-1924 he designed a new fighter aircraft for the air force that could compete favorably with European models, the Vecihi K VI. Despite very successful trials in January 1925; he failed to receive a license. Undaunted, Vecihi undertook a new project in 1930 and produced a new plane, Vecihi XIV, which was certified. Later, he founded the first Turkish Civilian Pilot School, which trained many volunteer Turkish pilots. After World War II Vecihi founded Hurkus Airways, but he could not compete with Turkish Airlines and lost his entire fortune. He was a very important figure in Turkish aviation, beginning at the same time as such famous world aviation leaders as Fokker, Douglas, and Boeing.

Men or Machines? Deep Battle and the Soviet Robotic Tank Program, 1929 to 1941

Ian Johnson (Yale University)

Early Soviet military theory emphasized the power of morale over material considerations, but that equation was reversed in 1929 with Stalin's "Great Turn." That year, the Red Army massively increased funding for technological research and development. Mikhail Tukhachevsky – the Red Army's leading theorist and head of the Armed Forces Armament Office from 1931 – oversaw much of the Soviet military's research program. He was deeply interested in the concept of the unmanned radio-controlled tank, or Teletank, as a solution to the problem of positional warfare. Under his supervision, the Teletank began its evolution towards reality. After seven years of development, the Teletank entered mass production in 1936, leading to the construction of 128 vehicles by the outbreak of World War II. Drawn from archival collections at the Russian State Military Archives (RGVA) in Moscow, this essay explores the political fault lines and clashes in military doctrine which inspired this futuristic military experiment. It also details the process of research and development, which involved the direct participation of many of the Soviet Union's top military theorists and designers. And finally, it offers some thoughts on the philosophical reevaluation of man and machine in the Red Army which enabled the Teletank project to begin. I hope to refine the essay after receiving feedback at ICOHTEC and submit it for consideration to Vulcan.

SESSION W4B — Room 202

Technology transfers: Radio and traffic, metropolitan and transnational perspectives

Organiser: Programme Committee **Chair:** Frank Schipper

The technology, the innovation and the sustainability of regulating traffic in Victorian London

Carlos Lopez-Galviz (Lancaster University)

This paper will examine a set of plans, maps, counts, artefacts and legislation produced around the 1860s in London in the interest of solving street traffic congestion. It will show the role that technology, innovation and sustainability played in the process of understanding traffic at a particular

time of London's history. By discussing the work of William Haywood, Peter W. Barlow and John P. Knight, I will characterise traffic by reference to a particular scale of the city, whether it was confined to the City (the old square mile) or whether it was, by contrast, expansive, metropolitan, and reaching out into the suburbs. The ideas of Haywood, Barlow and Knight prompted conflicts of interest related to administrative boundaries as well as a range of debates around the need to regulate public behaviour by, for example, introducing a time structure for the handling of goods, or, designating street crossings for pedestrians.

Through a close reading of different kinds of sources, we will get a clearer sense of the challenges and opportunities behind the production of a 'regular stream of traffic', a term used by many to define how people, animals and vehicles should move along the streets of Victorian London. The paper will conclude with a reflection on what that tells us about technology, innovation and sustainability in history, more generally.

Transnational communication among radio amateurs in 1910s

Maria Rikitianskaia (University of Lugano)

This paper addresses the question of transnational telecommunication in 1910s among European radio amateurs. With transnational telecommunication we consider flows over national borders, circulation of ideas beyond the national spaces and attempts to build European radio network before broadcasting (Badenoch and Fickers 2010).

Scholars agree that wireless underwent the crucial metamorphosis during the 1910s, and especially during the First World War. However, this research rarely exceeds the limits of national histories. Susanne Douglas and other scholars claim that in USA radio amateurs provoked the turn from wireless telegraphy to radio broadcasting, from point-to-point to one-to-many media (Douglas 1987, Bartlett 2007). Cases of Portugal and Russia show that in the early 20th century the technology became user-friendly and understandable to public primarily because of passionate radio amateurs (Silva 2010; Lovell 2015). German historians describe amateurs as inventors and promoters of wireless for the state purposes (Friedewald 2000), while British and French history demonstrate radio amateurs as predecessors of new professionals for radio stations in 1920s, after getting military training during the war (Wythoff 2013, Junpier 2004).

Following transnational approach for media history (Fickers and Lommers 2010, Lommers 2012, (Balbi, Fari and oth., 2014) and technology history (Eckert, 2005), we investigate the technical knowledge transfer among radio amateurs and transnational communication. Using the sources from international organizations' archives, national archives and radio amateurs' materials, we check if national theories are confirmed and show that phenomena of reshaping the technology had transnational nature.

SESSION W4C — Room 203

Transforming the nature: technology and environment of the Russian Empire and the USSR in the periods of modernization (1800-2000)

Organiser: Andrei Vinogradov **Chair:** Evgeniy Gololobov

Water, technology and society in urban environment of Russian North, 1870 – 1917

Anna Agafonova (Cherepovets State University)

This report describes how a development of technologies of water supply were changing an urban area and social practices in cities of North region of Russian empire. In the paper those technologies are active participant in solution of environmental problems and creating a city of the modern type. In terms of the symposium theme, technological innovations of the problem of water supply are analyzed in context of an activity of scientific, socio-cultural, political, and biological actors that addressed to solution of environmental problems. In this regard, actor-network theory is methodological base of this research. It allows to show the whole set of interactions between technologies, citizens, city governments, germs and infectious diseases, wars, economic crisis, etc. In the paper will discuss causes of technological modernization of urban environment, problems of its realization, changes of ways of interaction between human and environment as results of this modernization. The sources base of the research consists of materials of national archives (the Russian State Historical Archive, the State Archive of Vologda Region, and the State Archive of Novgorod Region), periodical press of the local government, reports and research of health officers, who worked at this period, and statistical materials. — *This report was supported by the Russian Foundation for Humanities, project №16-31-15021*

Industrial technologies and natural resource using in the Middle Volga region in the period of the Industrial Revolution (1800-1917)

Andrei Vinogradov (Kazan Federal University)

In the 19th century the Middle Volga region was one of the most economically developed regions of the Russian Empire. In 1850-s the number of large industrial enterprises were formed there due to the presence of Volga and Kama rivers, the biggest transport arteries of Western Europe. Formation of the large factory industry coincided with a profound crisis of extensive agriculture, which was based on unlimited nature resources using and inevitably led to the reduction of soil fertility, forest areas and biodiversity. Historical sources used in the research (such as scientific papers in the fields of Agronomy and technology of the 19th century, statistic data, documents of government and local authorities of the Russian Empire) indicate that industrial technologies have greatly contributed to reducing of the anthropogenic pressures on biological natural resources. Creation of a large number of jobs on industrial enterprises caused urbanization, growth of a city and reducing of rural population. Development of science and technologies connected with industrial progress led to the expansion of mineral resources instead of biological, which allowed to reduce the scales of deforestation and increasing the soil fertility. Obviously, the establishment of large enterprises was the cause of new environmental issues, but they were of local character. Statistic data shows that in the Middle Volga region natural landscapes significantly increased by reducing farmland during 20th century. Thus, the example of the Middle Volga region could be interesting from the positions of general technological and environmental history. — *This report was supported by the Russian Foundation for Humanities, project №16-31-15019*

SESSION W4D — Room 208

Innovation in Oil and Gas Industry 3

Organiser: Eldar Movsumzade **Chair:** Eldar Movsumzade

Commentator: Olga Poletaeva

Development of Reduction Methods of Methanol Consumption in Natural Gas Transportation Systems

Alexander Kolchin (Ufa State Petroleum Technological University)

A number of gas producing countries possess great reserves of natural gas in hard-to-reach regions that are remoted far from the places of consumption as well as in areas with challenging climate where are no large cities and developed industrial infrastructure.

Natural gas supply of Russia and the development of gas industry in the immediate future are connected with development of remote and hard-to-reach fields. The majority is located in the interior of Arctic and off-shore areas. Field development is impossible without commercially attractive elaboration of transportation scenarios of produced hydrocarbons to consumers. One of the most promising solutions of the problem is the design of a new installation as well as modernization of already existed installations that provide complex preparation of gas and gas condensate directly on a field. Such installations could produce commercial products of required quality: gas, stabilized condensate, etc. The main expensive compound used to achieve the result is a hydrate inhibitor – methanol. Despite the relatively low prime cost the amount required for technological process is immense. Thus the operational cost of the named processes is increased.

The additional challenge is a transition to the European quality of Russian oil products. Thus any enterprise should state improvement of hydrocarbon treatment technology effectiveness as a high priority task.

The paper covers technical issues of development of methanol consumption optimization techniques at field treatment installations of gas and gas condensate in Russia and abroad. Significant attention is given to development of methanol extraction techniques from commercial products.

Design and Technical Equipment of Petrol Stations

Tatyana Dmitrieva (Ufa State Petroleum Technological University)

The greatest achievement of science and technique of XX century is an automobile. For the far delivery a car became a necessary addition to main types of transportation – railway, marine, river, pipeline and air. Distant delivery of cargo as well as passengers in most cases were beginning and finishing on a car. Mass production of automobiles at the beginning of XX century required construction of petrol station system. First in the raw was USA where 8000 of automobiles were in 1900. By the 1910 this amount achieved the magnitude 500 000.

The development of petrol station system was started in early XX century. This process continued during the century despite of wars. Petrol stations were located in big cities as well as small towns and along the main transportation routes. A lot of petrol stations that located on countryside were not only the point of fuel replenishment and maintenance of a car but also were the centers of meetings and communication of the citizens.

The first fuel stations in Russia were built in 1911 when Imperial Automobile Society concluded a treaty with society "Nobel brothers" . In after war period the system of petrol stations in USSR was underdeveloped but still able to satisfy the demand of soviet drivers. Petrol station construction was carried out in accordance with state development plan. In the cities petrol stations were built near the industrial areas, on countryside – along the main traffic routes.

The paper covers the issues of design and technical equipment of petrol stations in XX century.

Innovative Search and Facts about Metal Complexes and Compounds in Oils and Oil Solutions

Eldar Movsumzade, Olga Poletaeva, and Elbay Babayev (Ufa State Petroleum Technological University)

It is considered heavy oil resource potential in Russia. On Russian territory the bulk of the resources dedicated to the heavy oil fields in the Volga-Ural, West Siberian and Timan-Pechora oil and gas basins. Growth of oil consumption and an increase in stocks of heavy metal-bearing oil poses to society social - environmental problems associated with environmental protection. Stimulated transition to large-scale development of heavy metal-bearing oil with unfavorable environmental properties enhances its negative impact on the environment. It is known that

heavy oil vanadium and nickel content is comparable to its concentration in ores, and in other petroleum products (fuel oil, coke, tar, asphalt and kilns) in 2 - 4 times more. Timely investigation and accounting the level of the natural and the technological upgrading of a heavy oil by metal toxicants can prevent or at least reduce the impact on the environment. Information about the content of metals in the oil give an option to take protective measures on time, at the stage of selecting the technology of extraction, processing and utilization of hydrocarbons. It also allows evaluating the possibility of separating the metal compounds from crude oil.

SESSION W4E — Conference Room 2

Computers in postwar society 4. Transition and control

Organiser: Dick van Lente **Chair:** Hans-Joachim Braun

The computerization of social laws: on the influence of automated data processing on the West-German pension reform von 1972

Thomas Kasper (Centre for Contemporary History Potsdam)

From the mid-50s, the federal German *Rentenversicherung* used the capabilities of modern data processing devices for the calculation of retirement pensions. The reform of 1957 started an era of expanding benefits, that reached its climax with the pension reform von 1972, which implemented a flexible statutory retirement age. During that time, pension laws became increasingly individual and inclusive, covering citizens formerly excluded, like housewives or self-employed freelancers, and therefore got more and more individualized and dynamic, but also nearly impossible to comprehend. Thus, the amount and complexity of processed data grew rapidly. At the same time, the computerization of society and economy, and the emergence of cybernetic discourses sparked the desire for a more transparent social state administration. Basically, this meant an periodic account sheet, which should inform all members of the pension insurance about the current status of their pension, marked missing contribution periods and therefore gave detailed information about what to expect in retirement. To tackle these challenges, the state released directives and measures which should establish and improve the usage of electronic data processing in the *Rentenversicherung*: assigning a social security number to all insurants and pensioners, providing the basis for

individual pension accounts, where all relevant information should be saved electronically and introducing new ways of gathering required data from employers. My presentation wants to shed light on how computers affected and influenced the West-German welfare state during its massive expansion, how data processing helped this processes ultimately realize the reform of 1972.

Integration of computers into an existing field of activity: The case of computerized systems and regulations in the life-science industry 1982-2015

Yoel Bergman (Tel-Aviv University) and Dick Van Lente (Erasmus University)

This paper discusses the obstacles that regulatory bodies had to overcome in guiding the proper use of computerized systems in the life-science industry since 1980. Computerized systems in the life-science industry impacted product quality, safety and data integrity. From the early 1980's, these systems have challenged regulatory bodies in the US. Whereas regulations on manual chemical/physical processes and laboratory practices had matured by the 1980s', the regulation of computerized systems was only beginning. The primary concerns were the controls over the entered data, the dependability of the software systems and controls on the captured data. One strategy was to find similarities between computerized and manual controls and to apply the same approach to the new technology. Regulations have evolved from a more general guidance in the 1980s' to more specific ones in the 1990s', much with the help of industrial professional bodies. European and American approaches and terminology have differed somewhat but not much. In recent years, regulatory bodies have become stricter on proper implementations, as more data has become fully electronic, since virtually all systems are computerized and since more producers, less familiar with regulations, have entered the market. The sources for the abstract include: EU GMP Annex 11 (old and new), US 21CFR Parts 11 and 211, GAMP early and latest versions, FDA warning letters in the last decade on non-compliance with computers regulations by specific firms and the new British MHRA 2015 guideline, setting stricter standards on data governance.

Predicting the future of computers in the Netherlands during the nineteen sixties

Dick van Lente (Erasmus University)

During the late 1960s and 1970s, there was a lot of speculation, in the Netherlands as elsewhere, about applications of computer technology in the near future. Experts expected computing to enter small companies and organizations, as well as homes, in the form of either standalone machines with limited processing power, or as terminals connected with large machines that would provide information and computing capacity to small users. Information and electronics companies, such as large publishers, broadcasting organizations and electronics firms such as Philips had a strong interest in exploring such possible uses. Their share in a very competitive and potentially lucrative information market depended on their capacity to correctly predict and possibly shape this market. This paper will focus on the Philips electronics firm. It will show how Philips attempted to predict possible technological developments, what kinds of machines customers would (or could be made to) prefer, what kinds of skills would be needed, and how these would be acquired. Philips also developed its connections with the national government, as well as with publishing firms and broadcasting organizations, in order to create an environment that would welcome its products.

SESSION W4F — Amphitheatre 2

Wine in History: between Technology, Science and Transfer of Knowledge 4

Organisers: Irina Gouzevitch and Dmitri Gouzevitch **Chair:** Thomas Schuetz

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Chemistry, wine, and good technological practices. The campaigns of Luis Justo Villanueva (1834-1880)

Antoni Roca-Rosell (Universitat Politècnica de Catalunya)

Luis Justo Villanueva, born in Madrid in 1834, belonged to the first promotion (1856) of industrial engineering in Spain. After being teacher in Valencia and Gijon, he was professor of the Industrial School of Barcelona in 1860. He soon was involved in local initiatives, such as a new chemical laboratory at the Institut Agrícola Català de Sant Isidre, an association of land owners and agriculture producers in Barcelona. Justo Villanueva would like to introduce better practices for

the production of wine, based both on the Chemistry and on the traditional practices, respecting the local varieties of grapes and also the local quality of wine. It should be discussed the intellectual framework of Justo Villanueva, follower of the new chemical engineering promoted by Liebig, also of the techniques introduced by Pasteur. Justo Villanueva was also a pioneer in chemical industry of fertilizers. Just before his death, he was named director of a new Municipal Laboratory in Madrid, his birthplace city, where he proposed the reuse of sewage for fertilizer. Nevertheless, the laboratory of Madrid was not fully established at that moment. In Barcelona, after the decades, the conceptions of Justo Villanueva had a relevant influence in the Catalan wine industry.

Professional paths and international connections as a way to understand the links between chemistry, engineering and wine seen by the cases of Júlio Máximo de Oliveira Pimentel and António Augusto de Aguiar

Ana Cardoso de Matos (CIDEHUS - Universidade de Évora) and Conceição Andrade Martins (ICS-U. Lisboa)

Usually the approach of the history of wine in Portugal is made from the point of view of economic and social history. As a result, in these studies, even in those that look out to individuals, such as Julio Maximo de Oliveira Pimentel (Viscount of Vila Maior) and António Augusto de Aguiar, usually don't take in consideration their training and their scientific and professional career, namely their performance as teachers of the Polytechnic School and the Industrial Institute of Lisbon, and when this subjects are considered they normally have a secondary place. On the other hand, the studies concerning the intervention of these men in the teaching of chemistry in those two institutions rarely focuses on their intervention in the wineries matters of the country.

However, technical studies, proposals and interventions that they had in the wine sector in Portugal were influenced by their training in Portugal and abroad, the study visits made to different foreign countries, in particular to the Universal Exhibitions where they were able to compare our wines with wines from other countries, as well as the teaching that they both promoted at the Polytechnic School, both in the Industrial Institute and the experiences they have done in the laboratories of these schools.

In this paper we intend to analyze the professional background of Júlio Máximo Oliveira Pimentel (Viscount of Vila Maior) and António Augusto de Aguiar, to better frame and understand their

intervention in the wine sector.

Thursday, July 29
09:30-11:30

SESSION T1A — Room 201

11th Annual Symposium of the Social History of Military Technology 5

Organiser: Bart Hacker **Chair:** Yoel Bergman

Flash Gordon vs Hitler: How Death Rays Saved the World

David Zimmerman (University of Victoria)

In the 1930s the worlds of science fiction and science fact collided to save the world. This talk will explore how popular futuristic belief in death rays led to the key development that would allow the Royal Air Force to defeat the Luftwaffe in the Battle of Britain. The focus of this presentation will be on the 1920s, when hundreds of death ray proposals were made by inventors. Many people believed that not were death rays possible, but in fact existed. Why people believed in death rays and how this belief changed the world will be explored through views of science, technology, pseudoscience, pseudotechnology, the occult, and magic held by many people during this period. Special attention will be given to the mysterious "X Factor", often ignored by historians, that propelled this fantastic idea into the realm of the believable.

Romanian military aviation in the Second World War on the Eastern Front and the performances of IAR-80 Romanian aircraft

Traian-Constantin Dumbrăveanu (Muzeul Casa Muresenilor)

When Romania entered the war against the Soviet Union on June 22, 1941, as an ally of German military aviation, Romania had in service 621 airplanes, as: Henschel Hs-129, Messerschmidt 109, SM-79, Junkers 87, IAR-80.

Romanian Military Aviation fought on the Eastern Front until August 22, 1944, taking part in the great battles of Stalingrad and Crimean and Ukrainian fronts. Romanian Aviation obtained between 1941-1944 a total of 2,000 aerial victories.

Aim of the study is to analyze the ability of Romanian aviation in World War II and also the condition in which aircraft of IAR-80 type have been made, in the years between the two world wars, in Romania. Based on archive documents, testimonies of survivors, scientific monographs, the author analyzes the period in which a group of ingenious engineers of the IAR - Brasov company have designed and implemented the famous model IAR - 80 of aircraft monoplane fighter and bomber dive, which in early 1940 was among the top four best air fighter in the world. This project was implemented in just 14 months by a team who worked day and night to complete successfully the plane that exceeded all expectations.

The study shows that in the interwar period, and the war period, 1941 - 1944, Romania had a strong aircraft industry, designing and producing almost all kinds of military and civilian aircraft. In particular, IAR-80-series was noted during the Second World War, being used in a significant number on the Eastern Front.

SESSION T1B — Room 202

Between analogue and digital. Histories of media technology 2

Organiser: Programme Committee **Chair:** Ana Paula Silva

Television broadcasts from outer space: Achievements, Globalization and National Interests

Vasiliy Borisov (Russian Academy of Sciences)

Television broadcasts from outer space began in essence on 7th of October1959, when the radio-television system of automatic interplanetary station "Luna-3" began transmitting to Earth pictures of the back side of the Moon. Space television has become an important link in processes of globalization. TV report about the first orbital flight of Yuri Gagarin (April 12th, 1961) was broadcasted to Helsinki, London, Berlin and other European cities. The world watched on television the landing of the first man on the moon (N. Armstrong, and others), the expeditions to the moon by the Apollo program (1969-1972).

A great contribution to the science on planets of the Solar system was to obtain television pictures of Mercury, Mars, Jupiter (American "Mariner" and "Voyager"), as well as of the closed by clouds Venus (Soviet "Venus"). Examples of effective international cooperation have become joint flight Apollo - Soyuz (1975) and flights of international crews on the orbital space station.

Since 1960-ies, the USSR and the USA developed radio and television broadcasting by satellite. At 1971 the international satellite communications system "Intersputnik" was established which, in addition to the USSR, attended to Bulgaria, Cuba, Czechoslovakia, GDR, Hungary, Mongolia, Poland and Romania. The U.S. initiated the creation of the international satellite system “Intelsat”, the services enjoyed by 90 States. After the collapse of the USSR (1991) dominant role in space exploration belongs to the USA. At present the main body of the Russian network television includes 20 Russian and up to 10 foreign geostationary satellites.

Evolution of Open-Access to Scientific Information as Basis for Sustainable Development

Nicoleta Constantinescu (Romanian Ombudsman, National Preventive Mechanism) and Yolanda Constantinescu (National University of Defense "Carol I")

The acceleration process of the society's globalization and informatisation led to the generalizing the open access to information, a current practice in which an large accessibility to a wealth of knowledge is offered. Among the types of knoledge, the scientific one is assiduously searched.

The scientific knowledge is rapidly implemented in research and it has as result the strengthening the collaboration between the research groups, with a great impact to the technologies for eco-designing and manufacturing the new products.

The results can be seen also in the renewal of the structure of several research entities, in research labs, institutes or networks and scientific platforms, which have as stringent objective the implementation of the sustainable development.

The demand for free and open access to information was formally launched and made known in 2002 during the Budapest Open Access Initiative, and, followed, in 2003 by Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities.

Starting from a large bibliographic research, the authors analyse the aspects of the open access to the scientific information.

There are highlighted the barriers existing in the transition to the open access publishing alternative model, contrary to the traditional ways of publishing, in which the access to the publications is made only at surcharge.

Relevant economic and political factors in implementing this concept in Romania is shown, and based on multiple existing databases, the characteristics of the stages of on-line and open access to scientific information are done.

SESSION T1C — Room 203

Producing Non-Simultaneity – Construction Sites as Places of Progressiveness and Continuity

Organiser: Eike-Christian Heine **Chair:** Christoph Rauhut

Chances and Limits of Non–Simultaneity as a Research Tool for Late Nineteenth Century Construction Sites

Christoph Rauhut (*Independent scholar*)

Late nineteenth century construction sites were places of non–simultaneity: The building process was characterized by the simultaneous existence of people, practices and objects from different epochs and origins. Around 1900 the system of work assembled a highly varied group of actors from traditional craftsmen to specialist technical actors, attached to large companies or individual entrepreneurs. The processes of planning or the responsibilities for supervision and approval of qualities were heterogeneous and flexible, and adjusted according to the specific tasks of the building processes. Other examples are the employed products and practices: They were characterised by variety and amongst others aspects one can discern various developments that took place at the threshold between the building site and the workshop, as well as the great significance that was given to formalisation and standardisation. The spatial connections of a specific site were also divers: Building materials may have originated from local places of production and simultaneously other products from far distant ones, due to new and improved transportation. A last example would be the legal circumstances of construction, which were ranging from local laws to national and international norms.

To summarize: In the nineteenth century many innovations and transformations changed the building practice while a number of older aspects remained unchanged – construction sites became places of non–simultaneity.

The paper is based on the authors recently completed dissertation, entitled *Die Praxis der Baustelle um 1900: Das Zürcher Stadthaus Fraumünsteramt.*

General Contractors on Site: Contractor's Discourses on their Professional Position and Organization, Belgium 1870–1970

Inge Bertels and Jelena Dobbels (Vrije Universiteit Brussel)

Due to the rising industrialization, the building sector underwent some mayor changes in the 19th century. At an international level this modernization process has been described as both 'sneaking' and 'broad'. Sneaking since it took largely place behind historicizing brickwork and stone facades but also broad because the entire building industry was transformed. Also in Belgium, the construction history evolved strongly in the second half of the nineteenth and in the twentieth century, resulting in both an increasing employment in the construction industry as well as in a professionalization of the construction process. Due to this professionalization process, new working relations on site were established and a growing specialization within the construction industry emerged. Recently, scholars increasingly question the role and position of general contractors in the building process, as one of the protagonists besides architects and engineers. This proposal wants to add to this research by analyzing the contractors' discourses about their professional position in relation to other more traditional and new emerging professions in the field as well as about the actual organization of the building organization. This research links with the non–simultaneity concept since it focuses on different levels of professionalization in the realm of construction.

This paper will focus on journals, published by general contractors' organizations, which became important tools to create and diffuse knowledge on professional contractor's issues.

Cathedrals, Pyramids and Hitler's Highways: Temporal Intersections on the Construction Sites of the German Autobahn under National Socialism (1933–1941)

Eike-Christian Heine (University Stuttgart)

Exiled from Germany, the philosopher Ernst Bloch observed in 1937 that the *Autobahnen*, which were constructed with immense propagandistic effort by the Nazis, make for "a strange architecture, thousands of kilometres long, but somewhat flat". He ironically commented on the pathos with which these roads were compared with the monuments of ancient civilisations, with Cathedrals, Pyramids, the Chinese Wall or the Akropolis of the Athenian. To understand the success of

such 'brazen bombast' (Bloch), he introduced the term *Non-Simultaneity* to express how National Socialism combined ideas from different epochs.

Soon after the Nazis ascent to power, imposing ceremonies to commence construction were staged. When construction finally started with great delays, it relied on muscle power, emphasising the character as public relief work. Work and life in the camps resembled earlier infrastructure construction sites (e.g. Kiel Canal, American Panama Canal) while forced labour camps were part of the concentration camp sytem, confronting the historian with questions of change, continuity, simultaneity and non-simultaneity. After 1936, when workers could find employment in the arms industry, they were replaced by machines. Finally it is highly doubtful that the *Autobahn*gave military advantages. Instead they provided a large pool of machinery and knowledge, ready to be employed in occupied territories. The war ended with the destruction of the *Autobahnen* by the builders to slow down the advance of the Allies. Thus, the construction sites of the highway system were places of temporal ambiguity which cannot be described by processes of rationalisation and mechanisation alone.

Constructing Brutalism: in situ knowledge and skill in post-war Britain

Christine Wall (University of Westminster)

'Raw potent concrete' was the phrase coined by American critic G.E. Kidder Smith to describe the architectural concrete of the twentieth century, a material used with great effect by the young, British, post-war architects of the Brutalist movement. Brutalism was primarily an aesthetic movement: a reaction against the white functionalism of modern movement architecture it sought to expose the raw materials used in production, which in the case of in situ concrete meant the board marks of the formwork. One of the key Brutalist schemes was the South Bank Arts complex, consisting of the Queen Elizabeth Hall and Hayward Gallery, designed by the London County Council architects' department including a number of individuals who were soon to set up the avant-garde practice, Archigram. In this complex and difficult structure the designers demanded high quality detailing to joints and finish which in turn required extraordinary levels of workmanship and accuracy in construction. This chapter examines how the tensions embedded in the avant-gardism of an architecture dependent on traditional craft skills and social organisation of the construction process are illuminated by the oral history accounts given by men who worked on the South Bank Arts complex.

SESSION T1D — Room 208

Nuclear Fun? Banalization of Nuclear Technologies Through Display (I)

Organiser: Jaume Sastre-Juan **Chair:** Jaume Valentines-Álvarez

Communicating while Concealing: Exhibiting Britain's Atomic Piles, 1949-1960

Alison Boyle (Science Museum, University College London)

In the years following WW2, atomic energy was a key area of interest to the British press and public, but scientists' enthusiasm for communicating their work was tempered by official requirements for secrecy.

This paper will track the movements of two display models depicting Britain's first experimental atomic piles, GLEEP and BEPO, made by the staff of the Atomic Energy Research Establishment for use in exhibitions around the country and at international fairs.

The object biography approach reveals the commercial motivations behind going public with pile technologies, and shows that exhibits were designed to dissemble as much as disseminate. The models were manufactured so as to mislead viewers about sensitive technical details, while certain exhibitions – particularly those designed to quell local communities' concerns about the safety of the new Windscale reactor – were consciously planned to win hearts and minds, 'killing all foolish talk'. In later years, newer reactor technologies were being promoted by the nuclear industry, and these models fell from public view.

Playing with the Atom: A Nuclear Science Center at the New York Hall of Science

Jaume Sastre-Juan (CIUHCT, U. Lisboa)

In 1967, the New York press informed that a Nuclear Science Center was being planned as an extension of the Hall of Science, which had been built as part of the 1964-1965 New York World's Fair. Among other displays, such as the Space Park, visitors of the Hall of Science could experience

what a newspaper described as a 'nuclear adventure in Flushing Meadows': adults could visit a Life Sciences Radiation Laboratory or see a Con Edison's audiovisual on the production of nuclear power, and children could prospect for uranium or activate a nuclear reactor at the playgrounds of Atomsville U.S.A. The projected Nuclear Science Center –which was finally never built- would add to these displays the new spectacular main attraction of the Atomarium, in which visitors would be able to see from within how an operating Triga research reactor -donated by the Atomic Energy Commission- went critical.

From the ludic approach of Atomsville U.S.A. to the immersive approach of the Atomarium, this paper will analyze the political role of playfulness, entertainment, participation and familiarization as display strategies in the exhibition of nuclear technologies at the New York Hall of Science in the late 1960s. By putting these displays in the pedagogic and corporate contexts of the contemporary hands-on approach to science popularization, it will explore what was the role of ludic displays in shaping Cold War nuclear popular culture in the United States.

SESSION T1E — Conferece Room 2

Innovations and Mediations in the Technologies of Sound and Image: 1890s-1990s

Organiser: Stefan Krebs and Susan Schmidt Horning **Chair:** Hans-Joachim Braun

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The Failure of Binaural Stereo: German Sound Engineers and the Introduction of Dummy Head Microphones

Stefan Krebs (University of Luxembourg)

In 1973, binaural stereophony was introduced to the German public during the International Broadcasting Fair (IFA) in Berlin. Based on the invention of dummy head microphones binaural (or head-related) stereophony provided facsimile sound recordings that enabled the listener (when using headphones) to experience the full spatial acoustics of the original recording situation. Trade fair visitors were invited to listen to binaural test recordings, and the Berlin radio station RIAS broadcasted the first binaural radio play 'Demolition'. Radio listeners and newspaper journalists praised 'Demolition' for its "super stereo" quality and the highest fidelity ever achieved in recording history. Despite this remarkable echo German broadcasting stations were quite reluctant to adopt binaural stereo. A few departments were eager to experiment with binaural recording technology

and a small number of interesting radio plays and music recordings was produced in the following years. However, most sound engineers and sound editors (in German: Tonmeister) fiercely argued against the use of dummy head microphones; often they referred to certain technical shortcomings of head-related stereo in general, and available microphone models in particular (e.g. Neumann's KU80). Based on contemporary publications, sources from broadcasting archives, and oral history interviews, this paper will argue that the radio makers' rejection of head-related stereophony was rather based in contemporary listening and recording practices than in actual shortcomings of binaural stereophony.

Jazz and the Aural Image: Van Gelder, Eicher, and Godard

Krin Gabbard (Columbia University)

Since the early 1950s, Rudy van Gelder has engineered several thousands of the most revered jazz recordings. Just as the Classical Hollywood Cinema tried to convince audiences they are looking directly into the lives of real people, Van Gelder's recordings are engineered to make listeners believe they are hearing the authentic sound of performed jazz. But Van Gelder has taken pains to curate his sound, most notably by turning down the volume on the drums and creating a balance that makes every instrument distinctly audible. People who grew up listening to Van Gelder's recordings may find the music to be chaotic and distorted when they actually hear it in a club. By contrast, producer Manfred Eicher, who has released thousands of recordings on his ECM label since 1969, has asked audiences to confront the music as a scrupulously recorded artifact. Eicher has said that French filmmaker Jean-Luc Godard's practice of exposing or dispensing with cinematic conventions has influenced his own work as a record producer. Like Godard, whose films seldom strive to be transparent renderings of reality, Eicher and his engineers ask us to confront their recordings as recordings. On one ECM LP, for example, the bass is entirely on the left channel and the drums are entirely on the right. Eicher presents his music as carefully engineered artifice entirely unlike the Van Gelder recordings with their illusion of unmediated sound. This paper considers these two traditions in the technology of jazz recording and their relationship to cinematic art.

The Soundies and the Scopitone: The Short-Lived Pre-History of Music Videos

Susan Schmidt Horning (St. John's University)

When MTV launched on U.S. television in 1981, the marriage of sound and image in the short music video led to a sea change in popular music, giving rise to elaborate productions of short films to accompany song releases that once only aired on radio, with the occasional live or lip-synched television performance as promotion. It seemed that overnight, popular music had shifted from a predominantly aural culture to a fusion of aural and visual. But MTV did not give birth to the music video. During the 1940s in the United States and the 1960s in France, two playback devices—the Panoram and the Scopitone—featured three and a half-minute 16mm films of musical numbers that customers could select as they did a song on a jukebox. The films ranged from straight performances of musical numbers, to elaborate productions with costumed dancers. These video jukeboxes enjoyed rapid success, but suffered equally rapid declines in popularity due to a variety of factors. Based on viewing of some of the hundreds of Soundies made for the Panoram, and the films made for the Scopitone, and on documentary evidence and secondary works in cultural and technological history, this paper will explore the cultural and technological factors that may have prevented these innovative technologies from succeeding, as well as their long-term impact on musical culture.

The Théâtrophone: New Sonic Spaces and Binaural Listening Practices in late 19th Century Theatre

Melissa Van Drie (Centre National de la Recherche Scientifique)

This paper presents a historical and theoretical reflection of the *théâtrophone*, a late nineteenth-century telephone broadcast service that allowed users to listen in live to local theatre and music performances. Often referred to as the first binaural experience (1881), aspects of the théâtrophone's longer history in Paris (1889-1930s) are relatively unknown. This paper considers what hearing through a théâtrophone meant to contemporary users. In doing so, the ways in which the théâtrophone was attuned to discourse and practice emerge, as do subtler processes involved in 19th century constructs of hearing and listening. Precisely, the théâtrophone's development is examined in regards to its particular social context: its installation in sites on spectacular Parisian *Boulevards* and its relation to*fin de siècle* theatre culture. The paper will explore how théâtrophonic listening was accorded to existent practices of theatergoing. Secondly, the paper

develops the more radical propositions of this 'virtual experience' in relation to aesthetic and practice-based changes occurring simultaneously in theatre culture. The théâtrophone multiplied a performance's forms and its modalities of creation and reception. Through accounts of 'listening in', the aspects of the new sonically constructed space are described, as are postures of early mediatized listening. Ending with Proust, who was one famous subscriber, théâtrophonic listening is defined as contributing to the development of a refined ear, capable of detecting sonic nuance, that was central to artistic sensibilities at the time.

SESSION T1F — Amphitheatre 2

Globalization from the ground-up: Exploring the entangled geographies of food commodities

Organiser: Tiago Saraiva **Chair:** Amy Slaton **Commentator:** Amy Slaton

Plantations on the move: connected histories of cocoa

Marta Macedo (CIUHCT, U. Lisboa)

In the early 1900s, an obscure Portuguese colony in the equatorial Atlantic rose as the world's leading cocoa producer. Cocoa from the island of São Tomé was grown on large plantations, with indentured labor, and high technological inputs. This specific political economy had created both a standard commodity and a stable colonial power. As São Tomé's plantation technologies, to control both plants and people, became the model for making an industry-suited cocoa, the experimental knowledge produced there was able to travel to other African colonial territories, mainly to the Belgium Congo and German Cameroons. But São Tomé's connections were not exclusively African. If we follow this plantation story it is also possible to unveil the historical links established between the islands and former coffee landscapes of the Vale do Paraíba in Brazil. This paper argues that the transnational and transcolonial features embedded at the core of empire building are better perceived when we take commodities and its actors as objects of study.

Codfish Architecture: bridging North-Atlantic hypothesis

André Tavares (Escola de Arquitectura da Universidade do Minho)

Cod inhabit the cold waters of the North Atlantic and, so far, the history of cod fishing has been told from the perspective of the sea. But what about the impact of the fishery on building and urban development? How does an activity that takes place mainly at sea affect what happens on the shore? Cod fisheries provide a privileged perspective from which to assess technological shifts, an understanding of the mechanics of which allow us to link human practices to the transformation of the built environment. From fishermen's houses to harbors, from fish flakes to trade routes, it seems possible to trace the geography of codfish architecture.

This paper presents an embryonic hypothesis. It aims to discuss the potential of the codfish hypothesis to assess and challenge architectural history. If we follow the harsh experience of cod fisheries, demanding constant travels back-and-forth throughout the Atlantic, will we find leads to overcome the gap often drafted between popular and mainstream architecture?

Cloning California: Oranges, Genetics, and the Making of the Global South

Tiago Saraiva (Drexel University)

This paper follows the orange trail to unveil an early version of global California. It explores the role of geneticists in converting orange growers into horticulturalists organized in cooperatives producing commodities for world markets in the first decades of twentieth century. Cultures of cloning oranges are put in relation with the cultivation of growers.

The citrus orchards that contributed to the image of Los Angeles as Mediterranean Eden were cloned in the new Mediterranean being cultivated in South Africa and Australia, as well as in the old Mediterranean, namely in Palestine, Algeria, Morocco, and Spain. Attached to the oranges came the Californian cooperatives and their labor and racial relations. By tracing the trajectories of geneticists and their scientific artifacts, the paper intends to highlight the transnational nature of the cooperative experience across a new global Mediterranean and to offer an alternative understanding of the presence of the United States in the Global South.

11:30-13:00

SESSION T2A — Room 201

11th Annual Symposium of the Social History of Military Technology 6

Organiser: Bart Hacker **Chair:** David Zimmerman

Development Obscured: The 4.2-inch recoilless rifle in World War II

Yoel Bergman (Tel-Aviv University)

On 21 April 1945, Dr. Charles Hickman, who headed the National Defense Research Council (NDRC) section H (Investigations on Propulsion), filed a patent for a recoilless rifle (US2598256), which was based on his work during WWII on a recoilless attachment adapted to convert the conventional 4.2-inch (106.6 mm) chemical mortar into a lightweight, readily portable, weapon. The 4.2-inch mortar, originally developed in the interwar years to fire chemical shells, became the standard US mortar in WWII for firing explosive charges. Postwar recollections of NDRC members suggest that the recoilless adoption of the 4.2-inch mortar began with Hickman and others before the army initiated development of of the standard 57-mm recoilless rifle. Development of the 4.2-inch recoilless rifle continued until late 1944, with some pieces used in action. The abstract will follow the course of development and will try to answer still unanswered questions. Why was the 4.2-inch recoilless rifle not massively adopted by the army in the war? Why was Hickman's 1945 patent approved only in 1952, in the midst of the Korean War? Was it because of the renewal of the army program to develop quickly the unsuccessful 105-mm recoilless rifle (whose development was shelved in WWII) for the troops in Korea?

Turning Eagles into Sparrows? The U.S. Military's Role in Shaping Postwar Civilian Aviation

Alan Meyer (Auburn University)

In 1939, as the world teetered on the brink of war, there were fewer than 34,000 civilian pilots in the United States. Within a decade, this figure had swelled to more than half a million. Three military-related programs contributed to this explosive growth: the prewar Civilian Pilot Training

Program, wartime military flight training, and the postwar Servicemen's Readjustment Act, better known as the GI Bill (which besides helping millions of returning veterans attend college and buy their first homes, also subsidized flight lessons for hundreds of thousands of aspiring aviators under the guise of "vocational training"). Based on numbers alone, these three programs profoundly shaped the demographics of postwar aviation for decades to come.

But the U.S. military's indirect influence on the culture of postwar civilian flying was no less dramatic. Most newly-minted pilots were young, white men, a direct reflection of who had the easiest access to the cockpit during the war. Furthermore, they and the instructors who taught the flood of postwar GI Bill student pilots imbued civilian aviation with an aura of masculinity that harkened back to a military training regimen designed to weed out anyone who might fold under the pressure of aerial combat. Based on extensive primary source research, this paper describes the three wartime programs that trained this first generation of postwar civilian fliers, explores how this "fraternity of pilots" shaped aviation culture, and connects this to the continued dearth of women pilots, which has yet to exceed seven percent.

SESSION T2B — Room 202

Between analogue and digital. Histories of media technology 1

Organiser: Programme Committee **Chair:** Joanna Walewska

The invisible history of ruled paper

Peter Koval (Humboldt Universität zu Berlin)

One of the most apparent effects of the so called "digital revolution" is the decline of handwriting. The ubiquity of keyboards and touchscreens or the use of photography in instant global communication at almost no cost reduce dramatically the urge to write by hand. That doesn't mean that we are about to abandon handwriting in near future. A lot of attention is paid to the development of new technologies, bridging the analogue world of paper and the digital computer. This current "change of media" brings up an old question again: The question of the techno-logy of handwriting. Despite or rather because of the very individual character of handwriting many educational, political and media-technological efforts were made in order to standardize the writing by hand since ancient times. Since the 18th century ruled paper became one of the most powerful tools for disciplining – setting and enforcing geometrical rules to – the writing hand. There might

be a "natural tendency" of writing to get aligned to a line. But what are the technological implications of this alignment? In my presentation I would like to reconstruct the history of the industrialization of the production of ruled paper in 19th and early 20th century through the revision of relevant patents and machines.

Compression, convergence and conviviality: the contribution of new technologies to developments in radio from the 1980s

Chris Bissel (Open University, UK)

This paper will examine the role of new information technologies in the development of radio over the last four decades. The move to digital techniques saw the application of increasingly sophisticated compression algorithms, such as in the MPEG suite of standards, and the convergence of military and civilian technologies such as in the context of GSM. Digital techniques have also seen the convergence of audio and video in radio broadcasting: most radio networks now have websites, Facebook and Twitter feeds, and still photographs and moving video resources of various types are widely used to support radio programmes. In addition to commercial social networking sites, many radio broadcasters also include audience participation via specialised online forums or other forms of electronic communication between producers and consumers. It is not too fanciful to speak of a new conviviality within radio audiences – a conviviality that has existed in various forms since the early days of broadcasting, but which has recently undergone a categorical change in the active participation of listeners. Following a brief, but hopefully accessible, explanation of some compression techniques, the paper will examine the interaction between technological developments and social behaviour in their recent historical contexts.

Green Data Center - Virtualization in data centers

Pedro Brandão (CIDEHUS - Universidade de Évora)

Currently, data centers are a problem regarding the enormous energy consumption, therefore a problem regarding the carbon and energy costs. One of the solutions to this problem is through server consolidation. The best technology to achieve this goal is server virtualization. The concept of virtualization has been discussed since 1950, although it has become a trend with its implementation in the x86 platform, in the 80's. At the beginning of the 60's, IBM introduced the concept of "Time Sharing" (time-sharing), which has been the initial route for virtualization (through the

concept of hardware sharing). (MARSHALL, 2006). In 1972, the System/370 Advanced Function was made available and had a new hardware of net addresses relocation as well as support to four new operating systems: VM/370, DOS/VS, OS/VS1 e OS/VS2.

The introduction of the VM/370 Release 2, in 1974, contained the first interaction of micro code VMA (Virtual Machine Assist). In that same year, Gerald J. Popek e Robert P. Goldberg have created a set of formal requirements for architectures, whose greater relevance has been entitled "Formal Requirements for Virtualizable Third Generation Architectures". The greatest relevance was the conveniently presentation as well as easy to define in which circumstance a computer ś architecture would effectively withstand virtualization, presenting the guidelines to the architectural design of computer ś architectures intended to withstand. (UDDIN, 2011) The virtualization process encapsulate operating system and the applications into virtual machines. In consequence less physical servers thus less energy consumption and thus lower carbon emissions. (BREY, 2009)

SESSION T2C — Room 203

Flow in post-World War II Europe: Traffic, knowledge & practices

Organiser: Frank Schipper **Chair:** Hugo Silveira Pereira

Commentator: Carlos Lopez-Galviz

Car and the City: traffic congestion and the redefinition of urban space through automobility in Athens, during 1950–1980

Alexia Sofia Papazafeiropoulou (National Technical University of Athens)

This paper explores how the urban space has been reconstructed through automobility flows, within the case of Athens during the period 1950 – 1980. Athens is supposed to have suffered from traffic congestion since the early 1950s, during a period when the automobiles' circulation had been quite limited when compared to Western European countries. According to the engineers, that problem stemmed from the fact that the urban planning of that city hadn't taken place based on the parameter of automobility. Within the discourse expressed in the technical journals of that period, the automobile is either celebrated or demonized. In any case, it is considered as synonymous with progress. Consequently, the idea that prevailed until the 1970s was that all mobilities and urban activities should be reorganized so as to give space to the automobile flows; hence, mobilizing the 'static' urban complex was considered as a modernization process. Such an idea was

attempted to be applied in technical proposals for construction works conducted by both Greek as well as American engineers, who were invited so as to contribute to the regulation of the urban space according to the standards of traffic engineering. The central aim of the paper is to examine how automobility influenced the techno-social perception and organization of the postwar city.

Traffic Flows in Transition to Sustainability? The View of Delft

Frank Schipper (Eindhoven University of Technology)

This paper is interested in the question to what extent cities today will manage to shift away from car-based mobility. It argues that there are three phases that are important to answer this question. In a first phase, the city needs to open itself up to the car. In a second phase, boundaries are imposed on the extent to which the city is opened up to the car. The third phase is more offensive in terms of its anti-automobile measures, imposing measures with the explicit aim to shrink automobile territory and allow other modes to define the character of specific parts of urban space.

The paper talks about these processes in general, but studies them in particular for the city of Delft, which is interesting for two main reasons. First, the picturesque historic center Delft presented a space in which the accessibility for cars would always present a challenge, for the heart of the city had developed largely in absence of the car. Second, the city is the home of the prime technical university of the country, with an urban planning department that influenced thinking about traffic throughout The Netherlands and beyond.

Roads for development: Portuguese highway engineers and the appropriation of traffic engineering

M. Luísa Sousa (CIUHCT, NOVA)

This paper aims to explore the concepts of circulation and appropriation of technology between centres and peripheries, from a new theme in Portuguese historiography, the highway engineering and its connection to discourses of "development" (*fomento*). At the European level it aims at identifying the itineraries of circulation of Portuguese highway engineers either through training courses in universities (through scholarships), and participation in international conferences and seminars (for instance, those promoted by the International Road Federation or by European technical cooperation organizations). At the national level, I will focus on the contribution of highway engineers in the use of a development's (*fomento*) rhetoric in the framework of the Development

Plans (*Planos de Fomento*), as a strategy to enrich their projects with economic justification for building roads with improved technical characteristics. I want to study how this discourse, incorporating the concepts of traffic engineering, justified, for example, plans to build motorways in the metropole in the 1950s, and its relation to the Portuguese adhesion to the "Main International Traffic Arteries"; and how did it work in the promotion of "low cost" roads in the Portuguese colonies.

SESSION T2D — Room 208

Nuclear Fun? Banalization of Nuclear Technologies Through Display (II)

Organiser: Jaume Valentines-Álvarez **Chair:** Jaume Sastre-Juan

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Banalization of Nuclear Technologies? The strange case of the British Atomic Gardening Movement

Vanessa Cirkel-Bartelt (IZWT, Bergische Universität Wuppertal)

From the mid-1940s Great Britain saw a number of shows, exhibitions and other activities that were supposed to promote the peaceful use of "the atom" even before the American "Atoms for Peace"-Program reached its full impact through the 1955 Geneva conference. The British activities aimed at educated laypeople to teach them the physics behind the phenomena, foster acceptance for the use of atoms in different contexts and even ask their participation in "atomic" scientific endeavours. One of these participatory approaches was advertised by the British Atomic Gardening Society: hobby gardeners should experiment on irradiated seeds and thus become lab-hands of biologists that worked on radioactive breeding, i.e. the breeding of new varieties by means of stimulating the mutagenesis of plants by gamma-rays. Though the Atomic Gardening Society seems to have been rather short-lived, the case raises interesting questions concerning the banalization of nuclear technologies; the most important one being: why has radioactive breeding and subsequently its offspring atomic gardening vanished from historical and public perception? Though the number of varieties breed this way has risen from less than a dozen in 1960 to more than 3000 in 2015, it has never created the same stir as e.g. cloning and other direct manipulations of plant DNA did.

The talk will examine the case of atomic gardening, radioactive breeding, as well as the exhibition of plants produced this way and the public reaction to this very specific nuclear technology.

The Peaceful Atom for Every Child? Repackaging Nuclear Energy in Russia and Ukraine in the Post-Chernobyl Atomic Glow

Tatiana Kasperski (Södertörn University)

Within a few years of the Chernobyl disaster strong anti-nuclear protests developed in several Soviet Republics where dozens of nuclear reactors were operating or under construction. When the Soviet Union collapsed in 1991, the nuclear establishment in newly independent states had to work through the various ways to convince citizens of the safety of existing nuclear power stations and the importance of the further development of nuclear energy for their countries' national futures.

Through 1990s and 2000s the public nuclear organizations developed new communication instruments and forms, as well as such new spaces for nuclear science and technology displays as local information centers and exhibitions. This paper will focus on the activity of these centers in Russia and Ukraine and their attempts to repackage Soviet nuclear technology through entertainment and education as an object of both fun and awe for post-Soviet citizens and first of all for children. They opened excursions to nuclear stations; sponsored competitions for children including drawing contests; screened documentaries and cartoons; arranged visits to nuclear technology exhibitions and museums; and organized games, lectures and even festivals, carnivals and plays. What were the goals of the nuclear industry? What were nuclear spokesmen trying to achieve? We will look at these activities as attempts to "domesticate" the atom, stage openness, accessibility, and friendliness of the nuclear installations, and to "nationalize" it and instill pride in technological achievements.

Making Fun of the Atom: Entertainment, Play and Humour as Resistances to Nuclear Technologies in Spain and Portugal, 1970s-1980s

Jaume Valentines-Álvarez (CIUHCT, NOVA), Ana Macaya-Andrés (UAB—CEHIC), and Asa Ekengren (Boston Consulting Group)

In the years around the 1973 global oil crisis and the fall of the two long-lasting dictatorships of Franco (1939-1975/77) and the Estado Novo (1932-1974), new models of society and technology were at stake in Spain and Portugal. Long after the first international agreements between the fascist regimes and the US and the UN concerning the development of nuclear programs in the 1950s and 1960s, a myriad of (ideologically heterogeneous) social resistances to nuclear technology appeared in the 1970s and 1980s in the Iberian Peninsula, closely intertwined with wider political struggles.

Despite "nuclear fun" was used as a way of banalization of the technological risk, the toxic atmospheres and the military interests to seduce citizenship, entertainment, play and humour (in journals, leaflets, comics, lyrics, festivals and demonstrations) were also an essential part when contesting the nuclear discourses, landscapes and objects. By focusing on the cases of the nuclear plants of Vandellós (Catalonia, 1972), Lemoniz (Basque Country, [cancelled]), and Ferrel (Peniche, Portugal, [cancelled]), this paper will deal with the self-managed fun devoted to reject and resist the atomic programs as well as to promote alternative sources of energy and a transformation of the social order in the Iberian Peninsula.

SESSION T2E — Conference Room 2

Playing with Materials and Technology 1

Organisers: Stefan Poser and Maria Elvira Callapez

Chair: Maria Elvira Callapez

Playing with Materials and Technology: The case of the toy industry since the 1950s

Maria Elvira Callapez (CIUHCT, U. Lisboa) and Stefan Poser (Bezirksamt Steglitz-Zehlendorf von Berlin)

Materials influence technology-based play to a remarkable extend: (i) many games are based on feeling and guessing different kinds of materials and products. (ii) In sports the application of new materials was and still is the key to lightweight constructions, which influence competitions. (iii) The application of iron enabled engineers of fairground rides to construct new, fast, extremely large rides since the 1890s. Constructions from steel and plastics reduced the fixed costs of the showmen since the 1960s. (iv) In the toy industry, new material and technologies of mass production reduced the production costs, contributing to the toys' distribution in every strata of society. Our case study is dedicated to toys, made from plastics since the 1950s.

Plastics daily infiltrate into everyday life. They are defined as a material with *plasticity* which allow production in any shape, size and form, without limits. In the modern playthings kingdom such *qualities* of plastics can make them into a material of imagination, assuming limitless forms. The world of construction play has seen a boom of plastics toys after the Second World War. Toymakers were experimenting with new types of plastics with better properties than traditional materials.

In this paper we will analyze how the toy industry dealt with the substitution dimension of plastics: wood, iron, aluminum were substituted by new synthetics materials. To what extension toys reflect technology and innovations in plastics? How important were plastics for the mass production of playthings? What's about the role of toys for our nowadays plastic culture?

The cultural technique of building, between play and work

Jose Muñoz Alvis (Humboldt-Universität zu Berlin)

Building blocks configure a heterogeneous connection of techniques and knowledge between natural sciences and architecture, as well as codify a cultural technique of building, evidencing thus any difference between the practice of working and the practice of playing. This argument is supported by historical research about the reintroduction in Europa of the prefab technique of building, achieved by the architect Gustav Lilienthal and the development of models to analyze the spatial distribution of atoms improved by the chemist Friedrich A. Kekulé.

In the conference, I would like to describe how in both contexts, the dissimilar production of knowledge is supported by a notation system of building which defines the practice of modeling with building blocks. This notation system comprises points, lines, areas and solids, which were systematized into the building blocks by the Crystallographer and Pedagogue Friedrich Fröbel in the first part of the 19th century. Based on this notation, I would like to propose the idea that during the process of building with these materials a set of construction techniques is stored in the builders, configuring a specific practice to produce and transmit knowledge. Thus, building blocks can be moved to any place such as the laboratory, the school or the home without changing the achievement of its practice. At the same time, they establish the parameters to problematize the practice of building, producing a scenario to set up new constructions (media) and decision processes, defining, as a consequence, a specific "cultural technique" of building.

Shaping the future through play: Construction sets and their manuals (late 19th-early 20th c.)

Artemis Yagou (ICON/ICOHTEC)

In the period under consideration (late 19th-early 20th c.), construction sets were not viewed simply as toys, but as educational tools for young boys. With the gradual expansion of the middle class and the rise of domestication, construction sets became playthings par excellence for interior spaces, where play was supervised by adults. Unlike outdoor play which was considered dangerous, playing with construction sets was not only safe but also expressed the dominant rhetoric of bourgeois education for boys, which emphasized discipline, rationality and self-control. Especially in Germany, such toy things were seen as preparation for engineering careers and underpinned the vision of a modern society where the engineer held a central position.

Construction sets were typically made of wood, ceramic, or metal and were usually accompanied by manuals which included pattern sheets, extensive instructions and user testimonials. The proposed paper will analyse construction sets' manuals from Munich collections (Stadtmuseum, Technical University and Deutsches Museum), in order to discuss the ways in which play activities were structured by relevant adult stakeholders. Toy producers, parents, engineers, representatives of the State and other adults contributed in different ways to these manuals and shaped the acceptable usage of construction sets and the associated educational discourse. The presentation topic lies on the intersection of the history of technology, play, gender, everyday life and education.

SESSION T2F — Amphitheatre 2

Innovations on the Plate: Technology behind Cookery

Organiser: Timo Myllyntaus **Chair:** Hans-Joachim Braun

Bottlenecks and Breadcakes: Engineering a British World Food System, ca 1840-1918

Thomas David Finger (Northern Arizona University)

Over the course of the nineteenth century, the amount of wheat traded on the international market skyrocketed. A host of regional trades were transformed into a global trade with London and Liverpool at its core. This presentation describes a host of technological innovations in the nineteenth century that were required to bring wheat from around the world and turn that wheat into a loaf of cheap bread for the English consumer. Zeroing in on the Anglo-American grain trade, I will describe how innovations in the field, at port, and in the processing facility combined to encourage the surplus production of wheat in the United States.

By 1900, the U.S exported nearly forty percent of its wheat crop to England. In the field, farmers innovated new types of wheat that would stand up to dramatic fluctuations in temperature and precipitation of the upper Midwest. At the same time, a small community of millers in Minneapolis stole the technology of roller milling from Hungary and adapted it for use with the hard spring wheats farmers in the area had developed. Finally, dramatic technological transformation of port facilities at locations like Duluth, MN; Buffalo, NY; and Liverpool, England allowed wheat to move quicker and cheaper than ever before. This string of technological innovations stretching

back into the 1840s made bread in England cheaper not only because of the volume it produced from the United States, but also because portions of this technological system were exported around the world to encourage the further planting of wheat in Russia, India, Argentina, Australia and Canada.

In sum, this technological system represented a large-scale food energy delivery system that collected solar energy on grasslands the world over and delivered it cheaply and in great quantities to the stomachs and muscles of industrial laborers in England.

The social stamp of a substitute food: Dispute on the acceptability of bark bread in Finland tortured by mass famines

Timo Myllyntaus (University of Turku)

Bark bread is one of the most common famine foods in the Northern Europe from Norway to Siberia at least since the Middle Ages. It is made of a thin inner layer between the outer bark and wooden trunk of a tree. The phloem layer usually scraped by a wooden knife from deciduous trees such as elm, ash, aspen, rowan or birch, but scots pine has been the most popular. Pine for collecting phloem must be at least fifty years old, and preferably thin and smooth skin knot-free wood. A pine phloem comes off the best during the latter part of May to early July. Before grinding dry phloem sheets, which as fresh look like parchment slips, are at first prepared by roasting or boiling for removal of harmful substances (bark, resins, waxes, terpenes, lignins). By grinding dry phloem sheets, it is possible to get so called pettu (pine bark) flour, which was generally used to replace part of rye flour in baking bread.

An exciting feature of bark flour is that social groups had quite different – even contrasting opinions – on bark flour, its preparation and using as nourishment. In the Nordic countries, the upper class started to despise pettu bread as a primitive and useless emergency food. In contrast, peasantry and especially the poorest strata of the rural population valued it as the best substitute food during famines. For the Sami people, bark flour and pettu bread made from Scots pine served as an important source of vitamin C. Even normal years, they used pettu flour by mixing it in rye flour while preparing gruels and bread.

The paper examines how economic values, technological practices and supply of food substances affected social considerations on bark bread. Why some social groups hated it, while others were fond of it and regarded bark bread as trustworthy food in the case of emergency?

How to make toxic lichen edible? Innovative emergency foodsolutions in 19th century Finland

Jukka Vornanen (University of Turku)

Finland suffered from serious crop failures in 1856, 1862 and 1867. Risk of famine was continuous, and Finnish officials attempted to find and create new and easy emergency foods. Ordinary Finns were used to eat bark bread "*pettu*" during hard times but Finland's political and educational elites thought *pettu* was unhealthy food and its harvesting harmful to valuable pine forests and developing forestry. Scholars in Sweden and Finland had tried to find better alternatives to bark bread since the 18th century and many had thought that lichens were the optimal solution. In Sweden and Finland, lichens grow abundantly and are easier in snowless periods to collect than pine bark.

According to scholars, the most edible lichen was Island moss (*Cetraria islandica*). Reindeer lichen (*Cladonia rangiferina*) was also recommended. The biggest problems in eating lichens were their bitter taste and indigestion. Lichens contain "lichen acids," which are nowadays categorized to fenolic carboxylic acids, aliphatic acids and usnic acids. The most characteristic consequence from eating regularly food containing usnic acid and its salts was serious hepatic toxicity and liver failure. In the 19th century, there were two known methods to neutralize lichens acids: either boiling them in water or soaking in a lye solution. The distinguished Swedish chemist Jöns Jacob Berzelius promoted especially the soaking method for lichen.

Finnish government officials attempted to educate common people to collect lichens and process them edible. In 1857, Finnish newspapers were full of articles on making lichen flour for baking bread. Ten years later, when even a more serious famine threatened Finland, special cooking courses were organized to teach people to use lichens as a substitute food.

My research focuses to find out how successful the lichen propaganda was in post-Crimean war Finland. Other research questions include: How well did common people learn to prepare lichens and processes them into edible flour? Were the elites' expectations realistic? Were lichens better a food substitute than traditional bark bread?

14:30-16:00

SESSION T3A — Room 201

11th Annual Symposium of the Social History of Military Technology 7

Organiser: Bart Hacker **Chair:** Alan Meyer

Black Operations and the Blackbird: Closed Societies and Intelligence-gathering Technologies

Layne Karafantis (Smithsonian Institution)

The SR-71 overcame a uniquely Cold War challenge: to monitor the Soviet landmass during a time of prohibited overflights. American military and political leaders feared the buildup of enemy bombers and missiles, and were convinced that monitoring Soviet air and space systems was the key to assuring American preparedness, thus avoiding global holocaust. This presentation considers the SR-71 Blackbird as not only a novel technology, but as one that was designed to meet specific, historically contingent, intelligence-gathering objectives. Its program yielded information that influenced myriad Cold War decisions, and a more complex understanding of its role not only as an advanced aircraft, but as a determinant of sociopolitical outcomes, enables us to better understand the roles that technology have played in global history.

Research is largely drawn from secondary materials, although they are approached and analyzed in a novel way, one which emphasizes the decision-makers, designers, and social underpinnings of the technology. Preliminary conclusions consist of: (1) the recognition of a particularly Cold-War-era approach to political and military decisions, one which preferenced sophisticated, technological solutions, (2) an increased tendency within the aerospace industry to accommodate and depend on federal contracts for their livelihood, and (3) the inevitable transition from older, expensive solutions when Cold War imperatives no longer justified the dedication of vast sums of capital to cutting-edge defense technologies.

The Military's Pivotal Role in the Formation of Israel's High-Tech Industry

Sandra Ziv (Bar-Ilan University)

Throughout the 50's, the Israel Defense Force sent thousands of officers and technicians to Europe and the United States to acquire advanced skills in operating arms, machinery and electronics, most of which had been purchased in France, England or, to a lesser extent, the United States. This trend continued throughout the 50's and, beginning in the 60's, the IDF Chief of Staff's Office started sending officers to universities in Europe and in the United States for advanced university degrees in engineering and the exact sciences. By 1959, the IDF founded the central computing system unit, and the School for Computer Related Professions. This unit became one of Israel's main sources of technology innovation.

A generation of Israelis who had been raised in the Israel of the 50's, served in the IDF of the 70's, studied for graduate degrees in the 80's, founded companies upon their return. These highly educated, highly trained ex-military officers served as human technology accelerators and were instrumental in establishing the high technology infrastructure and culture that gave birth to the high technology environment that we know today in Israel.

The company's they founded and the infrastructure they built formed the basis of many hundreds of high technology companies within the years of 1990-2000. It is these returning soldiers who formed the critical mass for what is now known as the "Start-up Nation".

Militarized Society, Socialized Army: The IDF Civilian Functions

Matitiahu Mayzel (Tel-Aviv University)

The purpose of the paper is to explore the roots of the historical process by which the Israeli military became both one of the most significant and powerful sources for technological development and at the same time the largest and strongest socialization agent in Israeli society. The period under discussion is the early part of the process, from the establishment of the IDF in June 1948 to the early 1950s. While this was a crucial period in the process of militarization of Israeli society, I propose that within the same process the military took on civilian attributes, that in the early years of the State of Israel the newly formed military served as an instrument for social and national purposes that in other countries, and later in Israel, are within the realm of civilian governmental

ministries and other agencies. One feature of this process, inherent in its non-military purposes, was employment by the military of simple and low technologies, as well as non-military technologies. This also relates to the wider issue of scientific and technological education. This was a challenging task in a society intensely engaged in absorbing very large numbers of immigrants, mostly refugees, of greatly varied social-economic status and educational levels. Thus the military was assigned task from dealing with flood and snow to housing and schooling crises. Of course, this also reflected in the social composition of the military and the manpower allocation system and its relation to technological skills.

SESSION T3B — Room 202

Poster Session

Organiser: Programme Committee **Chair:** Sławomir Łotysz

History of Science and Technology EPMagazine: A project based on intercultural experience exchange

Angelo Rapisarda, Catalin Mihai, and Carmen Lungoci

The History of Electricity in the State of São Paulo (1890-1960): Industrial Heritage, Landscape, and Environment – Electro-memory II

Giorgia Limnios, Gildo Magalhães, and Sueli Furlan

Formation of Information Technologies: Contribution of Academician V.E.Lashkarev to Discovery of p-n junction

Lilia Ponomarenko

Improved landscapes: tourism, technical expertise, and the aesthetics of hydropower in Austria, c.1830 to present

Angelika Schoder

SESSION T3C — Room 203

Innovation, environment and different sustainability patterns

Organiser: Programme Committee **Chair:** Johan Gärdebo

Natural catastrophes in forests as drivers of innovation towards sustainability

Péter Szabó (Institute of Botany, CAS) and Silvie Suchánková (Masaryk University)

Forests have played an important role in the history of the concept of sustainability. 18th and 19th-century German forestry is usually referred to as the starting point for the idea of 'sustainable development', even though recent research has demonstrated that 'sustainability' itself went through significant semantic changes. Some aspects of the development of sustainable forestry are well-known, especially the gradual evolution of management techniques. Recent research questioned some of the established truths of the forestry narrative, including the existence of timber-famine that would have necessitated novel technologies. However, the alleged lack of timber was not the only reason behind changes in management techniques. Windstorms, which are important drivers of forest dynamics, also facilitated the discussion on new, 'sustainable' technologies.

Based on an extensive geodatabase of windstorm events as well as forest area, management and tree species composition changes for the past 300 years, this paper will demonstrate the connection between natural catastrophes (windstorms) and the spread of 'sustainable' management techniques in Moravia (27,000 sq.km in the Czech Republic). Among the examples is the 'windstorm of the century' of December 1740, which contributed to the widespread planting of a rare ecotype of European larch. In addition, we will show how foresters used (and abused) large-scale windstorm events to promote the application of new concepts in planning and management.

Recycling and Soviet Forestry Industry, 1950s – 1960s

Elena Kochetkova (National Research University Higher School of Economics-Saint-Petersburg/University of Helsinki)

In the mid-century both the Soviet leadership, producers and scientists expressed anxiety about the lack of forests near pulp and paper plants, and started looking for alternative raw materials. The

modernization of 1950s-1960s witnessed a few initiatives to use different sources for pulp production, ranging from wood and timber wastes to one-year plants. In most cases, this search did not transform the raw materials supply. Most factories continued manufacturing pulp and pulp-based products using wood, and thus kept deforesting and exploring undistributed forests, particularly in Siberia.

I investigate using alternative resources in industrial operations and examine why employing these materials was not successful in the Soviet Union in the 1950s-1960s. I study how the forests were viewed in the USSR and examine the relation between protecting forests and industrial production. Then I focus on practical implementations of using alternative resources, answering why these initiatives did not become systematic and routine. Last, I show the role of contacts between East and West and the ways in which the Soviets addressed Western experience of using wood and timber wastes and other alternative sources in forestry industry production.

This topic is rather marginalized in the historiography. We find some views on forest use in different periods, and most papers say about a destructive nature of Soviet industry as well as rapid deforestation. At the same time, the role of technology and innovation in dealing with forests in the Soviet period is not well examined in the literature.

Industry, environmental crisis and the creation of identity: the Rupel case

Bruno De Corte (Independent Historian)

This paper reports how brickmaking transformed a complete region, provoked an environmental crisis and how the ecological rebound led to a new identity.

The Rupel region is a post-industrial area in Belgium next to the river Rupel . Next to the river is a geographical cuesta called the “Boom Clay”, providing an ideal raw material for the making of bricks. The river Rupel was the transport factor.

Non-continuous brick making in permanent structures started in the Middle Ages. In the 19th century the Rupel industry became a player on a national level. This demand triggered the switch into continuous brick making. In 1868 the first Hoffmann kiln for the continuous production of bricks was introduced. This important invention led to creation of an unique industrial landscape. The overall presence of clay pits gave the area the nickname of the “Moon Landscape”. Air pollution was a growing problem and the over-industrialized landscape burdened the region with a

negative perception. In 1957 the decline of the brick industry started, the derelict factories became the spot of waste crime. Against this environmental crisis a strong ecological movement started which also went over to industrial heritage protection. The situation reversed and with the ecological regeneration sustainable tourism started. Some derelict clay pits even became nature reserve. In combination with the growing interest in the industrial heritage in the area this created a new, positive image within and outside the area. Today, industrial heritage is seen as the backbone of the identity of the region.

SESSION T3E — Conference Room 2

Playing with Materials and Technology 2

Organisers: Stefan Poser and Maria Elvira Callapez

Chair: Maria Elvira Callapez

Gramophone Records (1887-1925): what were they made of?

Susana Belchior and Ana Maria Ramos (Universidade NOVA de Lisboa)

Early acoustic sound recordings from the late 1890's to mid 1920's have no standards as to their recording speed, groove width, or material composition of the pressed record. In spite of the numerous patents accompanying the recording industry's activities, some stages of the recording process were regarded as top secret, and therefore constantly changing and differing from company to company: namely, the formulae of the record itself. Each factory, at a given time, would press records that were quite unique and distinguishable from their competitors', always looking for new mixtures and new materials that would allow them to improve their final product in order to provide the ever increasing number of customers with a cheaper product cost, and less noisy disc.

This paper will present the surveyed information gathered from patents from this timeframe (1887-1925) that describe the production of sound records, and compare it with documents from the recording industry historical archives – namely paperwork from The Gramophone Company and their American counterpart, The Victor Talking Machine Company. The identification of the core materials used in the production of records, as well as the chief disparities between the several factories and labels, may be an important lead to ascertain in which factory and in which period a

record was produced, and possibly try to explain the variance of quality between the diverse record labels.

An industrial perspective on the polyurethane revolution in fashion and design

Susana França de Sá, Joana Lia Ferreira, Rita Macedo, and Ana Maria Ramos
(Universidade NOVA de Lisboa)

In this research we propose a new insight into the industrial context of polyurethane (PUR and TPU) use in fashion and design throughout the discussion of written testimonies collected from more than fifty selected patents (filed between 1960s-1970s).

Polyurethane, one of the most popular industrial novelties of this period, has completely changed the world of fashion and design with the offer of comfortable, unusual, stylish and luxury objects. With the selection of iconic polyurethane objects from MUDE's collection (the museum of design and fashion, Lisbon), this study not only established a bridge between the industrial conception and the final product, as identified the main reasons that led designers select PUR and TPU over other materials, the main technical and aesthetic advantages and the main application and uses. For that, patent documents concerning manufacturing, processing and design processes were selected, mostly, due to the information enclosed in these records: identification of previous drawbacks, purposes of the inventions, considered material options and technical and manufacture requirements.

The novelty of polyurethane flexible and rigid foams, fibers and elastic fabrics, films and leather coatings was explored based on the industrial production of objects from the daily life of the consumer, and companies working on polyurethane manufacture and design production and former commercial trade names were identified. Valuable information was collected and a new historical perspective concerning polyurethane industrial and design relevance was built throughout the industrial perspective of both chemists and designers.

Playing with new materials: the Portuguese acrylic sheet production and its application in artworks

Sara Babo, Joana Lia Ferreira, Ana Maria Ramos, and Maria João Melo (Universidade NOVA de Lisboa)

Acrylic sheet, i.e. poly(methyl methacrylate) (PMMA), was first produced industrially in the mid-1930s by Rohm & Haas (Germany) and Imperial Chemical Industries (England). Its transparency, light-weight, strength, and ability to be moulded, made it suitable for aircraft canopies during World War II but also attractive to artists, especially during the 1960s, when synthetic materials became more common and widely accepted in society. This was the case of two major Portuguese artists, Lourdes Castro (b.1930) and Ângelo de Sousa (1938-2011). While living in Paris, Lourdes Castro worked with *Plexiglas*® and *Altuglas*®; in turn, Ângelo de Sousa used acrylic sheet purchased in Porto at a local store.

To understand the origin of the material used by Ângelo de Sousa it was necessary to study the history of acrylic sheet production in Portugal, which will be discussed during this talk. This research was based on interviews and the study of documentary sources such as *Plásticos* (journal of the Portuguese plastics industry), *Boletim da Direcção-Geral dos Serviços Industriais* (journal of industry regulations), and companies' commercial registration.

The different ways both artists have played with this material will also be analysed. Lourdes Castro has explored mainly the transparency and lightness of PMMA, creating objects that result from the superposition of several planes. In contrast Ângelo de Sousa explored its thermoplastic properties, using heat to cut and model the acrylic sheets in three dimensional forms. In both cases, the properties of this new synthetic material allowed them to explore new possibilities and were fundamental for the development of their artistic work.

Heat modeled General Purpose Polystyrene containers: a sculptural set from 1975 by Ângelo de Sousa

Milton Raimundo and Joana Lia Ferreira (Universidade NOVA de Lisboa)

Being one of the most influential Portuguese artists from de twentieth century, Ângelo de Sousa (1938-2011) produced many artworks in painting, sculpture, drawing, photography and film. A key aspect of his creative process was to have readily available materials and so he stored them in

great quantities throughout the years, building an important material archive. Ângelo's frequent search and study of materials' properties led him to assemble a large personal library, which includes several books on material science and technology, as well as on material-handling. The whole production context provides crucial information for historians and conservators.

The traditional oil medium bothered Ângelo and he soon started experimenting with other materials. Since the early 1960s, and in accordance with the international scenario, Ângelo selected synthetic paints as his painting medium. His curiosity and playful spirit led him to also explore the thermoplastic properties of plastics in sculpture since then. An important and unique example is the work *Pequenas Esculturas*, a set of 27 small dimension sculptures, created by the artist in 1975 with heat modeled yogurt and butter pots made of General Purpose Polystyrene (GPPS). Using a strong enough heat source to soften the GPPS, along with a humorous approach, Ângelo could shape the containers until they acquired a form that would please him.

The information given by the artist's documentation and material archive allied to that obtained from industry archives and interviews contribute for the understanding of the industrial and artistic production processes, which will be the focus of this talk.

SESSION T3F — Amphitheatre 2

Industrial and cultural approaches to sustainable food

Organiser: Programme Committee **Chair:** Marta Macedo

Traditions and Innovations: Valorizing the Authentic Food

Elitsa Stoilova (University of Plovdiv)

The paper aims to explore in a critical manner food and drinks related festivals in Bulgarian context. I will question the very process of valuation of food and food technologies as genuine for certain region in order to grasp how local identity is created through food authentication. The food related festivals geographical, cultural, and economic diversity offers a richness of case studies, and different strategies for (re)invention of food technologies and their use for sustainable development. Since the 2000s several Bulgarian small cities and villages initiated celebration of rural food products and pre-industrial technologies for food production and agriculture. As a resent phenomenon for Bulgarian society food festivals are interesting from historical and anthropological perspective. Their specificity, I will argue, is that they are simultaneously traditional and

innovative in their nature. Food related festivals in Bulgaria incorporate the traditions of rural festivity combining them with diverse forms of local and national celebration inherited from the socialist regime. In a way they promote local products and sustainability, they might be considered as anti-global. Controversially, attracting alternative, culinary, or rural tourism they became part of globalization processes. Following the diverse actors (local governments, local community, producers, visitors, tourist agencies, and other) will lead to divergent stories. In order to trace the process of food authentication, and construction and popularization of local food brands, the local actors and local politics will be studied.

The Heritage of Agricultural Science in Portugal: The Case of the Estação Agronómica Nacional (National Agronomic Station)

João P. R. Joaquim (FCSH, Universidade NOVA de Lisboa)

This paper concerns ongoing research about the history and heritage of the *Estação Agronómica Nacional* (EAN), an institution whose life encompassed much of the Portuguese 20th century, starting in the 1930's and only recently disappearing as a result of administrative consolidation. The EAN was one of the reformist initiatives of the newly formed *Estado Novo* (New State) regime, with which it maintained a close relationship, that eventually defined, for instance, an ideological and moral frame-work under which the scientific research was made.

The rich and varied heritage left by the EAN, ranging from electron microscopes to frescoes, much of it still kept *in situ* in, the little altered, 1960's original buildings, was the catalyst behind the idea of finding solutions for its preservation, valorisation and divulgation. With that aim in mind the methods employed so far will be discussed regarding its effectiveness. The survey and characterisation of the different types of objects, collections and buildings once part of the EAN, in association with the archival research being conducted, allowed to identify an array of topics worth further inquiry but revealed also the difficulties of implementing such a project in a still active research facility. Moreover, in a theoretical approach, it became clear that the agricultural sciences sit at a particular crossroad between basic and applied science, which means its heritage sits at an equally difficult to define place between scientific, technological, agro-industrial and even agrarian heritage.

The history of the industrial refrigeration on Portugal: from 1956 to 1982

Susana Domingues (IHC, NOVA)

This paper presents the development of the industrial cold in Portugal, between 1956 and 1982. This is an instance of how the technology related with the industrial cold supported, and still supports, a demanding public for a diversified, low cost and perfectly conserved food. A pillar of the development of a consumer society and sustained by the outbreak of the chemical industries, the cold industrial was and still is, the key for the food supply problem.

This paper seeks to understand the role of the Portuguese State in the dissemination of industrial cold when applied to different perishable goods. Although within the same technology, refrigeration of meat, fish, fruit and vegetables requires different approaches. We used a historical and interpretive research methodology for the different technological objects. We address the national slaughter network, the country fish supply service as well as the installation and equipment of a network of core suppliers and local markets (for fruit and vegetables). All these mechanisms have proved inadequate in the face of the country's needs. And not even the Instituto Nacional do Frio (Cold National Institute) was able to place the country at the same levels of the rest of Europe at the end of the twentieth century.

Friday, July 29
14:30-16:00

SESSION F1A — Room 201

11th Annual Symposium of the Social History of Military Technology 8

Organiser: Bart Hacker **Chair:** Bart Hacker

More Beautiful Than Necessary

David Ritchie (Pacific Northwest College of Art)

The tension in weapons design between function and display is as old as the first embellished club and woad daub. Possibly older. We think an iPhone's balancing act between form and function is a civilian and modern set of decisions. Between these poles lies a history of tension between designing for function alone and accommodating the urge to add filigree to cannon, to try heat-patination of swords. We know that the cravat came to civilian life from the battlefield and that civilian fencing's singlemindedness about cut and thrust influenced military sword design. Historians of architecture and industrial design often attribute the change of mind we call "Modernism," where beauty arises from an exact relationship between form and function, to the Bauhaus, adding a nod towards the English Arts and Craft movement. An example of the French 75 on display in a fort in Oregon is embellished with patriotic slogans reminiscent of the magical words once engraved on swords. Some Napoleonic cannon went naked of ornament. The transition to the "tin hat" and dirt-colored uniform was neither as swift nor as complete as historians of the First World War and Modernism suggest. We should take another look at the transition from nineteenth century display uniforms and weapons to twentieth century mostly-functional ones.

Creativity and the Apocalyptic Sublime: a Visual Comparison of Nevada Test Site, Minimalism, and Land Art

Eric LoPresti (UC-Davis)

Between 1951 and 1992, the United States exploded more than 800 nuclear weapons beneath the desert at Nevada Test Site, leaving a vast salt flat pock-marked with circular subsidence craters. The high point of this bellicosely destructive activity coincides with two quintessential and overlapping American aesthetic movements, minimalism and land-art, as exemplified by sculptors such as Walter De Maria, Robert Smithson, Richard Serra, James Turrell, and Michael Heizer.

These artists sought to change their viewers' sensory relationship to space and environment by sculpting the earth on an unprecedented scale, prompting this artist to ask: how has the coincident and much larger modification of American territory within the Nevada Test Site changed our cultural relationship to our landscape?

In this high-energy visual essay, NYC-based artist Eric LoPresti will draw upon ten years of research and experience painting nuclear-inflected deserts to probe similarities in the creative practices of government nuclear engineers and anti-establishment artists during the tensest decades of the Cold War. Along the way he will assert both practices as examples of a distinctively American kind of sublime, question rationalized notions of art- and weapons making, and posit provocative new ways to see zones of conflict in a post-9-11 visual culture.

SESSION F1B — Room 202

The 'Common'-Denominator Notion, Expertise and Experience of Commons in the 20th century

Organiser: Tirza Meyer **Chair:** Dick van Lente

From 'Sensed' to 'Sensing' State: Swedens Remote Sensing of the Outer Space Commons and The Shift From Postcolonial To Environmental Use, 1970-1986

Johan Gärdebo (KTH Environmental Humanities Laboratory)

In 1970 the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) set up the Special Working Group on Remote Sensing to promote the optimum utilization of satellite remote sensing. Satellite remote sensing would monitor the total Earth environment for the benefit of individual states and the international community.

While UNCOPUOS since its founding in 1959 had debated the definition and use of 'remote sensing, the growing use of civil satellite applications actualised tensions between the member states. The developing countries, in particular 'Group of 77', criticized the postcolonial division of the world into 'sensing' and 'sensed' states, while satellite-owning states claimed that Earth observation was a precondition for environmental use and protection of resources. A recurring question was if outer space as a 'Commons' meant securing access or restrictions to its use. By 1986 the debate resulted with the unanimous approval of the UN Principles of Remote Sensing but with tensions and differing standpoints unresolved. The principles exemplify how what is technologically possible also demarcated what would be politically feasible.

During this time Sweden developed its remote sensing expertise and also shifted political stance in relation to 'sensing' states as itself became one of the 'sensing' states in the 1980s. The technocratic influence of satellite developers is part of why remote sensing and its UN-principles were defined in relation to their supposedly benign environmental use. Exploring the role of experts in conceptualising this technological environmentalism is part of the political history of the 'Commons'.

The Deep Seabed and the Common Heritage of Mankind: From remote place to humanity's raw material deposit?

Tirza Meyer (University of Science and Technology, Trondheim)

At The Third United Nations Conference on the Law of the Sea (1973-1982) a new concept was introduced to international law. A part of the deep seabed outside national jurisdiction, "the Area", was set aside to be governed under a unique concept. Article 136 of Part XI of the Convention reads: "The Area and its resources are the common heritage of all mankind".

This presentation examines the preliminary work that was carried out in several United Nations Committees that were set up to outline Part XI of the Law of the Sea. Those actions were triggered by the rising awareness of the accessibility of the world oceans due to technological progress and increasing demand of raw materials. By implementing a law that would force the international community to share the resources of the oceans, one hoped to prevent the revival of colonialization activities of developed states, this time off shore.

The presentation will focus on arguments that were used to advance the proposal of an internationally governed area on the seafloor. Was the time ripe for a new ocean world order? Who were the advocates of the common heritage of mankind and what historical and political context did they operate in? In a broader perspective the presentation will also aim at comparing the Law of the Sea and Outer Space governance.

Mining in our common space: Nonconventional resource-extraction and property in outer space

Anna Åberg, Björn Wallsten, and Anders Hansson (Chalmers University of Technology)

This presentation outlines the goals and challenges of a new research project, in which we want to investigate how non-conventional strategies for resource extraction are motivated and understood in both research and practice. Our chosen cases are drawn from space mining in the US (Planetary resources) and Russia (the state Moon project). We want to understand how these large, nonconventional, engineering projects have gone from being utopic visions to becoming real ventures, the roles of different actors in this process and the meaningful differences and similarities in the

respective projects and their social and cultural contexts. In order for these projects to become reality, major uncertainties need to be dealt with in the interface between science, policy, law and knowledge production. In this presentation, we want to specifically explore how the right to property in space and the space treaty is renegotiated through national initiatives in relation to resource extraction initiatives, as for example in the recent US Commercial Space Launch Competitiveness Act (H.R. 2262), recognizing the right of US citizens to own asteroid resources they obtain. How is the space treaty and the view of space as a common being reinterpreted in the face of resource exploitation? Which interests and actors are involved in this reinterpretation? Which arguments are put forward to change the way we look at property in space? The overall project will include a survey of scientific publications, grey literature, conference proceedings and reports concerning the resource extraction strategies, as well as interviews with promoters and employees of the projects.

SESSION F1C — Room 203

Radio Technologies in the Postwar Europe: Engineering, Institutions and Practices

Organiser: Joanna Walewska **Chair:** Chris Bissel

Freedom on the Air - Ireneusz Haczewski and the Independent Radio in Communist Poland

Dytman-Stasienko (University of Lower Silesia, Wroclaw)

My presentation is devoted to Ireneusz Haczewski – a famous Polish activist who organized technical structure of Radio Solidarity in Lublin Area and worked as a correspondent of Radio Free Europe in the 80s. The prime motor of his media activity was a conviction about the critical role of the information and the necessity of archiving the present for the future generations. With his family, he created an independent film studio called CVSH to document social and political life in communist reality. He meticulously archived video recordings, as well as photos and his radio appearances, and kept them in a secret, specially adapted room in his private apartment.

He started his radio conspiracy adventure as a teenager, in the 1950's. At that time, he constructed his first radio, which was audible in the Lublin area. He broadcasted music and, what is the most important, Radio Free Europe news reports. He was arrested and convicted after three months of his radio activity.

The key point of his life was the declaration of martial law in December 1981. During that period he got engaged in strong fight against the Communism. His most important activity was organizing the technical structure of Radio Solidarity in Lublin Area. He constructed several different radio transmitters, for example the transmitter that enabled sound broadcast on Polish government television wavelengths. His radio network included small towns near Lublin and enabled to broadcasted reports about independent activity of Solidarity movement.

His words are very telling: The totally incredible time, in which we had to live and act, demanded thinking outside the box. Only a completely free mind is able to create whole new things. Haczewski acted according to these beliefs indeed – he did make whole new things possible as he put his incredible ideas into practice.

Sonic (science) fictions in the Polish People's Republic – experiments in electronics in the movie soundtracks and radio dramas

Dariusz Brzostek (NCU Toruń)

In 1957 The Polish Radio Experimental Studio was founded in Warsaw by the musicologist and acoustician – Józef Patkowski, who ran the studio until 1985. During these years the studio produced experimental, electronic and electro-acoustic works of 93 composers, including such artists as Krzysztof Penedercki, Bogusław Schaeffer, Bengt Emil Johnson, Arne Nordheim and Kåre Kolberg. At the same time the studio produced also the soundtracks to the movies and radio dramas (inter alia, based on the novels by the most famous polish science fiction writer – Stanisław Lem; *Excursion Into Cosmos*, 1961, dir. Krzysztof Dębowski, music by Krzysztof Penderecki; *Der schweigende Stern, 1959*, dir. Kurt Maetzig, music by Andrzej Markowski). It was an impulse to begin the experiments in electronics to construct sonic (science) fictions in the polish radio broadcasts, among others: *Do You Exist, Mr. Jones?* (1955, dir. Michał Melina, music: Andrzej Pruski); *Crystal Ball* (1956, dir. Michał Melina, music: Ewa Sawnor), *Solaris* (1960, dir. Józef Grotowski, music: Jerzy Kaszycki); Solaris (1975, dir. Józef Grotowski, music: Barbara Królikowska), *The Astronauts*, (1977, dir. Marek Kulesza, music: Zbigniew Wiszniewski), *The Chain of Chance* (1979, dir. Józef Grotowski, music: Antoni Krupa).

The case of a hysterical textile worker who wanted to construct radio receivers. Woman labour in the radio industry in the People's Republic of Poland

Joanna Walewska (NCU Torun)

The recent years saw the publication of a number of interesting and well-researched studies dedicated to the female workers in the People's Republic of Poland. However, these studies are either mainly dedicated to the textile industry or focus on the practice of undertaking of typical masculine works by women in the period of Stalinism.

In my paper, I would like to take a closer look on women working in the radio-engineering industry, which was also a highly feminized branch of industry yet, unlike the textile industry, was considered as a branch allowing the advancement of women to better positions. As a point of departure for my analysis I would like to take a case of Anita L., an employee of a knitting factory in Lodz in central Poland, who in confidential letter addressed in 1956 to board of directors of the Radio-Engineering Plant "Diora" in Lower Silesia, was characterized by her predilection to "dress like men, drink vodka and start fights" and few suicidal episodes. The letter contained the request for Anita L. employment in Diora as she had a talent for radio assembly and did not show predisposition for work consisting of repetitive tasks. The request was denied.

Anita L. could be thus read as a hysterical figure but it is also possible to look at her behavior as a kind of strategy of resistance against the social status and working conditions of female workers.

Following this particular case and using other primary sources such as documents from the "Diora" archives, interviews with former female employees and factory newspaper, which quite frequently published materials on professional aspirations of female workers, I would like to analyze the conditions of female labour in the radio-engineering factories in the post-war Poland.

SESSION F1E — Conference Room 2

Technology in Society 2

Organiser: Programme Committee **Chair:** Irina Gouzevitch

Channels for translation of technological know-how into everyday life in the beginning of the 20th century (In Russian)

Olga Yakhno (Ural Federal University)

At the turn of the 19th-20th centuries technology became an integral part of everyday life. The author made an attempt to trace the mechanisms of penetration of technological know-how into different spheres of everyday life. The study is based on publications in the local and central Russian press of that period. The publications presented to the public the latest developments in technology, medicine, hygiene, transport and communications. The commercials also popularized and widely used the latest scientific discoveries.

It may be said that during that period the status of a number of occupations was changing. Entrepreneurs, engineers, researchers, doctors and teachers became quite influential in terms of shaping public opinion. Technology penetrated even the most conservative spheres of everyday life, such as cleaning and cooking. The concepts of health, comfort, general quality of life were moving to the forefront. The sphere of leisure and entertainment was also influenced by research. It became evident even from publications in the local press that the tempo of life accelerated significantly, it became important to find ways of reducing the time required for the exchange of information, covering long distances, as well as performing all kinds of routine tasks.

Continuous popularization of research, its achievements in various spheres turned the novelties from oddities into the must-have items in everyday life. This in its turn added diversity to life, expanded personal horizon and growth potential of the people. This kind of knowledge shaped public opinion, moral norms, and new value orientation of the urban population.

Data Science: Nascent Occupation and Field of Expertise

Netta Avnoon-Kaminsky (University of Haifa)

Big Data technologies, which allow the collection, storage, transfer, analysis and presentation of digital data in large scales, have a profound effect on the way we live our life (boyd & Crawford 2012; Manovich 2011; Mayer-Schönberger & Cukier 2013). Many activities, especially those requiring decision making, such as shopping, dating, and investment, are being computerized, modeled and automated. In the proposed paper I study Data Science as an innovate field of expertise and as an occupational group. Three theoretical building blocks taken from the literature of the sociology of occupations and professions guide the research questions: (1) what is the division of labor in the field and what are the skills and tasks required for data science? (Abbott 1988; Durkheim 1964 [1893]; Marx 1965 [1844]; Weber 1968 [1922]) (2) what characterizes data scientists as a community of workers? (Bourdieu 1993 [1976], Lave & Wenger 1991, Van Maanen & Barley 1984), and (3) in what activities do workers' engage collectively in order to establish occupational authority? (Abbott 1988; Freidson 1970, 1971; Haug 1975). 60 workers, managers and professors in the field of data science are being interviewed to gain an emic perspective of the occupation, its expertise and the impact of digital data use on life in the 21st century.

The transversality of knowledge in the scientific method: the lesson of Galen to the modern scientific debate

Nelson Henrique da Silva Ferreira (University of Barcelona/University of Coimbra)

There is an undeniable guideline of the work of Galen of Pergamon: the effort on the questioning the natural phenomena by the use of logic as main tool for the study of the natural sciences. Having defined his ideas with analytical and critical care, the search for the right questions and the facts that grounds them made the ancient physician a prototype for the modern scientist. Quite often, he notes in his work *On the properties of the foodstuff* the misgivings present on the total acceptance of the already established knowledge, without profound analysis, critical approach and controlled experiments: the essential requestable criteria for the construction of the path to a multidimensional truth. Nowadays, on the scientific debate there is a tendency for a subdivision of the science fields in order to generate precision and a kind of 'strict specialization', ignoring sometimes the peripheral knowledge that may bring additional data to the complex object that is 'the truth'. The aim of this paper is to point out some of those tendencies and prejudices reportable on

natural sciences and social sciences, using the same critical paradigm that served Galen on his *on the properties of foodstuff* and his statements about the scientific debate of his time.

SESSION F1F — Amphitheatre 2

Re-inventing health in globalized world

Organiser: Programme Committee **Chair:** Wolfgang Koenig

Telemedicine implementation in contemporary healthcare systems: accruing the tyranny of the "technological gaze"?

Carlo Botrugno (University of Bologna)

The implementation of telemedicine in public healthcare systems promises to significantly reshape and improve care-delivery processes, whilst reducing overall expenditures. Telemedicine allows the body to be represented, transmitted and evaluated 'over the wire', encouraging the process of objectification and fragmentation of the medical knowledge, started with the advent of medical imaging at the end of XIXth century. The progressive spread of telemedicine applications seems able to definitively mark a decline of the 'clinical gaze', or the capacity recognised to a physician in dealing with a difficult diagnosis through his own experience. This transformation could notably affect the quality of medical practice, eventually turning the current supremacy of visual diagnostics into a tyranny of the 'technological gaze'. Moreover, promoting an incremental logic according to which a good level of health protection depends on the possibility to access a certain number of healthcare services, the current ICT implementation process could result in a dangerous new wave of mechanisation and dehumanisation of the biomedicine paradigm. Despite the practical advantages in the use of the remote services, this innovative dimension could definitely lead the medical practice from the original connotation of *ars magica* to a terrain of application of statistical sciences and medical informatics instruments. This paper aims at exploring further the secondary effects of the implementation of telemedicine on the work of healthcare professionals as well as on the quality of doctor-patient interaction, paying special attention to the possible implications coming from detriment of other sensorial perceptions in routine medical practice.

Sleeping Sickness and Malaria – vector control policies and sustainability in Portuguese Empire (1902-1960)

Isabel Amaral and Rita Lobo (CIUHCT, NOVA)

This paper aims at discussing some aspects related to the impact of measures of prevention and fight against tropical diseases used by the Portuguese doctors, particularly those connected with the elimination of vector insects. In this context we will analyze the process of eradication sleeping sickness (human trypanosomiasis) in Principe Island (1902-1914) and Malaria in Cape Vert (1946-1958).

The main methods of control of these diseases have been prevention – stopping the disease-carrying vector – from contacting humans. In the fight against glossines (tsetse flies) and anopheline mosquito's physical and chemical processes were used. Of these, reservoirs elimination by drying stagnant water swamps and the use of pesticides, particularly the dichlorodiphenyltrichloroethane (DDT), should be highlighted.

As methodology, we will use the reports of medical missions in the Islands of Príncipe and Cape Vert, carried out under the aegis of the School of Tropical Medicine (1902-1935) and the Institute of Tropical Medicine (1935-), as well as the sanitary bulletins and other colonial journals, in order to evaluate the native population reactions to the impact in their habitat and environment.

Although in an exploratory way, we will try to discuss questions related to the "human" and natural ecosystems sustainability intersecting public health with the environment and the populations' balance.

Penicillin is not enough. The role of international organizations in fighting STDs in early post-war Europe

Sławomir Łotysz (Institute for the History of Science, Polish Academy of Sciences)

Historians of medicine generally agree that treatment of sexually transmitted disease (STDs) was revolutionized by penicilllin. And while it is true that that first antibiotic offered more efficient and faster relief to individual patients, one must not forget the role of morbidity control and prophylaxis in breaking the chain of infection. While such measures were effective within individual countries, controlling the movement of people and thus the germs they carried across borders

required coordination on a transnational level. Europe's merchant marines are a particular case in point. In 1948, various governments and international health organizations attempted to formally coordinate their efforts to harness the plague of STDs. To this end, they looked to their experience gained in the interwar period by similar transnational bodies, when Europe faced similar problems after the rise of infection rates after World War One. At that time, special attention had been paid to the problem of sailors spreading STDs up and down the Rhine River basin, and in 1936 the so-called Rhine Commission was established. Unfortunately, its successes were only moderate.

In this paper I will analyze how the international effort to control STDs among employees of merchant fleets evolved over time, and what their ground-level results were. I will argue that the success of the post-1945 Rhine Commission depended largely on the determination of the European governments to maintain safe, efficient navigation along its busiest inland waterway.

Saturday, July 30
09:30-11:00

SESSION S1A — Room 201

Imperial eyes and Mozambique's port cities

Organisers: Joana Gaspar de Freitas and Catarina Caetano da Rosa

Chair: Maria do Rosário da Costa Bastos

Commentator: Maria do Rosário da Costa Bastos

Coastal Ports and Trade Routes, Knowledge and Technology- Mozambique's Central Coast under Portuguese Rule (16th-17th Century)

Ana Cristina Roque (Centro de História da Universidade de Lisboa)

Arriving to the East African coast in the early 16th century, Portuguese faced an important and well-structured commercial network dominated by Muslim merchants. Operating throughout the Indian Ocean and in articulation with the inland African trade routes by way of the coastal settlements from Bazaruto up to the North of Mozambique, this network bustled luxury and basic goods benefiting either from a network of inter-personal relationships and kinship that supported the

whole business, or from an ancestral knowledge on techniques and particular procedures indispensable to navigate in the Indian Ocean.

This trade made the prosperity of small southern ports, such as Sofala or Mozambique, long before the Portuguese arrival. However, the preservation and continuity of this trade was so much dependent on the network's capacity of organisation and the supply / demand relation of the goods involved, as on other factors such as the political stability of the African kingdoms, the environmental changes that shaped flows and trade routes or the actual knowledge on the region and forms of organization and traditional practices of the local communities.

Focusing mainly in the ports of Sofala and Mozambique and its changes as well as in the information provided by the Portuguese in the 16th – 17th centuries this paper addresses the impact of the Portuguese presence and western technology on the evolution and changes of Mozambique' central coast area in order to a better perception of its role in the African / Indian Ocean networks under Portuguese rule.

Beira (Mozambique): problems of a city built between the river and the sea Technological Uses and Sustainability Challenges

Joana Gaspar de Freitas (IELT, NOVA), João Alveirinho Dias (CIMA), and Ana Cristina Roque (Centro de História da Universidade de Lisboa)

The city of Beira has serious coastal erosion problems. In 2015, houses were destroyed in the neighborhoods of Ponta-Gêa and Praia Nova, putting at risk more than 400 families. The groynes previously built to protect the area are not being effective. Environmentalists fear that climate change will make things worse.

Created by the Portuguese in 1887, in the margins of the Pungue River, Beira started as a small military camp, to ensure the necessary security to the construction of a harbor, taking advantage of the natural conditions of the estuary. After 1893, a railway linking Rhodesia to the coast transformed Beira's harbor in a main gateway for inland products. The city was built in a mangrove and dune area, a very instable land, frequently flooded by the tides. Settlement in Beira was a challenge since the beginning. Landfills and flood protecting systems were used in the process of building the city. Technical knowledge was imported from the metropolis. Coastal erosion started being a problem soon after the Portuguese settlement and increased as the urban area expanded along the seaside in the twentieth century.

The purpose of this study is to disclose the role of technology in the build and development of Beira, in the transformation of the land and in the triggering of unattended side-effects, like coastal erosion. It also aims to contribute to present discussions, questioning if the adopted solution - hard engineering infrastructures (e.g. groynes) – is the best or if other more sustainable approaches should be tried.

SESSION S1B — Room 202

Thinking Anew: History of the Governance of Global Technology and Innovations in African Societies

Organiser: Francis Gbormittah **Chair:** Collins Adu-Bempah Brobbey

Commentator: Kwabena Darko Akuamoah

Technological Innovations Governance and the Impact on African Democratic Societies

Collins Adu-Bempah Brobbey (Ghana Institute of Journalism)

This paper focuses on the technological innovations governance such as the use of biometric verification technology in facilitating free and fair elections in Ghanaian democratic society. Governments globally and Ghana in particular are grappling to find ways that can set a course for the continent to sustain and share long-term prosperity. They resorted to western technological innovation which is in dissonance with Africa in general and Ghanaian's governance values in particular. The paper argues that technological innovations have had multiple impacts- on the changing trends of Ghanaian democratic society. Thus, this paper maintains that biometric verification technology simultaneously spurs and negates credible electoral processes. This paper intends to stimulate discourse on how the technological innovations governance in Ghana contributes to the democratic dynamics in Ghanaian society. It is also intend to ignite the passions of the contemporary Ghanaian young scholars to enable them think anew, how technological innovation governance could facilitate the consolidation of democratic practices in the African continent through primary education and empowerment. Using qualitative method, particularly, focused Group Discussions for data collection and other peer reviewed articles, this paper investigates the contradictory impacts of technological innovation governance in Africa. Finding revealed that Africans are not familiar with the use of Biometric verification technology and recommend

that the Electoral College should not only be empowered financially, but also well-resourced educationally.

An Analysis of Cultural Dimensions of Technological Innovations and the African Societal Responses

Francis Gbormittah (Institute of African Studies)

The advent of mobile phone technology brought changes in the processes and management of culturally sensitive information in Africa as it creates a platform and access to quick and speedy information without any boundaries or limitations. Recent events have brought the phenomenon of tradition and information dissemination to the centre stage of national discourse. There appears to be a growing concern about the use of mobile communication in Ghana: specifically the values of communication, or ethics of appropriateness in language factor. There is a collective realization that mobile phone technology has come to control and define not only the space-time boundaries of information dissemination, but it has also changed the language and challenged the values of time-honoured traditions. This has enlarged the expressive and sentimental content of communication, and increased the ability and actual effect of conversation to develop or devastate the society. I have explored in this paper, the use of mobile phones in Ghana within the general ontological structure of tradition and modernity. It therefore attempts at explaining the place of mobile telephony in the Ghanaian cultural context. Multi-dimensional research strategy was employed for data gathering. This paper recommends that the dynamics of cultural and historical relevance of indigenous aesthetics of communication and acceptable ways to use language (that is, purpose, content, context, etc.) in the face of mobile phone technology should be encouraged.

History of Technological innovations and the changing trends in African societies

Kwabena Darko Akuamoah (Institute of African Studies)

The main thrust of this paper, is to discuss how African societies have experienced a changing trend in their indigenous technological innovations over time and its possible consequences. Precolonial Africans well noted for traditional iron smiting and smelting, wood and ivory working as well as in cloth weaving, pottery and indigenous traditional drugs administration. These when harnessed could help develop indigenous societies that are economically deprived. Local challenges

and opportunities could be undertaken if local knowledge and resources belonging to indigenous communities are exploited and developed. In pre-colonial Africa, indigenous technology was well expressed in the local structures across the board until the arrival of Arabic and Europeans, have greatly affected and influenced indigenous technology in contemporary times, and this have great consequence in most rural areas. In most Asiatic countries such as China, traditional skills and techniques have become major assets to the nation. This will fuel growth in areas of protracted unproductivity as well as transporting power and utility to indigenous group at the verge of extinction.[][The paper discusses specifically the Ghanaian perspective by delving into the application of scientific knowledge and skill for the enhancement of Pottery production vis-a-vis contemporary production in Ghana. It employed qualitative approach, particularly; focus group discussion for data collection.

SESSION S1C — Room 203

Ars vs. Natura in urban landscapes and gardens

Organiser: Ana Duarte Rodrigues **Chair:** TBA

Techno-scientific utopias of Lisbon

Ana Simões (CIUHCT, U. Lisboa) and Maria Paula Diogo (CIUHCT, NOVA)

In this paper we discuss urban utopias put forward in early 20th century, contrasting Portuguese techno-scientific and British environmental perspectives, and argue that their crucial differentiations depend on the differing urban contexts of their emergence and the ideological visions of their authors.

The first are the techno-scientific utopias for Lisbon presented in the Portuguese journal Ilustração Portugueza in 1906, one by the modernist writer and journalist of socialist leanings Fialho de Almeida - "Monumental Lisbon" - and the other by the engineer of Saint Simonian inclination and port expert Melo de Matos - "Lisbon in the year 2000." Both authors present Lisbon as a futuristic metropolis deeply shaped by a growing industrial economy, with a new geographical profile anchored in the river Tagus and marked by the rhythm of the new technologies of transports and communications ravaging Europe and the USA, which promised to turn into reality many dreams of the recent past.

The second is Ebenezer Howard's concept of garden city, whose first materialization took place in Letchworth Garden City (Hertfordshire, England), beginning in 1903. In Howard's post-Victorian projects, city and country were integrated through the idealized garden cities, echoing the differences between industrial utopian socialism and Georgism.

Contrary to Howard's environmental economics, closely related with the Arts and Crafts movement, Melo e Matos and Fialho de Almeida describe an industrial ecology that extend the enlightened rationalist tradition of progress grounded on science and technology and prefigure many of the urban projects of the futuristic architectural movement.

Eboshi's garden versus the Shishi Gami's Forest. Nature-culture dichotomy and the search for a safe operating space in Hayao Miyazaki's Mononoke Hime

Ivo Louro (CIUHCT, NOVA) and Ana Matilde Sousa (CIEBA)

Mononoke Hime ("Princess Mononoke", 1997) is an animated feature film written and directed by Hayao Miyazaki and animated by Studio Ghibli. A critical and commercial success – it is the highest grossing Japanese film of all time –, the movie explores themes of nature versus culture, gender roles and expectations, multiculturalism and looming environmental apocalypse in an unconventional way that sets it apart even within Miyazaki's oeuvre.

The story takes place in a fictionalized 14th century Japan and follows Ashitaka, a young boy who journeys across the country to find the source and cure of a curse that has befallen him. Eventually, he comes across a land where two factions wage a war. On one side the denizens of the mystical forest of the Shishi Gami ("Deer God"), led by a wolf goddess and a human girl raised by the wolves (San, or Princess Mononoke). On the other the citizens of Tatara, fortress home to an ironworks-cum-armsfactory lead by the fierce Lady Eboshi and run by an utopian collectivity of social outcasts, such as prostitutes and lepers. In order to secure their home, Eboshi is compelled to expand Tatara's operation and start a deforestation campaign, triggering the rage and hatred of the forest's Gods.

Our presentation will approach Mononoke Hime in light of the Anthropocene debate, namely the discussion of Culture versus Nature and humanity's need to find a safe operating space both in relation to the environment and to itself. We'll focus on two locations in the story, seemingly opposite but functioning in actuality as mirror images: Lady Eboshi's garden of lepers in Tatara,

and the heart of the forest where the Shishi Gami appears. These epitomize the film's overall strategy to: 1) reflect on the construction of the culture-nature dichotomy and 2) problematize conventional representations of pure unbridled and mindless industrial progress and its environmental consequences, and nature as harmonious passive agent. Moreover, we suggest Miyazaki employs three levels of representation to achieve this goal: technocultural society, cultural nature and precultural nature.

Planet garden: when nature ends and art begins

Ana Duarte Rodrigues (CIUHCT, U. Lisboa)

Focusing on Earth both as nature[1], in the sense of totality, as well as cultural in the sense that the whole is cultural landscape (as it seems there are no more virgin areas untouched by men), I will interrelate the idea of the ancient Persian pairidaeza with the recent definition of Planet Garden to promote the idea that Earth can be envisioned as a garden and therefore threated as thou. Furthermore, taking as point of departure the inspiriting story of Jean Giono's The man who planted trees, a French text first published in English in 1953, I will demonstrate some case-studies of a beneficial impact of man's action over nature. In fact, in these case-studies nature is the threatening entity that man has to fight back to protect the planet and its inhabitants. More than an argument, I have chosen to conclude this workshop with two messages: We have the ability to shape landscape, as well as landscape has the ability to shape us. One, we can make, transform landscape (create green sustainable landscapes); second, we believe on the healing power of green sustainable landscapes and how it can change the life on the planet in a positive way.

[1] When Robert Lenoble studied the idea of nature stood out the topic of birth. The word nation, from the Latin word natio has the same origin: means birth. Therefore it unites all those who have the same birth. Nature and natio have evolved simultaneously: such a development made the social and cosmological senses meet. The first contact of man with nature was not one of thought with things, but one of an isolated and weak being, full of needs, with a huge being, infinitely stronger and more stable than him. Nature is, therefore, seen as mother-nature, Natura mater, goddess.

SESSION S1E — Conference Room 2

The Impact of Cameralist Thought on Technology, Innovation, and Sustainability

Organiser: Marten Seppel **Chair:** Timo Myllyntaus

The Political Economy of Useful Knowledge. Iron and Steel Production and the Academic Discipline of Technology in the 18th and Early 19th Centuries in Germany

Stefan Gorißen (University of Bielefeld)

The understanding of the basic chemical and physical processes involved in iron and steel making developed very slowly during the 18th century, though the main technical innovations already came in use in England before 1750. The paper introduces to the main eighteenth century writings of German cameralist authors, dealing with the process of iron and steel production and discusses the relevance of these texts for production purposes. By this the paper aims to take a critical view on Joel Mokyr's interpretation of the industrialization process as *Enlightened Economy*. Instead of understanding the cameralist writings on technology as part of a system of "useful knowledge", this paper suggests to read those texts as parts of a system of political economy in a narrow sense.

Between the Divine and the Individual: Eighteenth-Century Swedish Iron Making and Layers of Household Practices

Göran Rydén (Uppsala University)

Swedish cameralist writers often imagined society in three different, but related, layers. At the top of the structure was the all-encompassing Divine household, with a benevolent God at the helm of his creation. In a mid-section we find the 'Common' household, circumscribing the politically defined countries, while the base of the structure was imagined as a mass of Individual households. Writers, like the first Swedish professor of economy (Anders Berch, 1711-1774), devoted most of their efforts to scrutinise the Common household, and modern scholars have followed suit, but it is essential not to forget that these analyses were always inserted in a much wider worldview, with divinity and individual people. The aim of this paper is to discuss how these different levels were

related to each other, and how perceptions and practices of work and labour were crucial in this. The aim is, further, to make a case for including more layers within this structure. The empirical focus in my contribution is the iron making communities, so called *bruk*, in central Sweden, and their perceptions of the oeconomy, the s.c. *Brukshushållning*.

The Impact of Cameralism on Famine Prevention and the Sustainability of Food Supply

Marten Seppel (University of Tartu)

A deep vein in the history of scientific forestry links the development of sustainable forestry practices to cameralism. Johann "Hannß" Carl von Carlowitz, noted cameralist and author of the *Sylvicultura oeconomica* (1713) has been called the father of sustainable forestry (Irmer and Kießling, 2012). Moreover, Henry Lowood, in his seminal article on "The Calculating Forester," connects cameralist theory and practice with the birth of *Nachhaltigkeit* (Lowood, 1990). Johann von Justi, the most prominent camerlist writer of his generation, also wrote about the importance of "sustainable" practices in forestry, but as I have shown his use of the forest ran counter to what he wrote about forestry (Wakefield, 2009). I intend further to interrogate this dynamic of sustainable rhetoric and rapacious practice among the cameralists of central Europe.

SESSION S1F — Amphitheatre 2

From grey to green: sustainable energy

Organiser: Programme Committee **Chair:** Elena Helerea

Use of alternative energy in rural communities: a case of study in India

Antonia Esparza (Universidad de Guadalajara)

It had always seemed difficult for me to understand why was said that Gandhi was against the use of technology. I had only read a couple of times this and heard some comments so I had no a clear idea of what that meant. So I am interested to study more about this subject.

To do this, I went for a month to the community of Gadhada, in Bhavnagar, visiting different institutions, where I could see the work done there on rural development and application of

technology. In addition to observation, I had interviews with the heads of the institutions as well as individual workers and some people from the community itself, which allowed me to meet the challenges they face in this area as well as the solutions proposed by the use of rural technology.

After this experience I understood more clearly what Gandhi meant, he was not against the technology, but the use we make of this: the wise use of technology should be human friendly, eco-friendly and make rational use of local resources.

The benefits of using this type of technology are many, although the results sometimes are not immediately apparent, I learned that is important to think in a long term and also that will be difficult to try to convince others of the importance of rational use of technology, but the best way to do is by example.

Innovation for Empire: Pre-war Japan's Search for Alternative Liquid Fuel and Its postwar legacies

Daqing Yang (George Washington University) and Elena Shadrina (Meiji University)

Commonly considered as a resource-poor country, prewar Japanese domestic petroleum production fell far short of its rising demand. As a result, Japanese scientists explored alternative liquid fuel by initially following advances in Germany and other countries, and increasingly made their own innovations.

In the area of alternative fossil fuel, the colonial railway conglomerate SMR succeeded in low-temperature conversation of oil shale in the 1920s. It began producing synthetic oil for the Imperial Navy in 1929 from a large oil shale factory near the giant Fushun coal mine. In 1935, Japanese scientists succeeded in finding a new method of coal liquefaction, and went on to build giant facilities in northern Korea and southern Manchuria. In the meantime, Japanese researchers also experimented with bio-fuels and other "sustainable" energy, with "success stories" often reported in newspapers in 1930s. In 1936, a university professor reportedly succeeded in producing petroleum from lignin in wood while eliminating harmful waste during the production of paper pulp. In late 1937, a Japanese engineer in Tokyo applied for a patent for producing petroleum from the city sewage. A newspaper estimated that if the method was expanded to kitchen waste as well as human feces in entire Japan, a total of 200,000 tons of petroleum could be produced annually, more

than one tenth of Japan`s total consumption. Whether these innovations with alternative fuel created false hope for Japan before the abrupt US oil embargo in 1941 is an intriguing question to explore.

Every Grain of Black Coal: A Material Perspective on Sustainability

Nora Thorade (Helmut Schmidt University Hamburg)

Black Coal symbolizes industrialisation as well as exploitation of nature. During the 19th century the consumption of*Black Coal* increased rapidly and the local availability promised benefits for economic development and the national economy of Germany. Every grain of the valuable resource should be used.

Black Coal is not a homogenous material, but exists in different qualities. This paper aims to specify how different qualities of this raw material were embedded in an innovative process for using the full capacity. The research on the physical and chemical properties of *Black Coal* and the development of technologies for intertwining its optimal quality with specific applications were exemplary for the discourses on sustainability of non-renewable and renewable energy resources in Germany. In this regard, *Black Coal* formed the framework for examination of alternative energy sources like water and wind, *White* and *Blue Coal*.

Following a material approach on history of technology this paper focusses innovations in the field of coal mining and processing. Contemporary studies on the physical and chemical constitution of *Black Coal* dealt with these processes of coal refining. In particular, the research was engaged in coke production as the most important refining process of the 19th century. In relation to the economic ambition of sustainability a corpus of coal should be prepared for coking and the losses of preparation should be minimized. A considerable importance was utilizing by-products of coking like gas and coal tar. This extensive coal refining dominated the mining regions of Germany as well as the consumption of coke shaped the industrial energy landscape.

11:30-13:00

SESSION S2A — Room 201

Innovating in imperial settings:
western dominance, indigenous agency and go-betweens 1

Organiser: Programme Committee **Chair:** Ana Cristina Roque

Techno-Scientific utopia and imperial expansion

Catarina Madruga (CIUHCT, U. Lisboa) and Sílvio Correa (Universidade Federal de Santa Catarina)

In the final decades of the 19th century when Jules Verne's novels were at their height of popularity, utopian projects for steam-powered transportation were similarly widespread. This paper presents two such proposals. The first one a revolutionary method of transportation proposed by the Italian engineer Roberto Arménio (1836-1900), consisted in a system that would allegedly replicate the camel in its progression on sandy terrain. The idea was presented in Brazil as a solution to social inequality assured to connect peoples of all races and colours. The second, by Francisco Bayão (1833-1883), a Portuguese army Capitan, was a «Portable Railway», where the locomotive would move inside a huge rail circumference. Without requiring placement of tracks this system would, according to the author, be adaptable to any terrain, and even water travel.

Both proposals addressed the challenge of transportation fostered by colonial expansion towards the hinterland. Their bold designs and revolutionary outcomes reveal a cultural and social environment rich with shared ideas of techno-scientific progress and social utopia. Ironically the same techno-scientific development would ultimately lead to colonial dominance. This paper aims to provide a reflection on social and technical utopia and the representations of social change via technological and scientific progress in the imperial context.

Innovations in map making concerning Mexico and Brazil before and after the conquest of Spain and Portugal

Harald Gropp (Universitaet Heidelberg)

This paper will consider the question how in the field of cartography the map makers changed their view of the countries across the Atlantic Ocean. It will be discussed how the Spanish and the Portuguese discoveries in the 15th and 16th century influenced the development of producing maps.

In the first part, the indigenous traditions are considered, mainly in the case of Mexico. A few years after the conquest of Tenochtitlan a map of the town is printed in Nürnberg.

In the second part, it will be outlined how European maps before the conquest are drawn concerning the detailed information on known and unknown territories across the sea. It will be further shown how the maps develop during the following years, also from a technological and mental point of view.
In the third part, a few special cases will be discussed. On the one hand, the territory of Nueva Espana is represented by larger and smaller maps. For the Brazilian part of South America it is mainly the coastline which is represented on early maps produced in Europe.

A special focus will be on the people involved, their biographies, their education, their experiences on both sides of the Atlantic Ocean.

When Worlds Collide: Indigenous-Spanish Copper Production in Early Colonial Mexico 1532-1630

Johan García Zaldúa (Universidade do Porto — University of Kent)

During the entire colonial period, the South-Central region of Michoacán, Mexico was the main producer of copper in New Spain and one of the most important loci of production in the whole Spanish empire. Copper was a fundamental material for artillery, coinage and silver extraction, not to mention its importance in the manufacture of all sorts of daily life items (cauldrons, pans, knives, spoons etc.). However, at the time, Spanish colonizers had an almost complete lack of copper extraction knowledge. Spain did not have an established copper production industry and all the

copper consumed in the peninsula was acquired already in metallic form from production centers in Hungary and Germany, mostly through intermediaries in Flanders.

On the other hand, the South-Central region of Michoacán had a natural occurrence of rich copper ore deposits and a well-established indigenous metallurgical tradition based on copper developed during the course of eight centuries. These set of factors led the Spaniards to heavily rely on native knowledge, technology and labor.
This paper will focus on the social and technological aspects of copper metallurgy during the contact and early colonial periods of New Spain and how the traditional indigenous metallurgical technology and the specialized communities of indigenous metallurgists had an important role in the development of the colonial economy as key suppliers of strategic materials and objects. Furthermore, this paper aims to approach the changes suffered by these communities with the shift of the productive paradigm and the encounter with the European technology.

SESSION S2B — Room 202

Displaying the past or teaching the future?

Organiser: Programme Committee **Chair:** Ana Cardoso de Matos

What should be the sustainable and effective form of technical museums?

Ivana Lorencova (National Technical Museum)

National Technical Museum in Prague in Czech Republic: past, present and fiuture. The presentation will be focused on seeking answers, and possibly initiating discussion, to a range of fundamental questions concerning the future of technical museums such as: 'How to make technical museums attractive for young people? What is the future of technical museums? How to make people visit this kind of museums? What should be the sustainable and effective form of technical museums? How tomake exhibitions more attractive and appealing to visit? What is our experience with newly-opened exhibitions in our museums? What kind of educational programs proved to be the most effective and what is our experience with such activities? What was the role of technical toys and historic teaching aids in the past and what is the situation today? Can a museum help upgrade the quality of teaching of technical disciplines? What kind of role can a museum play in the overall educational process?'

From the Gutenberg-Galaxy to the Global Village – Historical and Contemporary Narratives in Permanent Exhibitions

Sonja Neumann (Deutsches Museum München)

The future initiative of the Deutsches Museum in Munich is in full swing. During the next years all of the exhibitions will be updated and most will be fully redesigned. Among the latter is also the printing technology exhibition. Until its closure in 2015 it had presented a printing machine park arranged as a display of obsolete technology in chronological order with a "contemporary" part attached. As it were soon after the opening in 1997 the modern equipment had turned into an arrangement of outmoded appliances.

Right now the museum is planning a new permanent exhibition in the field of printing technology. Of course the planning process is affected by the same ambitions as before: How to create a sustainable exhibition which provides a stimulating and inspiring space – at least for the next 10 years? But this time the circumstances are completely different: With the rise of the digital revolution not only the technological principles in the field of printing technology have altered radically, also the role of museums has changed fundamentally. Both sectors are undergoing a metamorphosis from a one-way-media to a social-media-platform.

These premises require a distinct strategy. It is not all about broadening the thematic horizon, escaping from the chronological lockup. It is rather a question of whether the exhibition enables to offer a shape of the future where the visitor could fill in the details. I would like to share and discuss the substantial concept and planning process of the new exhibition "Image – Text – Codes".

Power Plant in Levada de Tomar: the conservation and musealisation of industrial and technical heritage

by Matthias Tissot, Manuel Lemos, and Graça Filipe (IHC-FCSH-UNL)

The power plant in *Levada de Tomar* (Portugal) alongside the Nabão River, a classified public interest heritage from the early 20th century, houses three groups of generators, which allow us to interpret, in archaeological and museological contexts, three distinct forms of electricity production: hydro, steam and diesel. The chronological evolution of the power plant is represented by the equipment, the buildings and the structure of the weir and channel.

This work aims to present the power plant musealisation and conservation methodologies that combined the material conservation, the interpretation of the industrial background and the accessible exhibition communication, in the context of *Levada de Tomar*, managed by local political authorities (Municipality of Tomar).

The museological programme considers *in situ* heritage preservation, regarding the equipment characteristics and marks since its defunctionalisation and the industrial cease, ensuring the heritage authenticity.

In order to attain these objectives, the aim was to preserve the material and the mechanisms in a static equilibrium, disregarding the equipment refunctionalisation. The selection of a cleaning method that would not affect the kinetic mechanisms was the critical issue of the conservation plan. It was selected the dry ice blasting technique, which presents as main advantage the absence of cleaning residues that could spread in the mechanisms and, due to the low cleaning pressure method, the possibility to preserve wear and usage marks, like inscriptions at the surface of different elements. These marks are equipment material evidences of the usage, reflecting, in part, the immaterial component of the power station heritage.

Tramcar's role in the evolution of Porto: a vehicle for pleasure and labor

Carla Dias (Porto Tramcar Museum)

Porto Tramcar Museum belongs to the STCP - Sociedade de Transportes Colectivos do Porto, SA (STCP), which throughout its existence has been able to collect and preserve a unique collection of vehicles and a variety of species and artifacts that are representative of its history and development.

Since opening in 1992, the Porto Tramcar Museum adapted itself to the building that welcomed as museum project - the old Thermoelectric Power Plant of Massarelos, built between 1909 and 1915 by the former company: Companhia Carris de Ferro do Porto.

This building, classified as a building of local interest, accounted for the company that created it, the embryo of the city public transport network, since it was here produced and transformed the energy necessary for the operation of tramcars. Despite the technological changes that led to the cessation of his production function and generator of electricity in the early 1960s the permanence of energy transformation functions and the tramcar perseverance in the city every day, dictated the

preservation and maintenance of unique equipment illustrating part of the twentieth century electric national early heritage and which are now part of the collection of this museum.

With the possibility of using European funds are extended the opportunity to get to know the spaces and heritage that the old Thermoelectric power plant holds. Through the 2010 Community framework is launched the project for a new interpretation of the named "machines room" of this listed building and thus became possible in June 2015 to present this distinctive heritage complex, to the city and all.

SESSION S2C — Room 203

Innovations and Environmental Crises

Organiser: Anthony N. Stranges **Chair:** Anthony N. Stranges

Högbom and Arrhenius: Early Recognition of a Future Environmental Crisis

Anthony N. Stranges (Niagara University)

Arvid Högbom (1857-1940) and Svante Arrhenius (1859-1927) at Stockholm represent the small group of scientists who recognized the long-term consequences of human-caused warming of Earth's atmosphere.Högbom in 1894 calculated the amount of CO2 natural sources emitted and compared that amount with the amount of CO2 emitted mainly because of the increased industrial combustion of coal. He showed that at the 1890s low rate of increasing CO2 emissions, the amount of atmospheric CO2 would double over a very long time, likely thousands of years.

Arrhenius investigated the influence of heat-absorbing gases in the atmosphere, and in April 1896 he published his results in the *Philosophical Magazine*. Arrhenius showed that doubling the amount of atmospheric CO2 increased the average global temperature by 5-6° C. Arrhenius, like Högbom, did not seriously worry about European and American industrial expansion that was putting more CO2 into the atmosphere. He recognized that CO2's increased presence in the atmosphere would trap more of Earth's reflected heat and produce a global warming. But he believed that at the current pace of industrial expansion, a 5-6° C temperature rise from doubling CO2's concentration would require a 3,000-year time span. Arrhenius discussed global warming again in his 1908 book,*Worlds in the Making: The Evolution of the Universe.*

Högbom's and Arrhenius' studies led to the first recognition of serious long-term environmental consequences that would result from an increasing concentration of greenhouse gases.

Limited Victory: Love Canal Reclaimed

John B. Stranges (Niagara University)

Limited Victory: Love Canal Reclaimed: In March 2004, the United States Environmental Protection Agency (EPA) removed the once-notorious Love Canal section of Niagara Falls, New York from the Superfund National Priorities List of contaminated chemical sites. Most of the area was declared fit for human habitation. This article discusses the long and contentious process by which government agencies, mainly, reshaped and reclaimed this physical space. The story provides one of the best illustrations of both the symbiotic relationship between technology and policy in defining habitability and the powerful and controversial shift in U.S. environmental policy from remediation to redevelopment of contaminated properties. This article also shows how EPA resolved conflict among competing views of remediation in order to provide a generally attractive setting for a return to Love Canal. Finally, the most important actors in this story, the returnees, provide their own explanations for their central role in the revival of Love Canal.

Climate Change - How Can History Help?

Petter Wulff (*Independent scholar*)

In his best-selling book *Collapse* Jared Diamond has described how the Viking settlement in Greenland was wiped out when climate there changed to more chilly conditions in the early 15th century. More than the cold the settlers ´insistence on a European lifestyle was what finished them off, says Diamond. More precisely, the Viking food habits were too adapted to the European idea of what to eat to survive a climate change. The Greenland Vikings insisted on keeping cows and disregarded the sea as a food reserve. Diamond thus presents a case, which is a warning to us not to cling to our lifestyle too long. It is one way of using history to help the present – by pointing to examples with outcomes that should be avoided and indicating the parallels to today.

But history could also be used to provide examples with positive outcomes. If we look at the food issue, we know that meat and dairy products carry a considerable climate cost. What examples do we have of changes in food habits in the past? My presentation aims at discussing some cases of food flexibility that may give hints of how a more sustainable food culture could be achieved.

SESSION S2E — Conference Room 2

Free energy vs. Tool of governance

Organiser: Programme Committee **Chair:** Catalin Mihai

An innovative approach on energy sustainability: Inventions of Nikola Tesla

Elena Helerea, Calin Marius Daniel, and Moasa Beatrice (Transilvania University)

Nikola Tesla (1856 - 1943) is a famous inventor with depth knowledge in physics, engineering and technology. His scientific and technical activity, reflected in the more than 150 patents registered in the US and other countries, greatly contributed to the foundation of modern knowledge about the alternative electrical current, the transportation and efficient use of electricity, and the development of electric and electronic technologies.

The paper raises the following question: what sustainability elements of energy are included in the patented systems, methods and models of Tesla?

To answer to this question, we examined the patents of Nikola Tesla recorded in the period 1886 - 1890, a period considered the most fruitful in his overall inventor work. There are analyzed the description of innovations, the models that sustain these inventions, the validity in space and time of the patents, the patents' families.

The paper sources are the three volumes published in Iasi, Romania - that contain the full Tesla's patents, the proceedings of "Tesla" symposia, organized in Serbia (2002-2008), and the IEEE journals' articles.

Currently, a list of Nikola Tesla's patents enumerates 112 US patents and 109 patents registered in other countries. The analysis reveals the sustainable character of Nikola Tesla's inventions, many of which, such as the wireless energy transfer, transport control systems, robots and aircraft, being still elements of the future research.

Even the controversy AC - DC on power transmission systems is still currently debated, the efficiency of both systems being continuous and balanced demonstrable.

Geo-political games vs. Sustainable development in the energy sector of the Republic of Moldova

Dorin Dusciac (Former Deputy Minister of Environment, Republic of Moldova)

The Republic of Moldova declared its independence in 1991, during the breakdown of USSR and the "Socialist Block" in Central and Eastern Europe. Unfortunately, the declaration of its political independence from the Soviet Union did not result in acquiring full freedom from the former hegemon, the Russian Federation. Russia succeeded in conserving a very strong influence on the Republic of Moldova over the past 25 years through maintaining direct and continuous control of the country's energy sector. Currently, 80% of the Republic of Moldova's consumed electrical power is being produced by the "Moldovan Thermo-Electrical Power Plant", situated in the break-out region of Transnistria (separatist, pro-Russian enclave in the Eastern part of Moldova). More than 98% of Moldova's consumed energy (including all types: electricity, gas, oil, etc.) is imported from the Russian Federation.

In this article, we analyze the consequences of external control over the Moldovan energy sector. Russian geo-political ambitions have jeopardized the energy sector reform and development in the Republic of Moldova since the beginning of the 1990's. Today, only 1% of the electrical power consumed on the internal market is "green". Electrical power production, transformation, transportation and distribution infrastructure is degraded and inefficient. Despite some progress, the existent legal framework is largely insufficient, or not suitable for modern, innovative development of the energy sector. Republic of Moldova's energy security is seriously hampered by the Russian "strategic interests" in the region. We provide several possible actions that would create a free, diverse, sustainable and "green" energy sector in Moldova.

SESSION S2F — Amphiteatre 2

Rethinking global technology governance: how to make innovation work for society?

Organiser: Programme Committee **Chair:** Anna Åberg

Extracting a Better Social Order from the Sugar Beet in France, 1815-1850

Andrew Butrica (*Independent Scholar*)

The role of Napoleon I as the originator of the French beet-sugar industry is well known. The literature also recounts at length the political fighting (the "War of the Sugars") between advocates of beet and cane sugar starting in 1837. Proponents gave many arguments to protect beet-sugar production against the supporters of cane sugar that included plantation owners and operators, the slave trade, port cities, sugar refiners, and the merchant marine, to name the most vocal.

This paper examines the arguments provided in favor of beet sugar prior to the struggles with cane-sugar interests. In particular, it traces the origins and evolution of the idea that the cultivation of beets and the extraction of sugar from them provided an ideal way to deal with the "problems" of rural peasant France as well as the "laboring classes and dangerous classes" (Chevalier) in the cities. Among the key individuals were the chemists, Chaptal and Dumas, and Louis Napoleon Bonaparte (the future Napoleon III). The institutional focus is mainly on the Société d'Encouragement pour l'Industrie Nationale. In a general way, the proposals discussed seem to support Jeff Horn's interpretation of French industrialization (*The Path not Taken*).

The "factory on the farm," as one proponent described the effort, seemed to prefigure Leo Marx's *Machine in the Garden* on the pastoral ideal in America.

The electric motor – the key-element to innovation of the industrial process (1920 – 1950)

Maria da Luz Sampaio (University of Évora)

This paper presents the introduction of the electric motor in the manufacturing space, and its impact in rationalizing working methods. This analysis give important information about the new technology - the electricity - in the operative chain and to design the linearity of the industrial space and in rationalization, making the appearing of new areas and the conversion of others. The electric motor brought a new answer to energy distribution and production capacities. With its introduction the thermic generator gradually became obsolescence, with him each operator gains prominence to control its machine and electrical connection, with great impact in the working society and in the technical training. The new machine will be the key-element to innovation of industrial process, and will be responsible to change ratios of productivity and efficiency technological in the industrial space in the first decade of the XX century.

This research essay to present the results of a qualitative and descriptive analysis of photograph sources, specially, of Domingos Alvão (1872-1946)[1] and photos of the enterprise Jayme da Costa[2] (Portuguese subsidiary of ASEA) as well as scholar manuals and publications about the electricity equipment (1928 – 1940) which presents instruction and record the process of introduction of the electric motor in the manufacture process.

[1] Domingos Alvão – Portuguese Photographer owner of a Photographic House in the city of Porto – Collection CPF - Portuguese Center of Photography – Ministery of Culture –Portugal.

[2] Jayme da Costa S.A : importer of electric motors from the Swedish company ASEA : 1920-1950.

14:30-16:00

SESSION S3A — Room 201

Innovating in imperial settings: western dominance, indigenous agency and go-betweens 2

Organiser: Programme Committee **Chair:** Sławomir Łotysz

The issue of sustainability regarding traditional technologies. Challenges and conflicts in preserving traditional underground water channels (qanāt/kārīz)

Constantin Canavas (Hamburg University of Applied Sciences)

A traditional technique of extracting and transporting water in arid regions of North Africa and Asia – from Middle East up to East Asia – is generally known as *qanāt* or *kārīz* or other local names. It is characterised by sophisticated (mainly empirical) knowhow, high labour demand on construction and maintenance, but low-tech demand on (traditional) equipment. Such water networks – whether for irrigation or drinking – consist of underground canals leading water from the source (generally near a mountain) to the places of consumption, and are visually traceable through the rings of accumulated soil dug out from the aligned shafts between the mother-shaft and the outlet of the underground canal.

The present study focuses on "rediscovering" this technique and introducing the issue into the heritage discourse and tourism policy in several countries (e.g. Algeria, Iran, PR China, Oman). A major issue in these discourses is the alleged sustainability of the traditional technology when compared to other water capturing and transporting techniques, e.g. drilling wells or simple overground aqueducts.

The present study focuses on two claims. The first regards the alleged overlapping (if not identity) of traditional and sustainable. Historical evidence on past and actual conflicts indicate that this technology is not more or less sustainable than conventional well drilling. The second touches the issue of societal embedding. Sustainability in *modern using* of the traditional *qanāt* network can only

be achieved under the condition of engaging local interests and enhancing public awareness for the traditional technology.

Translating African pastoralism to the late colonial state: the role of the Mission for Angola Agricultural Surveys

Cláudia Castelo (CIUHCT, U. Lisboa)

Tensions between African pastoralists and the European livestock farmers increased in the late Portuguese colonial empire, in proportion to the growth of large wired ranches owned by settlers in the Cunene region (Angola). For a long time ethnocentric bias and ignorance of the real dynamics of the pastoral system meant that indigenous cattle rising system was considered irrational and unproductive, and the pastoralist populations classified as nomads.

Mission for Angola Agricultural Surveys (MIAA) created in the early 1960s to collect, compile and analyse data on agriculture and agricultural holdings in response to a request from FAO, was called upon by the colonial government to give information on the so called "nomad problem". MIAA proved that annual herd movements did not mean that pastoralists were not permanently-settled people; asserted that transhumance should not be explained in terms of water availability but of distribution of the ecological formations; revealed that farming activities and cattle commercialization were much more important than had been assumed before the census; and exposed the disruptions caused by the ranching system.

In this paper I discuss African pastoralism versus European ranching within the notion of indigenous agency – embodied by sustainable practices – in front of western dominance based on a development model maladjusted to local environment. I also reflect on the surveyors as 'go-betweens' who represent the colonial state before the pastoralist and translate African rationality to the colonial authorities. The surveys explained and valued the capability of adjustment of neglected colonised people to an adverse milieu.

SESSION S3B — Room 202

Popularization of technology and technology of popularization

Organiser: Programme Committee **Chair:** Isabel Zilhão

Ethical aspects of technology in the media discourse of the postwar era. The case of Poland

Urszula Jarecka (Institute of Philosophy and Sociology Polish Academy of Sciences)

Technological development was used in propaganda narratives during the socialist era to support the vision of dynamic progress in the Polish People's Republic and the socialist block. Modernization, innovation, progress are typical words which have been engaged in the propaganda of success in the socialist block. Nevertheless, some Western ideas, inventories and technologies were "smuggled" into the official, socialist media discourse. In this paper is discussed the tension between the need of clear and solid information on the technological reality, and the propaganda goals: to create a vision of successful, buoyant East in opposition to inhuman, ruthless West. Ideological fight between the "socialist progress" and the "bloody capitalist development" were presented in the newsreels, press articles and the TV programs, in the rhetorical framework of strong ethical judgement. The ambiguous results of that battle will be also described and interpreted. The research material will be chosen from the large spectrum of media, mostly newsreels and press articles.

Popularization of science and technology had a unique position in Polish media, such as newsreels, specialist journals ("Młody Technik" [*Young Technician*], "Wiedza i życie" [*Life and Knowledge*] etc.), and TVP programming from the 1950's. During the whole epoch even entertainment was meant to fulfill serious educational tasks. Its character must be deep and ambitious; media during this period eagerly followed the main ethical principles of socialism: innovatory activity, a secular worldview, egalitarianism and humanism. "Humanism" was very tricky value here, in popular socialist consciousness it was equated with communist ideas, and activity against the Western world. Despite this attitude, some articles and programs promoted the news from behind the Iron Curtain as well. However, presentation of the newest technological inventories was often accompanied by the discussion of issues such as ecology, devastation of environment, "capitalist greed", social dishonesty, etc.

Technical innovation in popular magazines in Romania between 1956-1960

Laura Lelutiu, Dan Constantin Balan, and Marius Daniel Calin (Transilvania University)

The aim of paper is to analyze the complex relationship between technological innovation and the modality in which the science and technology was promoted in Romania, in popular magazines during 1956-1960. It was the period of "cold war", in which democratic western world was separated economically, politically, socially and culturally by the "iron curtain" of the totalitarian communist world of Eastern Europe.

Romania, which in 1945 after the WWII was considered as a defeated country and indebted with the USSR, had an unequal distributed industry, with many economic poorly developed regions, and with a strong Soviet influence.

The question is whether the transfer of information and technology was unidirectional and which was the socio-economic impact ? To pursue this problem, we used as sources the issues of the magazine “Science & Technique“, edited in the period 1956-1960.

The paper presents the results of this study: issues of the magazine cover many important technical areas for the Romanian economy: mining, metallurgy, energy, construction, chemistry, communications; it is signaled the emergence of electronic computers; Romanian products are promoted in the magazine.

In conclusion, the journal "Science & Technique ", published by the Communist Youth Union of Romania, had an important role in educating young people and also in promoting art and technology in Romania. However, in magazine articles the news on the technologies and technical innovations are taken only from the Soviet space or countries with communist regimes, and information on the West countries have not found.

Croatian Encyclopaedia of Technology: Objectives and Methodology

Zdenko Jecić and Nataša Jermen (Miroslav Krleza Institute of Lexicography)

Research into the Croatian technology heritage has been limited so far, and focused mainly on the biographies of the Croatian-born inventors and scientists (eg. Nikola Tesla, Roger Joseph Boscovich), resulting in the inadequate representation of technology in the educational system and public perception. In light of these circumstances, in 2014 the Miroslav Krleža Institute of Lexicogaphy initiated the project for the online *Croatian Encyclopaedia of Technology*, which is carried out in collaboration with all the relevant institutions and experts within the field. This paper reports on the objectives and methodology of the project. By describing historical development in addition to the current state of technology in Croatia, the main purpose of this open access *Encyclopaedia* is to comprehensively summarise the field's knowledge. Besides its contribution to understanding the role of technology in a social and cultural context, it will serve as a platform for knowledge networking and sharing, thus facilitating research into the Croatian history of technology. Furthermore, this paper will discuss the innovative role of the *Encyclopaedia*. Due to the importance of the technological artefacts in research and education, the traditional textual encyclopaedic content will be upgraded using available digital data about the artefacts accessible to the public, thus creating a virtual museum of technology. To conclude, we will explain how networking of information from various sources and encyclopaedically organised knowledge could contribute to the development of the history of technology, as well as to the revalorisation and the sustainability of the technology heritage.

SESSION S3C — Room 203

When the sustainable industry was born?

Organiser: Programme Committee **Chair:** Tiago Saraiva

The Co-Production of Cement and the New State: Technology and Corporatism in Portugal (1930-1940)

Isabel Bolas (ICS - Universidade de Lisboa)

The aim of this paper is to contribute to an understanding of the technological dimension of Portuguese corporatism.

Based on the hypothesis of an existing process of co-production between cement and corporatist regime, recent developments in the History of Science and Technology have been conceptualizing the articulation between the practices developed by scientists and engineers and the development of authoritarian regimes.

Drawing on the space of production of my research - Maceira-Liz cement factory - I focus on technologies that make it distinctive – rotative ovens –, to demonstrate that this is an historical object important to understand the processes involved in the New State construction work; and the ways in which it became an experimental space for social and economic policies of the corporatist regime. I will illustrate its contribution to the cement industry's organisation under the Industrial Licensing (a central element of the new regime's economic policy), and also to the creation of the first corporate social welfare system in industry. The design of the factory and social housing set was a space for social experimentation, where equipments were built and tested, like a pilot-project of corporate solutions later implemented in the Portuguese territory (Social Housing Quarter, Chapel, the first *House of the People* in the new regime).

The analysis of this cement factory's case will shed light to the implementation and institutionalization of the corporate regime, as cement became an essential constitutive element of the ways in which the New State regime materialized into Portuguese territory.

Technology, innovation and sustainability in aviation at IAR Brașov in Romania in the 90 years of existence (1925-2015)

Traian-Constantin Dumbrăveanu (Muzeul Casa Muresenilor), Traian Tomescu and Tudor-Mihai Tomescu (*Independent Scholars*)

During the 90 years of the founding of the Romanian Aeronautical Society I.A.R. Brasov on June 25, 1925, when King Ferdinand of Romania signed "the law on industrial enterprises related to national defense" in which Article 1 stipulated "building an Aerospace Romanian Company to manufacture aircraft in Brasov… as first Romanian factory of airplanes", there were produced gliders, sailplanes, helicopters and planes. Romanian State was obliged by Article 2 to guarantee with a third of the initial capital and to pay state aircraft factory obligations for a period of ten years. The inaugural document, signed on 11 October 1927 by officials at that time headed by the Prime-Minister Ion I.C. Brătianu and by the first chairman of I.A.R. Brașov General Constantin Coanda (father of the engineer Henri Coanda, which realized the first flight in the world with a plane with jet engine in Paris on 17 December 1910), indicates that I.A.R. Brasov has become "the first Romanian factory of airplanes ". In the 90 years of aeronautics in Brasov, there were made over 90 types of aircrafts and aircraft engines through the activity at a high level of professionalism of over 20,000 workers, foremen, technicians and engineers which resulted in over 2,200 aircraft, used in more than six million flight hours. This proved the high reliability and durability of the planes. The paper analyzes the conditions in which the new technologies and innovations have contributed to the sustainability of this industry in Romania.

The 'birth' of concrete prefabrication in Portugal: Pioneer examples in Lisbon and Porto

Clara Pimenta do Vale (Faculdade de Arquitectura da Universidade do Porto)

Construction industry is a major economic sector in contemporary society, as recent crises prove it beyond doubt. However, if its importance is recognized, a set of consistent study on its history and development is still missing, not so in a worldwide view but mostly with regional perspectives that can relate technology to local characteristics and conditions.

Mainly after World War II building prefabrications had a major increase all over Europe as it could help rebuilding large devastated areas in less time than conventional construction and also because it aloud new uses for the 'out of business' war industries. As Portugal didn't participate in

WWII, it remained apart from this industrialization implementation. Nevertheless architects and engineers aimed the construction rationalization that such a fabrication method could bring. From foreign references mentioned in national publication to architects and engineers' communications in professional and scientific meetings, desire of prefabrication implementation in Portugal is evident.

This paper aims to contribute to the history of construction industry in Portugal, focusing in concrete prefabrication sector, and in its pioneer examples - in the late 60 and early 70, prior to 25 April revolution. Based on archival sources (first examples building permits), interviews with people related with those experiences (architects, engineers and foreman) and the papers presented in 1948 First Architects' National Congress and in 1968 First National Conference on Prefabrication we intend to trace concrete prefabrication roots in Portugal, from first low tech and experimental examples to the birth of a new industry.

SESSION S3E — Conference Room 2

Routes of innovation: From diffusionism to appropriation

Organiser: Programme Committee **Chair:** Elitsa Stoilova

The key Western technologies in the XIXth century Russian Empire: from diffusion to the appropriation

Elena Alekseeva (Ural Federal University)

The author accents the urgency of western technological innovations research in the present day global world and Russia particularly. Historic precedents of European technological transfer in Russia are compared with the current practice. Technological progress in the XIXth century Russian empire is studied in the context of European modernization on the basis of theory of diffusionism. The paper is addressed to the identification of Westernization waves in Russia, i.e. the author attempts to define the content and nature of fundamental innovations in technology that gave rise to each of the waves; to consider mechanisms of their diffusion in Russia; to analyze political, social, economic and cultural consequences of the diffusion; to identify the reaction of the Russian society towards the innovations; to study the mechanisms of inclusion of innovations in traditional structures and their synthesis. On the materials of the oldest specialized periodicals in Russia – the "Mining Journal" the author reconstructs major milestones of technological progress

in the XIXth century: the emergence of a new mode of transportation - public railways; the use of a new type of fuel in industry - coal; introduction of a new technology for the production of metal - cast steel. The paper also points at the relationship between national identity and the development of the western originated technical progress in Russia in the XIXth century.

Human resources for innovation of industry during the reign of Peter the Great

Elena Borodina (Ural Federal University)

The paper aims to highlight main routs of innovation in the Russian Empire during the reign of Peter the Great (1682-1725) whose reforms made great changes both in everyday life of the state and the place of the country in international relations. One of the most influential sectors of these reforms was economics which had the most intensive development in the field of plant and factory building engaged with creation of new industrial centers. It is worth to note that such centers were not a novelty in Russia, but there was no precedent of making up huge industrial objects in short period of time before.

The 1st quarter of the 18th century is tightly connected with the processes of formation of the Ural industrial region. The Urals is well known as the natural border between Europe and Asia and as place where many natural fossils such as iron and copper are concentrated. Although the region had a lot of natural resources it took time to create conditions for all stages of industrial process. The most important element of the latter is engineers and working people. That is why the paper focuses on such questions as to who were the first industrial specialist in the Urals and how they were recruited Ural plants. For example, the analysis of data has shown that among with the foreign specialist government used internal sources for Ural plants' personnel. First of all they were Russian artillery officers who had an intimate knowledge of engineering.

Portuguese engineers and the routes of the transfer of technology from the centre to the periphery (XIXth-XXth century)

Ana Cardoso de Matos (CIDEHUS - Universidade de Évora)

Engineers were important agents of the transfer of technology from central Europe to Portugal, a country that geographically was in the periphery. The means by which that transfer was made

were several and linked up with the needs that over time the economic and social progress of the country was demanding.

In the XIXth engineering education in Portugal was still insufficient. For that reason many engineers completed their training in civil, electrical or mining engineering in European schools where these teachings were more developed. In the return these engineers trained abroad applied the knowledge acquired and those who were teachers of technical schools taught to their students what they had learned.

The foreign study trips to visit the most advanced laboratories and factories in order to meet the most modern industrial processes or the most advanced machines were other means by which it made the transfer of technology.

Among the study trips of engineers we cannot forget those who made to the Universal Exhibitions. In fact often the engineers integrated study commissions appointed by the government that had the mission to study certain sectors that were usually those who at the time had more interest to the country.

Associations and societies to which the engineers belonged, or technical schools where they taught, allowed them to have access to specialized libraries.

Finally we must not forget that the Portuguese engineers established networks of relationships with their foreign counterparts which, through regular contacts, allowed them to follow the progress of science, technology and industry.

Technology Transfer in Urban Sanitation: A Perspective from Backward Europe

Álvaro Ferreira da Silva (Nova School of Business and Economics)

The creation of the sanitation system in mid-19th century constitutes one of the most remarkable innovations. It is difficult to think of any other single invention that has stopped so much disease and death, even if it did not have the intellectual awe of other contemporary innovations, as it used technologies known for a long time in civil and hydraulic engineering. It constituted a hidden revolution, whether from a literal or metaphorical perspective.

The water carriage system of waste disposal appears as the inevitable and almost teleological solution for modernizing urban sanitary infrastructure, replacing a atomistic and labour-intensive process by a centralised, networked, and capital-intensive system (Tarr, 1985; Tarr and Konvitz, 1987; Melosi, 2000). However, a much less well-known "battle of systems" dominated debates on sanitary technology after mid-19th century, when solutions based on dry vs. water carriage systems were proposed and tested.

This paper analyses this process of innovation in Lisbon, the capital city of a peripheral country and facing a process of economic decline, as a result of its decreasing role in the Atlantic trade. International transfers of technology are an important topic for understanding the constitution of a network of practices and of practitioners, as well as for analysing processes of technological adoption and "domestication". Technologies used in sanitary engineering have a high level of site-specificity (Rosenberg, 1972 and 1976) turning technological circulation and adoption in a backward country a hazardous and challenging process.

Networked sanitation dealt with the most acute environmental problem in 19th-century cities. Using an extensive array of historical sources, this paper contributes to the central theme of this conference, understanding the complex relations between technology, innovation, and sustainability.

SESSION S3F — Amphitheatre 2

Literature and technology: new perspectives

Organiser: Hugo Silveira Pereira **Chair:** M. Luísa Sousa

Commentator: Eduardo Beira

"The drama of the Tua Line": fictional narrative and literary dialogue with the contemporary Portuguese railway technology

Maria Otília Pereira Lage (CITCEM, Faculdade de Letras do Porto)

This paper is the analysis of the short story "The Tua Line drama" that builds a fictional dialogue between objects of a technological museum about the past and the future of the Tua railway. We aim to discuss the relationship between technology and literature in the contemporary social context and understand its complex and dynamic interrelations. Narratives, characters, events and

episodes in various times and spaces make up the set of the literary fictions that provide an approximate and sensitive vision of the Tua Valley and the realities around the construction, operation and closing of the railway line. Thus, we deal with memories, identities and historical contexts, where perceptions, affections and social representations operate under various logics or social worlds that illustrate, by the fictional production of an imaginary realism, the socio-historical meaning of the Tua Valley and railway. To study these issues we will use a longitudinal qualitative analysis of the occurrence of these subjects during this period, and a socio-historical content analysis, drawing from literary studies. We will aim to identify the main patterns of fictional narrative, in which we find embodied the sociotechnical knowledge about the railway. The interdisciplinary analysis thus made is developed on the socio-historical framework (M. Block), the "sociology of action" (Thévenot e Boltanski), the theory of social representations (Durkheim) and literature theory (Todorov). It aims to open other avenues of academic research on this topic.

The inauguration of the Beira Alta railway in 1882: a travel narrative

Hugo Silveira Pereira (CIUHCT, NOVA)

In 1882, the Beira Alta railway was inaugurated. It was considered the real international railway connection that would draw Lisbon and its harbour closer to Central Europe. Having in mind the relevance of the event, the king and his family couldn't be absent. However, the presence of the king is not the main focus of the following paper. We will otherwise focus our attention on an unlikely non-Portuguese guest (B. Wolowski), who for two weeks followed the king in the inaugural ceremony and also in his journey around some of the northernmost cities of the kingdom. Wolowksi described the landscape, people, mores and behaviours of those regions. Later, he summed his notes up in a small book, to which he gave the title *Les Fêtes en Portugal. Inauguration du chemin de fer de la Beira-Alta*. The paper is a brief analysis of this work, under the methodological umbrella of travel literature studies and the relationship between the Self and the Other in a technological context. We will examine the place of the Beira Alta railway in the Portuguese rail system and in the political context of the epoch. We will also try to determine who this B. Wolowski was. We aim to analyse and divulge yet another example of travel literature and of an technological evaluation of Portugal by the eyes of a foreigner..

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List of Participants

Name	Email	Affiliation	Country
A.A. Nikishin	nikishinandrey@mail.ru	USPTU	Russia
Agnieszka Dytman-Stasienko	agnieszka.dytman@dsw.edu.pl	University of Lower Silesia, Wroclaw	Poland
Alan Meyer	adm0027@auburn.edu	Auburn University	United States
Alberto Grandi	alberto.grandi@unipr.it	Università di Parma	Italy
Alexander Kolchin	kolchin-alexander@mail.ru	Ufa State Petroleum Technological University	Russia
Alexandra Barata	alexandrabarata@gmail.com	Universidade Nova de Lisboa - FCSH	Portugal
Alexandre Herlea	catherine.cuisance@utbm.fr	Université de Technologie de Belfort Montbéliard	France
Alexia Sofia Papazafeiropoulou	sofialex.papazafeiropoulou@gmaiol.com	National Technical University of Athens	Greece
Alison Boyle	alison.boyle@sciencemuseum.ac.uk	Science Museum, University College London	United Kingdom
Álvaro Ferreira da Silva	asilva@novasbe.pt	Nova School of Business and Economics	Portugal
Amy Slaton	slatonae@drexel.edu	Drexel University	United States
Ana Cardoso de Matos	anacmatos@mail.telepac.pt	CIDEHUS - Universidade de Évora	Portugal
Ana Cristina Roque	centro.his@letras.ulisboa.pt	Centro de História da Universidade de Lisboa	Portugal
Ana Duarte Rodrigues	amnrodrigues@fc.ul.pt	CIUHCT - Universidade de Lisboa	Portugal
Ana Macaya-Andrés	anamaca@hotmail.com	UAB - CEHIC	Spain
Ana Maria Ramos	ana.ramos@fct.unl.pt	Universidade NOVA de Lisboa	Portugal
Ana Matilde Sousa	ana.matilde.sousa@gmail.com	FBAUL	Portugal

Name	Email	Affiliation	Country
Ana Paula Silva	apl.silva@fct.unl.pt	CIUHCT, Universidade NOVA de Lisboa	Portugal
Ana Simões	aisimoes@fc.ul.pt	CIUHCT, Universidade de Lisboa	Portugal
André Tavares	andre2007@hotmail.com	Escola de Arquitectura da Universidade do Minho	Portugal
Andrei Vinogradov	andreivinogradov@gmail.com	Kazan Federal University	Russia
Andrew Butrica	abutrica@earthlink.net	Independent Scholar	USA
Angelika Schoder	angelika.schoder@aau.at	Alpen-Adria-Universität Klagenfurt	Austria
Angelo Rapisarda	ganges@alice.it	History of Science and Technology - European Pupuls Magazine	Italy
Anna Åberg	anna.aberg@chalmers.se	Chalmers University of Technology	Sweden
Anna Agafonova	unerkannte@gmail.com	Cherepovets State University	Russia
Anthony N. Stranges	a-stranges@tamu.edu	Texas A&M University	USA
Antoni Roca-Rosell	antoni.roca-rosell@upc.edu	Universitat Politècnica de Catalunya	Spain
Antonia Esparza	antoesparza@gmail.com	Universidad de Guadalajara	Mexico
Artemis Yagou	artemis@yagou.gr	ICON/ICOHTEC	Germany/Greece
Bart Hacker	hackerb@si.edu	Smithsonian	USA
Benjamin Brendel	benjamin.brendel@gcsc.uni-giessen.de	University of Giessen	Germany
Bertrand Guillaume	bertrand.guillaume@utt.fr	MPIWG/UTT	France
Boris Mastobaev	mastoba@mail.ru	USPTU	Russia
Bruno De Corte	brunoxdecorte@gmail.com	Independent Historian	Belgium

Name	Email	Affiliation	Country
Carla Dias	csrdias@stcp.pt	Porto Tramcar Museum	Portugal
Carlo Botrugno	carlo.botrugno@gmail.com	University of Bologna	Italy
Carlos Lopez Galviz	c.lopez-galviz@lancaster.ac.uk	Lancaster University	United Kingdom
Catalin Mihai	catalin77@gmail.com	Transilvania University of Brasov	Romania
Catarina Madruga	cmmadruga@gmail.com	CIUHCT, Universidade de Lisboa	Portugal
Chris Bissell	chris.bissell@btinternet.com	Open University	UK
Christine Wall	c.wall@westminster.ac.uk	University of Westminster	United Kingdom
Christoph Rauhut	mail@rauhutc.de	Independent scholar	Germany
Ciro Paoletti	cpaoletti@infinito.it	Commissione Italiana di Storia Militare	Italy
Clara Vale	claracpvale@gmail.com	FAUP	Portugal
Cláudia Castelo	cscastelo@fc.ul.pt	CIUHCT - Universidade de Lisboa	Portugal
Constantin Canavas	constantin.canavas@haw-hamburg.de	Hamburg University of Applied Sciences	Germany
Daqing Yang	yanghist@yahoo.com	George Washington University, USA	USA
Dariusz Brzostek	darek_b@umk.pl	NCU Toruń	Poland
David Ritchie	profdritchie@gmail.com	Pacific Northwest College of Art	USA
David Zimmerman	dzimmerm@uvic.ca	University of Victoria	Canada
Dick van Lente	vanlente@eur.nl	Erasmus University	The Netherlands
Dmitri Gouzevitch	i_gouzevit@yahoo.fr	EHESS, Paris	France
Dorin Dusciac	dorindusciac@yahoo.com	Former Deputy Minister of Environment, Republic of Moldova	France
Eldar Movsumzade	eldarmm@yahoo.com	Ufa State Petroleum Technological University	Russia

Name	Email	Affiliation	Country
Elena Alekseeva	alekseeva167@mail.ru	Ural Federal University; Institute of History and Archaeology, Ural Branch of the Russian Academy of Sciences	Russia
Elena Borodina	sosnovi-bor@yandex.ru	Ural Federal University	Russia
Elena Helerea	helerea@unitbv.ro	Transilvania University	Romania
Elena Kochetkova	lena-kochetkova2008@yandex.ru	National Research University Higher School of Economics-Saint-Petersburg/University of Helsinki	Russia/Finland
Elena Shadrina	elena_shadrina@yahoo.com	Meiji University, Tokyo	Japan
Elitsa Stoilova	elitsastoilova@gmail.com	University of Plovdiv	Bulgaria
Elizabeth Williams	elizabeth_williams1@brown.edu	Brown University	United States
Esat Arslan	esat@cag.edu.tr	Cag University Turkey	Turkey
Francesco Gerali	fgerali@ou.edu	The University of Oklahoma/The University of Western Australia	United States
Frank Dittmann	f.dittmann@deutsches-museum.de	Deutsches Museum	Germany
Frank Schipper	f.schipper@tue.nl	Eindhoven University of Technology	The Netherlands
Frode Lindgjerdet	fr-lind@frisurf.no	Norwegian Armed Forces Museums	Norway
Gleb J. Albert	gleb.albert@uzh.ch	University of Zürich	Switzerland
Göran Rydén	goran.ryden@ibf.uu.se	Uppsala University	Sweden
Graça Filipe	gracafilipe@mail.telepac.pt	IHC - FCSH-UNL	Portugal
Graeme Gooday	g.j.n.gooday@leeds.ac.uk	University of Leeds	UK
Guilherme Frota	guilhermeafrota@gmail	Instituto de Geografia e História Militar do Brasil	Brazil

Name	Email	Affiliation	Country
Hans-Joachim Braun	hjbraun@hsu-hh.de	Helmut Schmidt Universtaet Hamburg	Germany
Harald Gropp	d12@ix.urz.uni-heidelberg.de	Universitaet Heidelberg	Germany
Hugo Silveira Pereira	hugojose.pereira@gmail.com	CIUHCT, Universidade NOVA de Lisboa	Portugal
Ian Johnson	ian.johnson@yale.edu	Yale University	USA
Ignacio Garcia-Pereda	ignnaccio@hotmail.com	Universidade NOVA de Lisboa, CEHFCi-U.Evora	Portugal
Ignacio Suay-Matallana	i.matallana@fct.unl.pt	Centro Interuniversitário de História das Ciências e da Tecnologia (CIUHCT)	Portugal
Irina Gouzevitch	igouzevitch@ens.fr	Centre Maurice Halbwachs, EHESS, Paris	France
Isabel Amaral	ima@fct.unl.pt	CIUHCT - Universidade NOVA de Lisboa	Portugal
Isabel Bolas	isabel.mb.bolas@gmail.com	ICS - Universidade de Lisboa	Portugal
Isabel Zilhão	isabel.zilhao@gmail.com	CIUHCT, Universidade de Lisboa	Portugal
Ivana Lorencová	Ivana.lorencova@ntm.cz	National technical Museum	Czech republic
Ivo Louro	ivomlouro@fct.unl.pt	CIUHCT, Universidade NOVA de Lisboa	Portugal
Jan Hadlaw	jhadlaw@yorku.ca	York University, Toronto, Canada	Canada
Jaume Sastre-Juan	jsastrejuan@fc.ul.pt	CIUHCT, Universidade de Lisboa	Portugal
Jaume Valentines-Alvaréz	jva@fct.unl.pt	CIUHCT, Universidade NOVA de Lisboa	Portugal

Name	Email	Affiliation	Country
Jelena Dobbels	jelena.dobbels@vub.ac.be	Vrije Universiteit Brussel	Belgium
Joana Gaspar de Freitas	joana.gaspar.freitas@gmail.com	IELT, Universidade NOVA de Lisboa, U.Lisboa	Portugal
Joana Lia Ferreira	jlaf@fct.unl.pt	Universidade NOVA de Lisboa	Portugal
Joanna Walewska	joanna.walewska@gazeta.pl	NCU Torun	Poland
João P. R. Joaquim	joaopedrojoaquim@hotmail.com	FCSH, Universidade NOVA de Lisboa	Portugal
Johan García Zaldua	dragg16@yahoo.com	Universidade do Porto - University of Kent	Colombia
Johan Gärdebo	gardebo@kth.se	KTH Environmental Humanities Laboratory	Sweden
John B. Stranges	jbs@niagara.edu	Niagara University, New York	United States
John Busch	jlbusch@optonline.net	Independent Historian	USA
Jorit Wintjes	jorit.wintjes@uni-wuerzburg.de	Julius-Maximilians-Universität Würzburg	Germany
Jose Muñoz Alvis	jose.munoz@hu-berlin.de	Humboldt-Universität zu Berlin	Germany
Juan Navarro	jnavarrolo@euskalnet.net	Sánchez Mazas (UPV-EHU)	Spain
Jukka Vornanen	jukka.vornanen@utu.fi	University of Turku	Finland
Julia Erdogan	erdogan@zzf-potsdam.de	ZZF Potsdam	Germany
Krin Gabbard	krin.gabbard@stonybrook.edu	Columbia University	USA
Kwabena Darko Akuamoah	kdakuamoah@ug.edu.gh	Ghana Institute of Journalism	Ghana
Lars Bluma	lars.bluma@bergbaumuseum.de	Deutsches Bergbau-Museum	Germany
Laura Lelutiu	lelutiulaura@gmail.com	Unitbv	Romania
Layne Karafantis	karafantisL@si.edu	Smithsonian Institution	USA

Name	Email	Affiliation	Country
Liliia Zemnukhova	l.zemnukhova@gmail.com	Sociological Institute of the RAS	Russia
Luciano Maffi	luciano.maffi@unicatt.it	Universitá di Milano Bicocca DEMS	Italy
M. Luísa Sousa	luisacoelhosousa@fct.unl.pt	CIUHCT, Universidade NOVA de Lisboa	Portugal
M. Mayzel	mayzel@post.tau.ac.il	Tel-Aviv University	Israel
Margaret Vining	viningm@si.edu	Smithsonian Institution	USA
Maria da Luz Sampaio	mluzsampaio@gmail.com	University of Évora	Portugal
Maria Elvira Callapez	mariaelviracallapez@gmail.com	CIUHCT, Universidade de Lisboa	Portugal
Maria Paula Diogo	mpd@fct.unl.pt	CIUHCT, Universidade NOVA de Lisboa	Portugal
Maria Rikitianskaia	mrikitianskaia@gmail.com	University of Lugano	Switzerland
Marta Macedo	marta.cdm@gmail.com	CIUHCT, Universidade NOVA de Lisboa	Portugal
Marten Seppel	marten.seppel@ut.ee	University of Tartu	Estonia
Martin Meiske	martin.meiske@gmail.com	LMU Munich / Deutsches Museum / RCC	Germany
Martin Schmitt	schmitt@zzf-pdm.de	ZZF Potsdam	Germany
Martina Hessler	mhessler@hsu-hh.de	Helmut-Schmidt-Universität	Deutschland
Melissa Van Drie	melissa.vandrie@gmail.com	CNRS	France
Michael Kay	m.a.kay@leeds.ac.uk	University of Leeds	United Kingdom
Milton Raimundo	ma.raimundo@campus.fct.unl.pt	Universidade NOVA de Lisboa	Portugal
Miroslaw Sikora	miroslaw.sikora@yandex.com	Institute of National Remembrance	Poland
Natalia Nikiforova	blondarama@gmail.com	Saint-Petersburg Polytechnic University	Russia

Name	Email	Affiliation	Country
Natasa Jermen	natasa.jermen@lzmk.hr	Miroslav Krleza Institute of Lexicography	Croatia
Nelson H. S. Ferreira	nelsonhenriquecechuc@gmail.com	UB & UC	Spain
Netta Avnoon Kaminsky	nettakam1@gmail.com	PhD Candidate, University of Haifa	Israel
Nicoleta Constantinescu	nicoleconstantinescu@yahoo.com	Romanian Ombudsman - National Preventive Mechanism	Romania
Nora Thorade	thorade@hsu-hh.de	Helmut Schmidt University Hamburg	Germany
Olga Poletaeva	ol612@mail.ru	Ufa State Petroleum Technological University	Russia
Olga Yakhno	mrsyakhno@mail.ru	Ural Federal University	Russia
Otilia lage	otilialage@sapo.pt	CITCEM, Faculdade de Letras do Porto	Portugal
Paolo Macini	paolo.macini@unibo.it	University of Bologna	Italy
Paul Coleman	phpc@leeds.ac.uk	University of Leeds	United Kingdom
Pavel Revel-Muroz	soschenkoae@gmail.com	Transneft JSC	Russia
Pedro Brandao	pb@pbrandao.net	CIDHEUS - Universidade de Évora	Portugal
Peter Koval	peter.koval@hu-berlin.de	Humboldt Universität zu Berlin	Germany
Peter Szabo	peter.szabo@ibot.cas.cz	Institute of Botany, CAS	Czech Republic
Petter Wulff	petter.wulff@gmail.com	Independent scholar	Sweden
Rita Lobo	rita.lobo@fct.unl.pt	CIUHCT, Universidade NOVA de Lisboa	Portugal
Roberto Cantoni	realecomplesso@gmail.com	LATTS - Ecole des Ponts ParisTech	France
Rosário Bastos	maria.bastos@uab.pt	Universidade Aberta	Portugal
Sandra Ziv	smithziv@gmail.com	Bar-Ilan University	Israel

Name	Email	Affiliation	Country
Sara Babo	sara.sbabo@gmail.com	Universidade NOVA de Lisboa	Portugal
Seymour Goodman	seymour.goodman@inta.gatech.edu	Georgia Institute of Technology	USA
Sławomir Łotysz	s.lotysz@gmail.com	Institute for the History of Science, Polish Academy of Sciences	Poland
Sonja Neumann	s.neumann@deutsches-museum.de	Deutsches Museum München	Germany
Stefan Gorissen	stefan.gorissen@uni-bielefeld.de	University of Bielefeld	Germany
Stefan Krebs	stefan.krebs@uni.lu	University of Luxembourg	Luxembourg
Stefan Poser	poser@hsu-hh.de	Bezirksamt Steglitz-Zehlendorf von Berlin	Germany
Stéphanie Lachaud-Martin	lachaud.stephanie@wanadoo.fr	CEMMC, Université Bordeaux Montaigne	France
Sueli Furlan	suelifurlan@uol.com.br	Dept. Geography - FFLCH-USP	Brazil
Susan Schmidt Horning	schmidts@stjohns.edu	St. John's University	USA
Susana Belchior	su.belchior@gmail.com	Universidade NOVA de Lisboa	Portugal
Susana Domingues	susanantunesdomingues@gmail.com	Susana Domingues	Portugal
Susana França de Sá	susana_de_sa@hotmail.com	Universidade NOVA de Lisboa	Portugal
Tatiana Kasperski	tkasperski@gmail.com	Södertörn University	Sweden
Tatyana Dmitrieva	td2607@mail.ru	USPTU	Russia
Thomas Kasper	kasper@zzf-potsdam.de	Centre for Contemporary History Potsdam	Germany
Thomas Schuetz	thomas.schuetz@hi.uni-stuttgart.de	Wirkungsgeschichte der Technik (History of the Impact of Technology)	Germany
Timo Myllyntaus	timmyl@utu.fi	University of Turku	Finland
Tirza Meyer	meyer.tirza@ntnu.no	University of Science and Technology	Germany

Name	Email	Affiliation	Country
		(NTNU) Trondheim - Norway	
Traian-Constantin Dumbrăveanu	traidum@gmail.com	Muzeul Casa Muresenilor	Romania
Urszula Jarecka	ujarecka@ifispan.waw.pl	Institute of Philosophy and Sociology Polish Academy of Sciences	Poland
Vanessa Cirkel-Bartelt	cirkel@uni-wuppertal.de	IZWT, BUW, Germany	Germany
Vasily Borisov	borisov7391@yandex.ru	Russian Academy of Sciences	Russian Federation
Victoria Cotorobai	cotorobai.victoria@gmail.com	Universitatea Tehnică Gheorghe Asachi din Iași	Romania
Winfried Heinemann	winfried.heinemann@gmx.de	BTU Cottbus	Germany
Wolfgang Koenig	wolfkoenig@outlook.de	TU Berlin/acatech	Germany
Ximo Guillem-Llobat	ximo.guillem@uv.es	University of Valencia	Spain
Yoel Bergman	yoelb@protalix.com	Tel-Aviv University	Israel
Yolanda Constantinescu	yolanda.constant@yahoo.com	National University of Defense "Carol I"	Romania
Zdenko Jecic	zdenko.jecic@lzmk.hr	Miroslav Krleza Institute of Lexicography	Croatia

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